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Human Performance Tools
Engaging Employees in Safety

Reaching Risks
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ASSE Election Preview
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Program Development Peer-Reviewed

44 Refresher Training
Considerations in the Public Sector
By James H. Olds
Training in the public sector can be a difficult task, particularly in states that do not have an agency to enforce safety standards. As a result, SH&E professionals may spend a lot of time just trying to convince others about the need for training. Once an SH&E professional succeeds in convincing public-sector employees/managers about the need for training, s/he has the added task of stressing the importance of refresher training, as this case example illustrates.

Safety Research Peer-Reviewed

50 Reaching on Ladders
Motivation & Acclimation Affect Risk Taking
By Angela T. DiDomenico, Mary F. Lesch, Michael F. Blair and Yueng-Hsiang Huang
Falls from ladders are a serious concern in many industries. This article describes a study that explored the effects of acclimation and motivation on lateral reach distances by novice ladder users while standing on 6- and 12-ft stepladders. Initial maximum lateral reach distances were compared to those that occurred after limited practice. Findings indicate that workers can reach farther than is recommended for safe ladder use. The authors discuss the importance of proper training and continuous reinforcement regarding the prioritization of safety over task completion speed.

Safety Management Peer-Reviewed

54 Human Performance Tools
Engaging Workers as the Best Defense Against Errors & Their Precursors
By Jan K. Wachter and Patrick L. Yorio
To prevent human error from affecting operations, management can 1) keep workers from making active errors (error avoidance) or 2) stop the errors from having an effect (controls). Human performance tools have been designed to help workers anticipate, prevent and catch active errors. Many tools are geared toward identifying the presence of error precursors. This article discusses the top 10 human performance tools, which were determined by analyzing interviews conducted with high-performing organizations. The authors discuss the effectiveness of these tools based on their ability to provide error-avoiding defenses and promote active worker engagement.
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Pass It On
“Instructions for living a life: Pay attention. Be astonished. Tell about it.”
Mary Oliver

What successes or missteps have you experienced with your safety programs? Have you developed a program that someone else could benefit from? Share your lessons learned with other safety professionals.

Professional Safety welcomes bylined, practical application-oriented articles for publication in the Best Practices section. These brief (1,200 to 1,800 words) articles deliver ideas and suggestions that readers can immediately apply and readily share.

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Z10 Standard for Occupational Health & Safety Management Systems
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Leadership Without Borders
Successful global leaders have strategies for guiding and empowering a diversified workforce operating in different countries, cultures and time zones. Being a competent global safety professional requires more than technical skills. It requires leadership, business, cultural, relationship building and communication, as well as other soft skills. This podcast builds on traditional leadership skills, offers a perspective on how cultural norms affect leadership, and engages the listener in a personal global leadership self-assessment.

The Politics of Safety & Managing Up
The great safety program you are implementing for your organization cannot be done all on your own. You need the support of leaders at all levels of the organization and the buy-in of the workforce. Ultimately, you need clout and it requires a new set of competencies including political savvy. This podcast will help you navigate the political roadmap of your organization.

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American hero Neil Armstrong passed away last year. We remember him as the first person to walk on the moon. Armstrong also earned degrees from Purdue University and University of Southern California, and he served in the U.S. Navy and flew 78 combat missions during the Korean War. Although he made two trips into space during his career with NASA, the most memorable moment came in 1969 when he stepped off the lunar module and said, “That’s one small step for man, one giant leap for mankind.” Some of you may remember the excitement, suspense and awe surrounding that moment. That step and Armstrong’s proclamation brought a great sense of accomplishment and national pride.

Throughout history we have witnessed many meaningful first steps. In fact, anything worth doing always requires someone taking action. Today, I want you to do something that’s important and meaningful—take a first step, then a leap.

During March, ASSE holds its elections. If you turn (or scroll) to p. 29 in this issue, you will see information about the candidates and the positions they seek. Even more information (including platform statements) is on the ASSE website at www.asse.org/elections.

As a membership organization, ASSE depends on volunteers to lead the Society. Some members volunteer within their chapter or practice specialty, while others serve on region or Society-level committees and councils. The top leadership group is the 15-member Board of Directors, made up of regional vice presidents, council vice presidents and the Executive Committee, which is comprised of the vice president, finance, senior vice president, president-elect, the president and the executive director.

ASSE’s election process is important. In the coming years, the Society will be addressing several critical strategic issues concerning ASSE’s governance structure, and the path forward for our profession and those affecting your livelihood. We need our best members to step up and lead. By being informed and voting, you play an important role in deciding who will lead ASSE. It’s an important responsibility of membership.

First a Step, Then a Leap

This first step is easy. Please take out your smartphone, tablet, day planner or whatever you use to keep your calendar and circle March 1. Then, note this to-do: Vote in the ASSE election.

Once you’ve done that, taking the leap will be easier. At 12:01 a.m. on March 1, most members will receive an e-mail containing a link to our online voting system and detailed candidate information. (Those who haven’t selected the online option will receive the information in the mail.) When you open that e-mail (or letter), take the giant leap: Cast your vote.

The reason for my earnest request is simple: Traditionally, less than 18% of members vote in these elections, and last year the percentage dropped to an alarming 11%. Some suggest such low participation indicates that members are satisfied and aren’t compelled to vote. Others say members don’t know the candidates, have never voted before or believe the election is a popularity contest. I don’t buy any of those arguments.

Voting is a Responsibility of Membership

Like volunteering, voting in the Society elections is a fundamental responsibility of membership. But as the voting returns indicate, most members feel it is acceptable to skip this responsibility. As a result, not voting has become part of the ASSE culture—one of our norms.

This is a problem we must address. To do so, we must challenge our collective beliefs. With 35,000 members, it is easy to sit on the sidelines and assume someone else will take the lead. It also is easy to cite reasons—many of them legitimate—to justify not volunteering.

The same cannot be said for not voting. Becoming informed about ASSE governance, the elected officers and the candidates takes so little time. In fact, I’m guessing that in 30 minutes tonight on your couch, you can learn what you need to know to cast an informed vote.

Together, we can change our culture and drive our profession and ASSE forward. Let’s recognize our membership responsibilities and challenge our beliefs, then act accordingly. By doing so, we can foster a new ASSE culture of involvement. Let’s make 2013 the year we all take one small step for ASSE—and what very well may be a giant leap for ourselves. Mark your calendar today and vote on March 1.

Richard A. Pollock, CSP

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February 21-23  St. Petersburg, FL

February 22  Charleston, SC

February 22  League City, TX

February 22-26  San Diego, CA

February 23-24  Dillsburg, PA
Ergonomics Assessment Certification workshop. Back School of Atlanta; (800) 798-7536; www.backschoolofatlanta.com.

February 25-28  Wesley Chapel, FL
Workers' Compensation Research Institute Annual Issues & Research Conference. Workers’ Compensation Research Institute; (617) 661-9274, ext. 235; www.wcrinet.org/conference.

February 27 - March 2  Orlando, FL

February 28  Mesquite, TX
OSHA’s Permit-Required Confined Space Standard course. Texas Engineering Extension Service; (800) 723-3811; www.teex.org/prt.

February 28 - March 1  Knoxville, TN
Risk-Based Process Safety workshop. ABS Consulting; (800) 769-1199; www.absconsulting.com/training.

March 3  Deerfield, IL

March 4-5  Houston, TX

March 4-7  Portland, OR

March 6  Online
Actively Caring for People webinar. ASSE; (847) 699-2929; www.asse.org/webinars.

March 8  Charlotte, NC

March 10-16  Des Plaines, IL

March 11-12  San Diego, CA
Accident Investigation course. OSHA Training Institute Education Center UC San Diego Extension; (800) 358-9206; http://osha.ucsd.edu.

March 11-13  Indianapolis, IN
Road Map to Safety: 2013 Indiana Safety & Health Conference & Expo. ASSE Central Indiana Chapter; (800) 824-6885; www.INsafetyconf.com.

March 11-14  Boston, MA

March 12  El Cajon, CA

February 26-27  Huntsville, AL

February 26-28  Wesley Chapel, FL
Update for General Industry Outreach Trainers course. Workers’ Compensation Research Institute; (617) 661-9274, ext. 235; www.wcrinet.org/conference.

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Permit-Required Confined Space Entry course. OSHA Training Institute Education Center UC San Diego Extension; (800) 358-9206; http://osha.ucsd.edu.

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Institution of Occupational Safety and Health; www.ioshconference.co.uk

Send event announcements to professionalsafety@asse.org.
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March 13-14 Minneapolis, MN

March 13-15 Des Plaines, IL
Corporate Safety Management course. ASSE; (847) 699-2929; www.asse.org.

March 14 Minneapolis, MN
Respiratory Protection Programs course. Centers for Public Health Education and Outreach, University of Minnesota; (800) 493-2060; www.sph.umn.edu.

March 16-17 Nashville, TN

March 18-20 Houston, TX

March 18-20 League City, TX

March 18-21 Dallas, TX

March 18-21 Houston, TX

March 19-21 Raleigh, NC

March 19-21 San Diego, CA

March 19-22 Schiller Park, IL

March 20 Online

March 21-23 Bethel Park, PA

March 22-24 Washington, DC

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March 25-28  Crystal City, VA

March 25-29  Honolulu, HI
Maritime Standards course. OSHA Training Institute Education Center UC San Diego Extension; (800) 358-9206; http://osha.ucsd.edu.

March 26-29  St. Louis, MO
Standards in the Construction Industry Trainer course. OSHA Training Institute Midwest Education Center; (800) 464-6874; http://ceet.slu.edu.

March 25-28  Houston, TX

March 25-28  Boston, MA
Management & Leadership Skills for EHS Professionals course. Harvard School of Public Health; (617) 384-8692; https://ceet.sph.harvard.edu/EHS-Leadership.

March 25-28  Crystal City, VA

March 26-29  St. Louis, MO
Standards in the Construction Industry Trainer course. OSHA Training Institute Midwest Education Center; (800) 464-6874; http://ceet.slu.edu.

April 1-5  Tempe, AZ

April 2-3  Denver, CO

April 2-4  Mesquite, TX
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April 16-19  Flushing, NY

April 16-19  Flushing, NY

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Safety Matters

Green Bike Lanes Double in 2012

If you live or work in an urban area, you’ve probably seen a bike lane. In six major U.S. cities, the standard bike lane, with its white paint outline, is getting a makeover, thanks to the Green Lane Project (www.greenlaneproject.org), a program launched by the Bikes Belong Foundation (www.bikesbelong.org). The improved space, called a “green lane,” adds physical separation between moving cars and bikes, such as a curb, parked cars or plastic posts, to better protect cyclists.

Protected bike lanes have been widely used in Europe for a long time, but only recently have they gained traction in the U.S. A recent report shows that the number of protected green lanes in the U.S. has nearly doubled this year. What’s more, the project expects the number to double again next year.

“Increasingly, U.S. cities want to make riding a bike a practical and comfortable way to get around for short trips,” says Martha Roskowski, Green Lane Project director. “The numbers make it very clear that if we change how the streets work, we change how people travel. “Building safe, appealing places to ride is the number one way we can encourage more people to hop on a bike.”

The project reports 60% of Americans say they would bike more often if they had a safe place, such as a green lane, to ride. This was validated by a recent study in Washington, DC, that revealed bicycling increased 200% on Pennsylvania Avenue after green lanes were installed. Visit the Green Lane Project website at www.greenlaneproject.org/inventory-of-protected-green-lanes to learn about the current inventory of green lanes, and for details on existing and future green lanes.

Six Tips to Reduce Pain When Using an iPad

Spending hours using an iPad or other tablet can cause neck and shoulder problems, according to experts at the Harvard School of Public Health. A simple shift in the viewing angle can change everything, according to a recent report from Harvard Health Letter (www.health.harvard.edu/newsletters/Harvard_Health_Letter/2012/October/prevent-pain-from-computer-use), which offers tips for preventing pain when using a tablet or computer.

Holding a tablet computer too low, say on the lap, forces the neck to bend forward too much, straining and possibly even injuring muscles, nerves, tendons, ligaments or spinal discs. Simply placing a tablet on a table propped at an angle in a tablet case can reduce neck strain and potential pain, according to research conducted by Jack Dennerlein, adjunct professor of ergonomics and safety at the Harvard School of Public Health, and his colleagues.

The number one tip for reducing pain, researchers say, is taking a break. “Change your position every 15 minutes,” says Dennerlein. Other tips include:

- When using an iPad or tablet:
  - Use a case that positions the device at a comfortable viewing angle.
  - Routinely shift hands and weight; stand up if seated, or sit down if standing. When using a laptop or desktop computer, follow the same tips for a tablet, plus:
  - Use an external keyboard.
  - Keep shoulders relaxed and elbows close to the body.
  - Keep hands, wrists, forearms and thighs parallel to the floor.
NTSB Releases 2013 Most Wanted List

National Transportation Safety Board (NTSB) released its 2013 Most Wanted List for transportation challenges this year. The list includes all modes of transportation and six new issue areas (distraction, fire safety, infrastructure integrity, pipeline safety, positive train control and motor vehicle collision avoidance technologies).

Here is the 2013 Most Wanted List:

- Improve safety of airport surface operations.
- Preserve the integrity of transportation infrastructure.
- Enhance pipeline safety.
- Implement positive train control systems.
- Eliminate substance-impaired driving.
- Improve the safety of bus operations.
- Eliminate distraction in transportation.
- Improve fire safety in transportation.
- Improve general aviation safety.
- Mandate motor vehicle collision avoidance technologies.

For more information, visit www.ntsb.gov/safety.mwl.html or www.youtube.com/watch?v=dO8OjADkfwg&feature=youtu.be.

OSHA Requests Recommendations to Update Its Construction Industry Standards

OSHA has issued a Request for Information to initiate the fourth phase of its Standards Improvement Project. The goal of the fourth phase is to streamline existing OSHA construction standards by removing or revising requirements that are confusing, outdated, repetitive or inconsistent with other standards. The agency invites the public to submit any existing construction standards that need revisions, and why those standards need them. Individuals may submit comments electronically at www.regulations.gov.

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OSHA Extends Temporary Enforcement Measures in Residential Construction

OSHA’s temporary enforcement measures in residential construction have been extended through March 15, 2013. These measures include free on-site compliance assistance, penalty reductions, extended abatement dates, measures to ensure consistency and increased outreach. Over the past year and a half, OSHA has assisted the residential construction industry as it transitions to the new requirements. The agency will continue to provide guidance and will also develop more educational training materials to help employers comply. For more information, visit www.osha.gov.

ASSE Professional Development Conference & Exposition

Safety 2014
June 8-11, 2014 • Orlando, FL
Call for Presenters

ASSE will hold its 2014 Professional Development Conference & Exposition in Orlando, FL, June 8-11, 2014. The program will reflect the breadth and depth of the profession and address the professional development needs of SH&E professionals across the globe. Executive-level and technical sessions geared to high-level SH&E professionals are particularly desired.

Interested professionals are invited to submit a proposal to speak at Safety 2014 by July 19, 2013. Presentations should address one or more of the following:

• Key issues and challenges facing SH&E professionals
• Skills and knowledge to address the key issues and challenges
• Emerging issues and areas of interest to the profession

A complete call for presenters will be available at www.asse.org by Feb. 15, 2013. In addition, a session on how to submit a proposal to speak at the 2014 conference will be conducted at the upcoming Safety 2013 Conference in Las Vegas, NV, in June.

Construction Injuries & Fatalities Raise Costs in California

The cost of construction injuries and fatalities to California residents was $2.9 billion from 2008 to 2010, a new Public Citizen report states. “The Price of Inaction: A Comprehensive Look at the Costs of Injuries and Fatalities in California’s Construction Industry” reports that in the 3-year time frame, 50,700 occupational injuries and illnesses and 168 deaths occurred in the construction industry.

“The economic picture is quite staggering,” says Public Citizen’s Keith Wrightson. “We now know that construction accidents impose huge economic costs in addition to tremendous pain for individual victims.”

To alleviate the number of injuries and fatalities, the report suggests California pass a law requiring companies to prove that they adhere to safety standards in order to be eligible to bid for state contracts. This would ensure contractor responsibility and would provide incentives for companies to maintain clean records while working on private-sector sites. “Such a step would help further protect workers while also yielding significant gains to the economy for minimal costs,” Wrightson adds. To view the report, visit www.citizen.org/price-of-in-action-california-construction-safety-report.
Donations to the Foundation make these opportunities possible. Donate now. It’s easy to contribute and it’s tax deductible.

www.asse.org/foundation
Employee Commitment Key to Improving Corporate Citizenship, Dow Rep Says

“Good corporate citizenship and SH&E go hand-in-hand,” Dow Corning Corp. Site Manager Jim Cross said during the 2012 International Manufacturing Technology Show in Chicago. “Citizenship provides a framework that allows internal SH&E activities to be leveraged outside of facilities.”

To efficiently give back both locally and globally, a corporation should start by addressing community needs. “We want the communities where our facilities are located to be great places to live, work, grow and play,” Cross said. Workers are able to improve the quality of life in their communities and promote economic development through community advisory panels, partnerships with local civic groups and nonprofits, and support for education. However, to be truly effective in a community, the company and its employees must show integrity and develop trust. Cross describes four necessary components for proving a corporation is dependable and honest.

- Inform. Proactively educate stakeholders (legislators, neighbors, local officials) and let them know what happens in the plant. This is where community forums and community advisory panels come into play. Invite residents on a tour and answer any questions or concerns they have.
- Invest. Give both time and money. Develop and follow a community relations strategy that emphasizes community safety; then invest in prevention, preparedness and response.
- Infuse. Use talents to develop stronger communities. Train with external agencies (local fire departments, law enforcement, trade associations, media) and allow these efforts to become personal and professional development opportunities. “We try to encourage people to make a difference in their communities,” Cross says. “Using skills, talents, abilities they have in the local area to continue to make improvements on the quality of life.”
- Influence. Get involved with local leadership and decision makers. Present the organization in a unified manner and emphasize business-critical issues. Share key topics and company initiatives with leaders.

According to Cross, the most important factor in successful citizenship is committed employees. Management must value employees just as much as it values profit, sustainability and the quality of products.
IPAF Requires Incident Reporting by Member Companies

As of Jan. 1, 2013, a new system for reporting mobile elevating work platform incidents is required for all International Powered Access Federation (IPAF) rental company members in the U.K. According to IPAF, members must report any known injuries to the federation’s accident database (www.ipaf.org/accident). Currently, there is no single mechanism or collection point for reporting and measuring serious accidents involving these machines, and no definitive data on the number and main causes of incidents. This initiative is designed to centralize how accidents are measured and reported so that similar incidents can be prevented in the future.

“The initial mandate is for U.K. rental companies to report all lost-time incidents for their employees, but all members are strongly encouraged to get on board and report all accidents, near-misses and contractor incidents they are aware of,” says Peter Douglas, chair of the IPAF U.K. Country Council, which has been spearheading the campaign. “The more information we have, the better we will be armed to reduce accidents in our industry.”

According to IPAF technical officer Chris Wraith, companies that report incidents to IPAF can confidentially record data and create their own databases of accidents. Companies will be able to compare their safety performance against aggregated results from all members and known industry benchmarks.

“IPAF’s accident reporting system gives the industry the means to comprehensively collect and analyze accident data and at the same time provide a valuable management tool to improve safety in the workplace,” Wraith says.
NHTSA Reports Highest Seat Belt Use in 2012

National Highway Traffic Safety Administration’s (NHTSA) annual National Occupant Protection Use Survey shows that seat belt use in the U.S. reached 86% in 2012. The agency reports this is an all-time high for use, which has been increasing since 1994. NHTSA also reports that the southern region has shown the most dramatic increases in seat belt use, rising to 85% in 2012 from 80% in 2011.

In addition, the agency says that seat belt use seems to be higher in states that have primary laws. These laws allow officers to issue citations solely for not using a belt, rather than requiring additional traffic violations.

NHTSA Administrator David Strickland credits state, local and national efforts such as the “Click It or Ticket” campaign to the increase in seat belt use. “Moving forward, it will be crucial to build on this success of using a multifaceted approach that combines good laws, effective enforcement and public education and awareness,” Strickland says. For more information, visit www.nhtsa.gov.

Study Finds Correlation Between Parents & Teen Drivers

A study of teen drivers ages 16 to 18 and their parents shows a significant correlation between their driving behaviors. The study, conducted by Toyota Motor Sales and the University of Michigan Transportation Research Institute (UMTRI), surveyed more than 5,500 young drivers and parents, and interviewed 400 pairs of teens and their parents. The study found that parents can influence their teen’s driving behavior, especially when it involves risky behaviors.

Key findings include:

• What teens think their parents do while driving has a greater impact on the teens’ behavior than what parents actually report they do.

• If a teen thinks that his/her parent looks for something in the vehicle while driving, the teen is four times more likely to do the same while driving.

• 26% of teens read or send a text message at least once every time they drive versus the 1% of their parents who said their teen does this.

• 54% of teens report that they use a handheld cell phone while driving, while 61% of parents say they do.

• 69% of teens drive with two or three teen passengers and no adults in the car, which AAA says doubles the driver’s risk of being killed in a crash.

• 50% of teens say that they deal with their passengers while driving.

“Children look to their parents for a model of what is acceptable, says UMTRI’s Ray Bingham. “Parents should know that every time they get behind the wheel with their child in the car, they are providing a visible example that their child is likely to follow.” For more information on teen driver safety, visit www.toyotateendriver.com.

SAE Issues Standard for Emergency Response to Hybrid & Electric Vehicles

As hybrid and electric vehicles become more prevalent, emergency responders need to be aware of the proper procedures for responding to crashes and emergency situations that involve vehicles equipped with high-voltage electrical systems. SAE International has published a standard to address this concern. The standard, J2990-Hybrid and EV First and Second Responder Recommended Practice, suggests practices for emergency personnel responding to incidents involving hybrid or electric vehicles.

“It’s an appropriate time to recognize best practices that facilitate a safe response when [electric vehicles] are in an accident,” says Todd Mackintosh, chair of the SAE Hybrid Technical Committee that developed the standard.

Recommended practices include:

• A procedure for vehicle labeling placed at standardized, consistent locations on the vehicle to identify that it contains high-voltage systems.

• A quick reference guide for first responders, helping them identify high-voltage components and safely disable them.

• Recommendation that manufacturers follow common standards for disabling high-voltage circuits.

• Manufacturer guidelines for creating second responder (e.g., tow truck operator) safety instructions for handling damaged hybrid or electric vehicles.

To access the standard, visit http://standards.sae.org/j2990_201211, or www.sae.org for more information.
Wastewater Facility Earns Kentucky VPP Star Status

Veolia Water, owned by Hardin County Water District No. 1, recently earned OSHA Star status under Kentucky’s Voluntary Protection Program (VPP). The Fort Knox, KY, facility received the safety honor for its high degree of employee involvement in safety programs, which include implementing safety goals scorecards and their efforts to demonstrate constant safety.

“Veolia Water has won the most prestigious health and safety award in the U.S. and more importantly, in Kentucky, which is the hardest to achieve,” says OSH Partnership Administrator Joseph Giles. According to the firm, participants “must meet rigorous qualifying criteria and undergo an extensive on-site evaluation in order to be certified.” To learn more about the company, visit www.veoliawaterna.com.

OSHA Publishes Removal Criteria for Violator Program

OSHA has published its criteria for removing employers from its Severe Violator Enforcement Program (SVEP). The program, which focuses agency resources on employers that demonstrate indifference to their responsibilities under the OSH Act, has been in effect since June 18, 2010. Since then, 288 inspections have been designated as SVEP inspections.

Generally, an OSHA regional administrator considers removing an employer after a period of 3 years from the date of the final disposition of the SVEP inspection citation items. This includes failure to contest, settlement agreement, Review Commission final order or court of appeals decision. An employer also may be considered for removal if all violations have been terminated, all final penalties have been paid, the employer has abided by and completed all settlement provisions, and has received no additional serious citations related to the hazards identified in the initial SVEP inspection. If an employer does not follow the terms and provisions of the agreement, it will remain in the program for an additional 3 years, after which time OSHA will reevaluate its status. For more information, visit http://s.dol.gov/VD.
Fewer Crashes for Fleets With Stricter Policies

The safest fleet vehicles have policies restricting the use of mobile devices and check cell phone records after all collisions, according to a study by the Network of Employers for Traffic Safety. The study, which involved a fleet of 521,000 vehicles and 9.8 billion miles traveled, also found that the lowest crash rates are at companies that:

- track completions of ongoing driver training on a fleet safety scorecard;
- conduct commentary drives with new hires and high-risk drivers;
- communicate fleet safety messages via senior management presentations at meetings.

Respondents were surveyed on more than 25 fleet safety program elements, such as cell phone policies, training and the use of in-vehicle monitoring technology. For more information, visit www.trafficsafety.org.

Mystery Game Application Has Hidden Safety Message

U.K. gas distributor Northern Gas Networks (www.northern gasnetworks.co.uk) has developed a free game app that challenges players to solve a mystery to learn how a student met his demise. But the game has a hidden safety message.

Players of iCOP (www.ngn games.co.uk) take the role of crime solvers tasked with cracking the case. Exploring the student’s apartment, players will search for clues, but taking too long may result in lightheadedness. That’s because the killer turns out to be (spoiler alert) carbon monoxide.

The app allows players to store the U.K.’s national gas emergency number in their phones and apply for a free CO alarm.

“CO poisoning continues to claim lives every year, so it’s vital that we keeping delivering the safety message in new and imaginative ways,” says Northern Gas Networks’ Gwen Allen. “Students living off campus in cheap rented accommodations are one of the key at-risk groups for CO poisoning. By making students more aware of the warning signs and symptoms, and encouraging them to apply for a CO alarm, we can help to save lives.”

FAA Aims to Improve Flight Attendant Workplace Safety

U.S. Federal Aviation Administration’s (FAA) newly proposed policy for addressing flight attendant workplace safety would have OSHA enforcing specific occupational safety and health standards not covered by FAA.

“Safety is our highest priority and that certainly extends to those who work in the transportation industry,” says Transportation Secretary Ray LaHood. “Under this proposal, flight attendants would, for the first time, be able to report workplace injury and illness complaints to OSHA for response and investigation.”

Flight attendant workplace issues could also include exposure to noise and bloodborne pathogens, and access to information on hazardous chemicals. According to Secretary of Labor Hilda Solis, the proposed policy will not only improve the safety and health of flight attendants by connecting them directly with OSHA, but also will enhance passengers’ flying experiences.

Through the FAA Modernization and Reform Act of 2012, Congress required FAA to develop a policy statement outlining the circumstances in which OSHA requirements could apply to working crew members. To view the policy notice, visit www.faa.gov/about/initiatives/ashp.

Six-Step Method Improves Workplace Productivity

When every employee understands his/her role in the company, the roles of others and has a stake in the outcomes, the benefits will go beyond efficiency, says Jim Bocci, product manager at Graphic Products. In the webinar, “5S: Improving Workplace, Work Space and Work Flow,” Bocci shared six steps designed to improve productivity.

**Sort.** Remove nonessential items, materials and tools from work areas. Eliminate clutter and hazards. Red tagging is a popular method for identifying work tools and how often they are used. This process can be phased in over a period of time to help determine what is necessary.

**Set in order.** Set items in their proper place for quick retrieval and storage. Have a place for everything and put everything in its place. A color-coding system should be considered for this step so that workers recognize equipment faster.

**Shine.** Thoroughly clean and organize the workplace and make necessary repairs to machinery.
Create a Winning Safety Program

A business can respond to occupational risks in a more timely and efficient manner when it is proactive and prepared. “Just as coaches need to prepare teams for the next opponent, safety directors must train and equip employees with a strong defense against potential safety risks,” says John Amann, vice president of first aid and safety at Cintas. Cintas has provided five strategies for businesses to create a winning safety program. And the catch? It’s not much different from coaching a football team.

- Work with seasoned referees and coaches. Putting safety in the hands of an unqualified service provider can have disastrous results. Partner with a seasoned first-aid and safety team that offers multiple solutions to safety and compliance needs.
- Practice. Employees must regularly update their safety skills. This can be achieved through regular training sessions using a combination of online, DVD and instructor-led formats. Training should address specific industry hazards and should occur when new members join the team, if regulations change and as a refresher for veteran employees.
- Wear protective gear. Encourage workers to put on PPE before performing potentially dangerous job tasks. This includes flame-resistant clothing for electrical work, hearing protection for noisy environments, and gloves and safety glasses for handling chemicals or equipment.
- Develop a strong defense. Workplace first-aid cabinets help reduce the effects of common ailments by providing quick treatment. Stock cabinets with bandages, aspirin, antibiotic ointment and a solution for diabetic reactions. This can limit the need for additional treatment and lost workdays.
- Keep a medic on the sidelines. It is crucial to place functioning automat-ed external defibrillators throughout a facility. Partner with a service pro-vider to ensure that units are regularly inspected and tested. Workers should be trained to act as first responders during an emergency.

Like a football team, to be successful, a workplace must be equipped with the proper preventive tools and training, says Amann. Training, PPE and emergency response equipment must be part of every safety manager’s playbook.

For more information, visit www.cintas.com/firstaid.

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FEBRUARY 2013 Professional Safety
**PS: How can SH&E professionals get a seat at the senior management table?**

**Mary:** SH&E specialists have a lot more to contribute than just ensuring that regulations are met. They can be at the heart of a culture change that transforms their organization. Every employee can buy into personal safety. Therefore, if SH&E specialists need to better engage their workers, they should start with safety. When safety leads employees to improve product quality and costs, senior management will see the value of SH&E.

If you don’t have a seat at the table yet, you are best off showing how you can impact more than just regulatory compliance. Demonstrate that you understand the whole business and can contribute to it positively. This way, you will be seen as a contributing part of the team, not simply as a compliance officer. By having a business head, understanding trade-offs and advocating for continuous improvement, SH&E specialists can get a seat at the senior management table.

**PS: What are examples of financial and social benefits to proactively reducing operational risks?**

**Mary:** Safer operations do not increase costs. In fact, a well-run operation is always more efficient. If you think about it, problems on the production line affect product quality, production rates and safety. When equipment breaks, unplanned maintenance has to occur, leading to unnecessary hazardous tasks. A safer operation leads to higher profit and benefits both workers and the nearby community.

**PS: How can SH&E professionals move from a compliance-based approach to a proactive approach?**

**Mary:** SH&E professionals have to think in terms of prevention and continuous improvement. They often struggle with the concept of “less than perfect” and they must learn to be comfortable with that idea. If you just check the box on regulations instead of thinking about the underlying reason behind them, you get complacent. However, if you recognize where safety stands today and what the biggest risks are, then you can focus on how to get the best bang for your buck. Once you make the philosophical jump to proactive risk management it completely changes the equation.

**PS: What are benefits of holistically managing SH&E operational, financial and reporting risks across facilities?**

**Mary Kilgo** is senior director, sustainability solution management, with SAP. Mary works with global customers to define the solution road map and best practices for operational risk management. Mary joined SAP after 25 years of working for global companies in the chemical process industry in which she held various roles in SH&E, operations and technical support. She also has practical experience implementing management systems, including ISO 9001 and ISO 14001. Mary holds an M.B.A. from The Anderson School at UCLA and a B.S. in Chemical Engineering from Georgia Institute of Technology.

**Mary:** One challenge that organizations face with SH&E is that there are many competing priorities, and limited time and money. In addition, SH&E risks cannot always be quantifiable in financial terms—or at least, the financial terms do not fully represent the cost of an injury such as a permanent disability. Thus, prioritizing on the sole basis of a cost analysis is inadequate.

However, using a common system of rating risks by likelihood and consequences allows safety professionals to develop a better view of the effect of their decisions. This helps you to prioritize better. Once you allocate resources where they have the most positive impact, you’ll notice an upward spiral of improvement. Every small improvement that prevents accidents and injuries leads to more resources being available for proactive projects.

**PS: How can SH&E professionals become better educated about risk management and risk assessment?**

**Mary:** There is a lot of good literature out there. The international standards ISO 31000 (ANSI/ASSE/ISO Z690,2-2011) and ISO 31010 (ANSI/ASSE/IEC/ISO Z690,3–2011) are a great place to start. Wikipedia can be used as well to look at all the references that are listed for specific risk analysis techniques. However, there is no substitute for hands-on experience.

One can start by cataloguing and rating all the risks in an operation. Then, list all the controls that are already in place. You’ll be amazed at all the things that are already being done that were actually part of a risk management process. You’ll see some gaps where you wished you had better analysis. Take those areas and apply some of the more complex risk analysis techniques and learn by doing.

**PS: With regard to risk management, you say, “good insight still can be obtained from a holistic study.” How can management be more proactive when identifying and assessing risks?**

**Mary:** Good data lead to good insight, which eventually leads to more proactive tasks instead of reactive ones. Start by making a comprehensive list of all the risks in your operation and rate them. After doing this, you might find that the SH&E team has been working on low-impact issues. However, the holistic approach allows you to have better insight into the right focus areas. You will naturally start to put more effort into understanding the high-risk areas so that you can take action to reduce them.
**PS:** How can safety professionals ensure compliance with legal and regulatory requirements?

**Mary:** I look at all legal and regulatory requirements through the lens of risk assessment. If a legal requirement exists, then there was some risk-based reason for it. When you create a complete risk register, all of the legal requirements will also be listed in there. You’ll likely find it interesting to see what things you are doing that are regulatory requirements and what go beyond compliance. You’ll learn a lot about your organization by the percentage split between those.

**PS:** What are some complexities associated with compliance on a global scale, and how do risk management solutions simplify tasks and control hazards?

**Mary:** The obvious difficulty is that every governing body has its own set of rules for creating regulations, so every regulation has at least some unique aspects. Standardizing regulations across the world is almost impossible. However, if you focus on the underlying intent instead of the exact prescriptive requirements, you’ll find that you can greatly simplify how you control hazards. When you take a systematic approach to this, you start to see the similarities instead of focusing only on the differences. If it is a requirement to have a hearing protection program in some countries, it is probably a good idea to have one even where there is no regulation. Whether the regulations force you to make changes, your company is still negatively impacted when workers are losing their hearing. Regarding tasks, it helps to look at all the tasks that the organization is already doing for SH&E. This is hard to do when those tasks are not all in one system.

**PS:** How can sustainability enhance corporate image and brand management?

**Mary:** There are not many examples of companies that have used their focus on sustainability in a positive way. It is always easier to focus on the opposite: how unsustainable practices hurt corporate image and brand management. No one needs to explain that.

This is starting to change as more people are making buying decisions based on more than just price. Part of this is just education. Until recently, no one thought much about where their food was coming from and how much energy it took to transport it. The same goes for labor practices affecting the people who made your clothes. Once people know about and understand the problems, they make more educated choices. The effect can be subtle and lengthy, and companies that are not already starting to focus on this will be left behind.
The title of this article assumes at least the following: 1) safety coaches exist to observe and recommend best practices; 2) how they work—and how they are supported by senior management—is crucial; and 3) safety coaches are coachable. Let me explain.

**Point 1:** Many SH&E professionals have described a bidirectional line with one arrow pointing to “safety cop” and the other arrow pointing to “safety coach.” Imagine a scale from 1 to 10, like any continuum. Many safety professionals have explained, “I need to lean on these people, just like any cop, to ensure compliance with OSHA or company regulations.” And some safety cops add, “If I weren’t on site or calling for daily status updates, these people wouldn’t do anything right.” That is certainly one perspective.

Another perspective comes from the other end of that continuum. Many SH&E professionals have said, “My role is to build relationships with the project leaders, foreman and craft (or insurance compliance representatives). Once we have built a trusting relationship, then I can be effective as a teacher or coach. My role is to suggest solutions and ask open-ended questions, rather than to tell or intimidate.”

Imagine that scale from 1 to 10, with safety cop as a 1 and safety coach as a 10. There is no right or wrong number, as situational leaders know. But we all have a general tendency or style. What is your natural style? Pick a number from 1 to 10 and write it down. There is nothing good or bad about that number; it is data, nothing else.

**Point 2:** How you choose to work is crucial. Notice the word choose. As a professional coach, I notice when people consider their choices. We all have choices, even when we may not think we do. For example, if you are observing someone climbing without fall protection, how do you respond? The banners at most jobsites remind you to adopt three steps: “Stop. Think. Act.” But how?

Research suggests that 60% of our daily actions are habitual. We act today in the same or a similar way that we acted yesterday because our brains reinforce that habitual behavior. So, you may choose to criticize someone or you may choose to ask open-ended questions. Or, you may choose to pause and think. When we pause for 7 seconds, we control our emotional responses and trigger executive thinking. You can choose to think, then to respond.

In fact, about 40% of our actions are new choices. They require us to assess the situation, gather data, consider several choices, then respond. You may know this, but technical knowledge will not define your career success. How you choose to respond will define your career.

I recently spoke with a veteran CSP who said, “Something always changes at this project site. Work packages, design, staff resources, mandates from corporate. The only thing that keeps me going is the realization that I can stop, think and then respond. On good days I do not always need to be reactive.”

**Point 3:** Safety coaches are coachable. By definition, the word coachable implies being open to multiple responses, willing to listen and consider choices, and be held accountable to past actions. The reason companies hire an external coach is to model these skills. Managers can develop their coaching skills. When senior managers support external coaching, you can develop a coaching culture. The return on investment is clear.

**Seven Proven Tips**

Here are some proven tips for how to coach safety coaches:

1) Explain the process. Coaching is a process that moves from awareness to action to accountability. External coaches provide objectivity to a company. Internal coaches, such as managers or human
The primary skill that managers must deploy is coaching. Make sure sessions are private and short. Focus on the direct report’s agenda. Speak less than 30% of the time. Make sure you are not interrupted.

2) Focus on those who are open to coaching. If you are assigned to work with someone and s/he agrees to meet in his/her office while on a conference call, or only after work hours, or if s/he skips coaching sessions, then do not waste your time or energy. That person is simply not open to coaching. Make a quick assessment. Trust your judgment. Rely on actions, not words. If the person is not coachable, select another coach or drop that person from your list.

3) Control the environment. If you are a manager, by definition you must maximize the productivity of others. The primary skill that managers must deploy is coaching. Make sure your sessions are private and keep them short. Focus on the direct report’s agenda. Speak less than 30% of the time. Have the person you are coaching take notes. Make sure you are not interrupted.

4) Set reasonable expectations. Coaching requires at least regular meetings, confidentiality, timeliness, accountability, honesty, executive sponsorship, high value and results.

5) Respect uniqueness. Everyone has different gifts. My primary role as a coach is to support the professional and personal development of others.

6) Use open-ended questions that begin with how or what. For example, “How can you increase data compliance in workers’ compensation cases?” or “What would your team look like if you excelled in business development?”

7) End each session by articulating next steps. For example, ask, “What are you taking away from this session that you might do before our next session?” Write down those possible takeaways and drive accountability by referring to them in subsequent sessions.

Doug Gray, PCC, is founder and president of Action Learning Associates Inc. (www.action-learning.com), which provides individual and team safety coaching and consulting. He can be reached at (704) 895-6479.

Do you have anything associated with SH&E issues in the semiconductor manufacturing industry?

Do you have information about the hazards and exposures of anhydrous ammonia used in manufacturing?

Do you have anything associated with SH&E issues in the semiconductor manufacturing industry?

Where can I go to get anecdotal and benchmarking information showing how lean manufacturing techniques and concepts are affecting SH&E practices?

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Candidates - Vice President, Region V

Scott Huberty

Candidate - Vice President, Region VII

Tara Falin-Kersting

Fred Sebastian
Michael Belcher, CSP, is director of safety for DS Waters, the U.S. leader in home and office water delivery, where he leads safety and health efforts that affect more than 5,000 employees. Belcher devotes most of his time working to align safety and risk management processes with desired business outcomes while managing a multimillion dollar budget.

With 23 years’ experience as a safety professional, Mike has worked successfully with various employers to control losses, improve operational performance, and prevent injuries, illnesses, fire and vehicle accidents. He also worked for Cingular Wireless and Coca-Cola Enterprises in prominent safety and risk management roles. He holds a B.S. in Industrial and Systems Engineering from University of Florida.

Mike serves on various Society committees, and was the Region IV vice president from 2010 to 2011 and deputy chair of the Council on Member and Region Affairs from 2011 to 2012. Mike was an area director for 5 years, and he has held offices as delegate, president, president-elect and secretary in the Georgia Chapter. Mike was named the Georgia Chapter’s Safety Professional of the Year in 2003, and he has appeared in television interviews as an ASSE spokesperson.

Other professional affiliations include the Georgia Safety Leaders Council and the Direct Delivery Leadership Council. As a member of various ANSI Z245 subcommittees, he participated in the development of national consensus standards for waste management safety. Mike also is the former vice chair of the Atlanta-Fulton County Local Emergency Planning Committee, a published author and a frequent speaker at professional conferences.

Thomas F. Cecich, CSP, CIH, is a 40-year member of ASSE and a past president of the North Carolina Chapter. He has been elected twice as vice president, Council on Professional Affairs, and has served on the Society’s Government Affairs (chair), Strategic Planning, Professional Development Conference Planning, Educational Standards and Public Relations committees. He was a trustee of the ASSE Foundation from 1991 to 1996 and 2004 to 2009, twice serving as vice chair. He is a two-time recipient of both the Charles V. Culbertson Outstanding Volunteer Service Award and the President’s Award.

Tom is president of TFC & Associates, an SH&E management consulting firm, and a member of Mercer/ORC’s safety and health consulting practice in Washington, DC. Previously, he was vice president of EHS for GlaxoSmithKline with various responsibilities including North American operations, global manufacturing, and governmental advocacy and strategy. He previously held safety management positions at IBM and Allied Chemical Corp.

Tom holds a B.S. and an M.S. in Industrial Engineering. He is a clinical assistant professor of environmental health sciences at the Tulane University School of Public Health, and teaches in the occupational health and safety master’s program.

Tom served on the Board of Certified Safety Professionals (BCSP) from 1993 to 1998 and was BCSP president in 1997. He also served for 3 years as board chair for the Manufacturers and Chemical Industry Council of North Carolina, a state affiliate of the American Chemistry Council.

In 2007, he was appointed to the North Carolina Environmental Management Commission by then-governor Mike Easley.
The Society has four councils: Member and Region Affairs, Practices and Standards, Professional Affairs and Professional Development. The Council on Member and Region Affairs is chaired by the senior vice president. The other councils are chaired by an elected vice president. The vice presidents of professional affairs and professional development are elected for 2-year terms in odd-numbered years.

The vice president of professional affairs chairs the Council on Professional Affairs, which develops and implements programs to place ASSE in a leadership position in promoting the safety profession, including recognition of the SH&E professional and enhancement of the profession. Three committees report to this vice president: Government Affairs, Educational Standards, and Technical and Professional Recognition.

James D. Smith, M.S., CSP, director of risk control services for Arthur J. Gallagher Risk Management Services, is a professional member of Region IV and an ASSE member for 30 years, residing in West Palm Beach, FL. Jim was previously employed as safety and claims (liability) manager for 18 years for South Florida Water Management. Jim holds a B.S. and an M.S. in Industrial Safety from University of Central Missouri.

Jim served 10 years on ASSE’s Board of Directors, in three major leadership positions including vice president of finance (two terms), managing the Society’s finances, budget and investments; vice president, Council on Practices and Standards (two terms), overseeing practice specialties, branches, the Standards Development Committee and common-interest groups; and vice president, Council on Professional Affairs.


Society awards/honors include ASSE’s Edgar Monsanto Queeny Safety Professional of the Year (2004); Charles V. Culbertson Outstanding Volunteer Service Award; and President’s Award for financial management (2010 and 2012). Jim serves on several ANSI standards committees [ANSI Z590 (chair), Z10, A14, A10.33, A14.3 (chair), A1264.1/1264.2] and he has been an expert reviewer for Professional Safety. His influence and contributions continue to shape ASSE policy, procedures and processes that sustain the Society as a premier SH&E professional organization.

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James R. Thornton, CSP, CIH, is director of environmental, health and safety for Newport News Shipbuilding, a division of Huntington Ingalls Industries. The company constructs, repairs and maintains nuclear-powered aircraft carriers and submarines for the U.S. Navy. Newport News has 21,000 employees and occupies 550 acres on Virginia’s eastern coast. Newport News is the largest OSHA VPP site, largest ISO 9001 site and the largest 14001 facility in the U.S.

Jim has progressive experience in the safety and health field since passage of the OSH Act, and has experience not only in shipbuilding, but also in many other diverse industries. He holds a bachelor’s degree in aerospace engineering from Auburn University and a master’s degree in industrial hygiene from Texas A&M University. He is board-certified in both industrial hygiene and safety. Jim is a past president of AIHA, and is a recipient of AIHA’s Distinguished Service Award. He currently chairs ASSE’s Government Affairs Committee, and he is a past recipient of the Charles V. Culbertson Outstanding Volunteer Service Award.
James H. Morris III has been the assistant director, environmental and energy management, for Virginia Beach City Public Schools for the past 10 years, including oversight of the division’s $20 million utilities budget. Before that, he was the industrial hygienist for the City of Virginia Beach and has been in occupational and environmental safety and health for 22 years.

Jim’s background includes a B.S. from the College of William and Mary and an M.S. from Old Dominion University (ODU). Morris also taught undergraduate and graduate-level classes in occupational health at ODU as an adjunct professor.

Morris is chair for the ASSE Region VI professional development conference. Before that, he was Region VI vice president from 2005 to 2010. He also is a member of several Society committees including Finance, Public Relations, and formerly served on the Sustainability Task Force and Past Presidents’ Task Force (as that group’s only nonpast Society president). Jim also chairs the NAOSH Week subcommittee. He received the Charles V. Culbertson Outstanding Volunteer Service Award (2007) and the President’s Award (2008) for his work with the Society. He was named the Greater Tidewater Chapter Safety Professional of the Year in 2009.

Jim also serves on the Board of Directors for the Virginia Energy Procurement Governmental Association. His family, including two sons, James and Sean, and wife, Colleen, received the Volunteer Hampton Roads Family Award in 2011. Jim also is on the Angel Flight charities board in Virginia and volunteers with the Virginia Beach SPCA.

Christine M. Sullivan, CSP, ARM, is the senior vice president, risk control services manager, for Lockton Cos. LLC in Denver, CO. Christine has more than 20 years’ safety and health experience. She holds a B.S. in Human Factors Engineering from Tufts University. For the past 15 years, she has been employed by Lockton Cos., the largest privately held insurance broker in the world. She is responsible for a staff of 30 associates who help both national and international companies with their risk management and safety activities. In addition, Christine acts as a liaison to numerous midsized companies serviced by her office.

An ASSE member since 1996, Christine served as the Colorado Chapter President from 2000 to 2001. During her term as president, the chapter earned a Chapter Achievement Award. She is a member of the Risk Management and Insurance Practice Specialty Advisory Group and is past assistant administrator for that group. Christine has served as a member of the Council on Professional Development since 2006 and is currently its vice president. Previously, she served for 6 years on the Professional Development Conference Planning Committee, with 3 of those years as chair. She also was a member of the 100th Anniversary Task Force, the Loss Control Symposium Planning Committee and the Leadership Initiative Task Force.

Christine has received the Charles V. Culbertson Outstanding Volunteer Service Award, the Risk Management and Insurance Practice Specialty Safety Professional of the Year Award and the Council on Practices and Standards Safety Professional of the Year Award.

The vice president of professional development chairs the Council on Professional Development, which is responsible for Society programs related to professional development and the communication of professional knowledge. The council provides the direction and oversight of the use of ASSE resources for education, training and technical publications for SH&E. Specific areas of responsibility include education and training programs; the annual conference and exposition; Professional Safety; technical publications including books and related media; and resources for career professional development. Three committees report to this vice president: Editorial Review Board, PDC Planning Committee and Technical Publications Advisory Committee.
Region
Vice President

Region I

James Boretti, CSP, has more than 28 years’ experience and an extensive background in the safety and health field. James is president of Boretti Inc., a professional SH&E firm providing a broad range of technical and business safety solutions. He provides safety consultation including training, safety process development and implementation, and problem resolution. James holds a B.S. in Business Administration/Marketing from San Diego State University. As a business owner, James provides leadership and oversight of business operations including strategic planning, financial and accounting management, operations, marketing, and staff development and management.

James has been a CSP since June 1996. He is a professional member and an active member of the Region I Regional Operating Committee as Assistant Regional Vice President for Governmental Affairs. He also is an active member of the Society’s Finance, Business of Safety and Professional Conduct committees among others. He has chaired and been a member of several ASSE symposia task forces. James also has served on the Society’s Council on Professional Affairs and has been president of two chapters: Central Valley and Orange County in California. He is a recipient of the President’s Award for continual leadership and mentoring, and the Charles V. Culbertson Outstanding Volunteer Service Award.

Erike Young, M.P.P.A., CSP, ARM, is the director of environment, health and safety for the University of California, Office of the President. In this position, Erike is responsible for providing system-wide direction, coordination and assistance to the campuses, hospitals and national laboratories in the development, implementation and maintenance of policies, procedures and programs necessary to maintain a safe and healthy environment for faculty, staff, students, patients and all visitors.

Before coming to the University of California, Erike was a senior consultant with Bickmore Risk Services, where he primarily worked with public-sector organizations to establish an effective safety culture by integrating environmental and safety management into their operations. He has presented and written several articles on the topic of safety culture, and developed a survey instrument to measure safety culture in public entities as part of his thesis work.

He is the past president of the ASSE Sacramento Chapter, and is currently on the board of directors of the National Safety Management Society. Most recently, Erike was recognized as ASSE’s 2012 Edgar Monsanto Queeny Safety Professional of the Year and the 2011 ASSE Region I Safety Professional of the Year. He holds a Master’s in Public Policy and Administration from California State University, Sacramento, and a B.A. from University of California, Davis.

ASSE’s eight regions provide administrative coordination for 150 chapters. Candidates for ASSE’s region vice president offices are selected by their respective nominating committees. Members of ASSE’s four odd-numbered regions will vote for vice presidents to represent them on the Council on Member and Region Affairs and the Board of Directors for 2-year terms beginning July 1, 2013.
Platform statements for all candidates will be available Feb. 1, 2013, on ASSE’s website (www.asse.org); or by calling Customer Service at (847) 699-2929. More details will be included with the ballot, which will be sent electronically or mailed to all voting members by March 1, 2013, as required by Society Bylaws. Ballots must be received by March 31, 2013, to be counted. Election results will be published in the May issue of Professional Safety. The new Board of Directors will be sworn in during the annual House of Delegates meeting on Monday, June 24, 2013, in Las Vegas, NV.

G. Alan Brown, CSP, CPEA, is a health supervisor at Total Petrochemicals & Refining USA Inc. He is a competent, experienced safety professional in both academic and practical areas of safety, health, industrial hygiene and training. Alan’s supervisory skills are within the fire, safety and health departments both represented and nonrepresented, and he is knowledgeable of state workers’ compensation laws with self-insured claims and reserves of more than $2.5 million. He has daily involvement with OSHA, EPA and DOT regulations. Alan’s refinery experience includes plant-wide safety, health and industrial hygiene responsibilities for the 270MM barrel per day facility.

Alan is responsible for contractor safety and orientation management in addition to plant-wide responsibilities for industrial hygiene monitoring, PPE and asbestos. He is a radiation safety officer for the refinery Texas Department of State Health Services nuclear license. He has specific duties for TSCA inventory reporting under Section 8c, Fire Brigade organization and training at Lamar University, HMIS implementation plant-wide and incident investigation through SCAT and TapRoot.

He has been an ASSE member since 1976. Alan also has participated in the Industrial Safety Training Council, board member, vice president, AIHA, National Petroleum Refiners Association and Golden Triangle Business Roundtable Safety Committee.

Alan has held many positions within ASSE. He was a charter member of the Imperial Calcasieu Chapter and received the Sabine Neches Safety Professional of the Year Award in 2005. He has been president of the Sabine Neches Chapter and currently serves on the executive committee. He was elected Region III Vice President (2011-13).
Scott Huberty, ARM, is loss control supervisor in the Minnesota Office of Meadowbrook Insurance. He is responsible for strategic development and implementation of loss control and risk management service plans for members of the Self Insurance Groups that utilize Meadowbrook’s loss control services. On a daily basis, he works with the loss control staff to provide risk assessment, safety training and consultation services for individual companies that participate in these funds.

Region V

Scott is active in ASSE. He has served two terms as president of the Northwest Chapter and participated on a Society committee. He is also a frequent speaker for trade associations and safety conferences, and has been interviewed on area radio programs. Scott is married and has four adult children.

Region VII

Tara R. Falin-Kersting, CSP, has more than 10 years’ experience in the SH&E profession. She holds a B.S. in Safety Management from Murray State University (MSU). Tara is the High Horsepower North America HS&E leader for the Engine Business Unit of Cummins Inc. in Seymour, IN. In 2010, she led the Seymour Engine Plant in achieving the OHSAS 18001 certification.

Tara’s ASSE involvement started in 2000, when she was a student at MSU in Region VII. As a student, she attended what is now the Future Safety Leaders Conference. After college, Tara became an active member in the Gulf Coast Chapter (GCC). During her time with the GCC, she held the offices of membership chair, secretary, vice president of membership services and chapter president. In 2007, Tara served as the Region III professional development conference program chair. She also received the GCC Safety Professional of the Year and NAOSH Champion awards.

Tara returned to Region VII in 2008, and was awards and honors chair for the Louisville Chapter and presented at the Future Safety Leaders Conference. During this time, Tara co-founded the Young Professionals in SH&E Common Interest Group, of which she is Vice Chair. She is also a member of the Society’s Public Relations Committee. Tara is a member of the Central Indiana, Louisville and the Gulf Coast chapters.

Fred J. Sebastian, CSP, CHSP, is vice president and director of loss prevention for Neace Lukens, Louisville, KY. He oversees the firm’s corporate Loss Prevention Department providing risk management, safety and health consultation to the firm’s clients. Fred has more than 31 years’ experience in the safety field. Prior to joining Neace Lukens, he was the manager of loss prevention for Acordia in Cincinnati, OH. He holds a B.S. in Education from the University of Cincinnati.

An ASSE member since 1991, he has held the office of president in the Southwest Ohio Chapter. During his term as president (2007-10), the chapter received the Chapter Star Award twice. Fred’s Region VII service includes one term as deputy regional vice president (2009-10), chair of the region’s Financial Audit Committee and webmaster.

As a master-level holder for CHSP, Fred is an authorized instructor for CHSP preparation classes and certification exam proctor for the designation.

Area Director Candidates

Region II Area Director Candidate
Area: B: Dustin Richartz, CSP

Region III Area Director Candidates
Louisiana: Lance Roux, CSP
South Florida: Robert Andres, CSP
Karen Metz

Region VII Area Director Candidates
Keystone: Aaron Cameron
Metropolitan: Frank Gesualdo, CSP

At least one-half of the area directors in regions II, IV and VIII are elected each year. Names of candidates will be listed only on the ballots of those members residing within the regions these candidates represent.
Disaster Preparation

Disaster & Recovery Planning

By Joseph F. Gustin. Published by Fairmont Press, 2010.

One of the best parts of a professor’s job is being steeped in the literature related to the safety profession. Each semester, I have to choose my textbooks. Sure, some SH&E textbooks are tried-and-true for meeting the academic’s needs (e.g., Fundamentals of Fire Protection by Janicak and Ferguson; or NSC’s Accident Prevention Manual).

Recently, I had quite an adventure trying to locate a meaningful text for a graduate-level disaster preparation course. A plethora of texts exists on this subject. Most focus on personal preparation. Many books are written by nonsafety professionals, and so have limited applicability. Several other great references are focused on a single topic such as business interruption, emergency action plans and community response coordination.

My criteria were expansive, thus most candidates fell short. The textbook needed to be appropriate to the graduate-level student (i.e., solid sources, well written). It needed to have a broad discussion of concerns focused on business preservation and recovery—beyond what we might get from insurers. It had to be modern—of course Hurricane Sandy and cyber-hacking in Israel are not discussed but I can handle those specific events in classroom case studies. I wanted it to be insightful and refreshing; in other words, did the content address something that I had not thought of or encountered in my own experience? And, finally, it had to be an acceptable cost. Some textbooks are quite expensive and not worth the investment. Simply put, I didn’t want students to be able to find more information via Google than what was offered in the text and then have buyer’s remorse.

A fellow disaster preparation educator recommended Disaster & Recovery Planning: A Guide for Facility Managers, and it has exceeded my expectations. It is an excellent read. It makes one think of exposures that might not have been considered. Gustin has not created a compilation of Internet resources, but rather, has provided a well-organized grouping of known concerns as well as opportunities for the reader to brainstorm his/her own situations.

What safety or business book are you currently reading? Review it for PS. Send an e-mail to professional safety@asse.org.

Laura Helmrich-Rhodes, CSP
Indiana, PA

Management Techniques

Dealing With People You Can’t Stand

How to Bring Out the Best in People at Their Worst

If its title caught your eye like it did mine, I think you will like Dealing With People You Can’t Stand. Undoubtedly, we’ve all had to deal with people we can’t stand, especially in safety. This book does a good job categorizing them and also offers insight into how to deal with them.

The authors identify 10 behaviors that show up in the workplace. They call the list, “The 10 Most Unwanted List.” We all ebb and flow between these behaviors depending on what situation we are in. Obviously, some people engage in certain behaviors more often than others. This will often change depending on circumstances and whom you’re with.

The authors provide some valuable suggestions for dealing with individuals whose behavior in the office matches one or more of these categories. Presented here are just a few of those suggestions.

The Tank

It is tempting to respond to The Tank with a counterattack of verbal bullets. However, doing so will simply escalate the situation. Hold your ground. Interrupt the attack by using his/her name until you have his/her attention. Get to the bottom line by starting with, “From my point of view . . . .”

The Sniper

Snipes include rude comments, sarcastic humor, an edgy tone of voice and rolling the eyes. Sniping can even start out as playful. But when it is unfriendly, you can choose from a few responses. First, when the snipe happens, stop what you’re doing, look directly at The Sniper and in an even tone repeat what s/he said. Ask what s/he meant or ask what the statement has to do with the present situation. This can help get to the heart of the matter in an inoffensive manner.
The Know-It-All
The authors describe The Know-It-All as someone who believes that to be wrong is to be humiliated. This person believes his/her destiny is to be dominating, manipulative and controlling. How do you deal with this person? Know your stuff. Do your homework before you meet so that you are prepared with the details. Think through your approach before meeting with The Know-It-All. When s/he demonstrates this behavior, repeat back what s/he said and blend with the person’s obvious doubts and desires. Do this with respect and sincerity.

The Think-They-Know-It-All
I used to post a quote in my office that said, “Those of you who think you know it all really annoy those of us who do.” This applies to the Think-They-Know-It-All. Most often, this person has learned just enough about a subject to talk about it, and let embellishments take it from there. There is a continuum between the truth, embellishment and lying. These folks live in the area between embellishment and lying—a fine line that makes it hard to pin him/her down.

Be aware that if you attack, the only option left to the person is being more grandiose and insistent.

Instead, give the person your attention, ask a question or two such as, “Who specifically?” or “When specifically?” At some point, redirect the conversation back to reality using I messages such as, “The way I heard it” or, “What I’ve read,” then make the person an ally by providing a way out. If possible, help him/her break the behavior cycle by using gentle confrontation. It helps to provide a graceful way out.

The Grenade
Brinkman and Kirschner describe The Grenade’s behavior as, “a last resort defense strategy against the feeling of unimportance.” Most Grenades hate their behavior but can’t seem to break the cycle. What doesn’t work as a response with The Grenade is to either blow up in return or slink away and despise this person from a distance. The authors say, “do yourself a favor by forgiving The Grenade [his/her] moments of temporary insanity.”

In an eruption, get the person’s attention by calling his/her name, showing your concern by saying what the person needs to hear. Usually at some point during his/her tirade s/he has revealed what they need, thereby reducing the intensity. Let things cool off.

The Yes Person
The Yes person wants to please everyone, but in the process makes promises beyond his/her ability to deliver and follow through. As a result, you can be the one left holding the bag, which can be frustrating. To work effectively with this person, make it comfortable for him/her to be honest, and be honest in return. Where possible, help the person learn to plan, set priorities and make viable commitments.

The Maybe Person
 Usually a true procrastinator, The Maybe Person is blinded by the possible negative consequences of making decisions. Showing your irritation with this person just exacerbates the problem, so establish and maintain a comfort zone and explore with the person the advantages and disadvantages of a certain decision/option under consideration. Then reassure the person that there simply is no perfect decision but certain decision/option under consideration. Then reassure the person that there simply is no perfect decision but that the one you’ve discussed is a good one. This turns a lose-lose into a win-win situation.

The Nothing Person
Passive and determined to get along, The Nothing Person can be shy, quiet and thoughtful. Perhaps s/he has a mortal fear of rocking the boat or making waves. This person seeks perfection, which is elusive. You must get this person to talk, but plan enough time for that to happen. Ask open-ended questions; try some humor such as making exaggerated guesses about the cause of his/her silence. A smile may follow. Help this person look into the future.

The No Person
The No Person wants to “get it right” simply by avoiding mistakes. This person despairs when things aren’t lining up in the direction of perfection. His/her negativism can infiltrate the entire office and spread misery. The most important thing to remember when dealing with The No Person is to show compassion rather than contempt, and to have patience. Don’t try to convince him/her that things aren’t so bad, because this person will simply work harder to convince you otherwise. Avoid trying to rush The No Person, because s/he will merely slow down even more. Reverse psychology can be effective, so you could try requesting that this person do the opposite of the desired action. Be sure to affirm at every opportunity.

The Whiner
The Whiner wallows in worries and problems, seemingly enjoying every minute of it, and rarely offers solutions. The authors suggest three “attitudinal requirements” for dealing with The Whiner: 1) have patience with this person’s impossible standards and seemingly endless negativity; 2) have compassion; and 3) have commitment to the lengthy process of getting him/her to focus on solutions.

Conclusions
If you find yourself dealing with these behaviors, reading the appropriate chapter will give you insight for strategies to cope with them. So, which behaviors dominate your personality? Hopefully, you aren’t the person other people can’t stand.

Mark Hansen, P.E., CSP, CPE
Irving, TX

Please visit www.asse.org/psextra to read the article.
Rescue Systems
Incorporating Them Into Fall Protection Programs

PS: Describe your position with DEUS Rescue.
Jeff: I am the technical manager for DEUS Rescue. I consult with industrial users to help them develop safe programs for rescue at heights. This includes self-rescue from aerial lifts, bailout off of rigs, assisted rescue from towers as well as multi-person evacuation from platforms.

PS: How does rescue fit into a fall protection program?
Jeff: Fall protection equipment is only half the battle when it comes to keeping workers safe at heights. Rescuing workers in a timely manner to avoid suspension trauma or additional injuries while suspended is the other half. The fall protection field is currently much more mature than rescue, but strides are being made rapidly with regard to rescue. OSHA’s General Duty Clause and the requirement for “prompt rescue” make it clear to employers that this procedure must be recognized and practiced.

Rescue is not just an element of a fall protection plan; it is a critical procedure by itself and needs to be prioritized on an equal level within a fall protection program. If an employer recognizes when fall protection equipment is needed, then the same must be true for rescue. Industry experts recognized this and incorporated new requirements into the latest ANSI/ASSE Z359.2 and Z359.4 standards.

PS: How do ANSI/ASSE Z359.2 and Z359.4 address rescue?
Jeff: Standards must be the basis for an employer’s fall protection and rescue program. The developers of consensus standards such as Z359 are industry experts representing government regulation agencies, users groups, unions, manufacturers and testing laboratories. Their knowledge and experience, combined with an overall desire to create safe procedures and equipment testing standards, are what yield safe products for workers.

ANSI/ASSE Z359.2-2007 requires that the employer provides a means for rescue from heights, and defines requirements and training for authorized and competent rescuers. The standard also offers guidance for employers regarding procedures should they wish to rely on professional rescue services, such as fire departments, by calling 9-1-1. If the employer chooses this type of rescue program, it must follow certain procedures in advance. A written agreement between the employer and professional rescue service must be in place prior to any elevated work performed. A job hazard analysis of the site, along with availability, preparation, training and required equipment specific to rescue at that location, must be completed. ANSI/ASSE Z359.2 also contains guidance and training requirements for employers who decide to provide for their own rescue from heights.

ANSI/ASSE Z359.4 created technical requirements and testing procedures for rescue descend- ers, ropes, harnesses and other equipment. I recommend that employers check whether their current rescue equipment has the ANSI/ASSE Z359.4 certification marked on it to ensure that products meet current standards. You would not use fall protection equipment that has not been certified to the current standards, and you also should not use rescue equipment that is not marked accordingly.

PS: Why has there been a delay in adopting rescue programs in the workplace?
Jeff: Many people think rescue is challenging and difficult to implement into their fall protection programs. With advancements in descender technology and well-established procedures, rescue practices can be implemented easily and seamlessly into all fall protection programs. Since rescue situations tend to be infrequent, they sometimes do not receive the proper attention. However, since potential hazards and injuries resulting from a fall or suspension are serious, employers need to give rescue implementation a higher priority.

PS: Should employees practice rescue?
Jeff: The ANSI/ASSE Z359.2 standard requires that employees know how to inspect, anchor,
assemble and use their rescue equipment. During rescue system training, employees must become competent to safely and comfortably conduct rescues from heights for all locations they will access or at which they will work. One does not become smarter during an emergency. Therefore, one must be well prepared in advance and have equipment ready for deployment prior to leaving the ground. Rescuers must be ready at all times since there is never any warning that a worker may fall and need help.

Training must be delivered annually—at a minimum—and should be practiced often. The standards require physical hands-on demonstrations of rescue scenarios to ensure that authorized and competent rescuers have the proper skills.

PS: Describe a situation in which a worker may need to be rescued.

Jeff: Many situations might arise where rescue would be required while working at heights. Slipping on a platform or ladder, aerial lift malfunction, heat exhaustion, cramping, nausea, diabetic reactions, electrical shock or even bee stings that cause anaphylactic shock are just a few examples of work situations that can lead to a rescue scenario. Falls continue to be one of the most common incidents in the workplace, so rescuing an injured worker is imperative.

PS: What details are needed for a rescue program?

Jeff: One must ensure that the proper rescue equipment is selected for a particular work environment. Rescue anchors are required to withstand 3,000 lb or to be certified to five times the applied load. Anchor attachments must be chosen with versatility in mind and can be applied anywhere on a structure quickly without being compromised by elements such as sharp lattice steel or hot equipment.

If harnesses are not used in the work environment, consider how to safely attach a victim to the rescue system. Hardware connector components should have 3,600-lb gate strength ratings and should be compatible with the rescue equipment. A means of hoisting workers off fall protection gear or moving them horizontally on a platform also must be considered. Rarely will an incident occur where you have a good vertical descent.
make sure a separate rescue system is on standby in case an incident occurs during training. Until a person is competent with the equipment and procedures, employees are exposed to additional hazards.

Start slow with simple rescue scenarios, then build on those until workers have practiced the most challenging conditions. Train to real conditions of the work environment. Do not simplify rescue training to save time or to check it off a list.

Ensure that a safely designed backup system is in place during training. Consider what would happen if the trainee made a mistake. Will the backup system leave the trainee hanging in the air? If so, the clock is ticking, and you will now need to perform a real rescue on-site if any suspension trauma occurs. You can simplify this condition by choosing an automatically controlled backup system that can descend the trainee to the ground. Choose a backup system so that it does not interfere, slow the trainee during the rescue exercises or require the trainee to manually activate it. Also, make sure that good communication exists during training from the rescue location all the way down to the ground.

**PS: Any last words of advice on rescue?**

**Jeff:** Many people feel intimidated by rescue procedures and shy away from them. However, similar to any other safety policy, it can be addressed reliably and efficiently if you address it head on. Rescue from heights is quickly gaining acceptance as employers realize that it is not only possible, but necessary, to perform these types of rescues.

Consider all work locations at heights. It may sound challenging at first, but rescue really can be completed promptly and safely with the right equipment and training.
The next generation of training, “must move beyond courseware and classrooms and into work” (Rosenberg, 2006). We need to shift our thinking about training formats, delivery and methods of making it stick. It’s clear that the next frontier in learning is both training formats, delivery and classrooms and into work” (Rosenberg, “must move beyond courseware and production flow. The ability to deliver training outside the traditional classroom has helped with efficiency; however, challenges with sustainability persist within e-learning approaches as well.

Key Barriers to Training Effectiveness
Traditional training approaches have some pitfalls. Given that only a fraction of the knowledge and skills presented through traditional training have been found to transfer to the job (Saks, 2002), it is vital to identify barriers to effective training. While ample opportunities exist for creating innovative solutions, the first step is to outline the types of barriers to effective training.

Tactical Barriers
The first category of obstacles associated with traditional training approaches is tactical barriers: logistical challenges that make it difficult for trainees to attend and complete training programs.

1) Real-time impact on production.
To survive in the current economic climate, many organizations are operating with leaner crews and on tighter production schedules. As such, pulling out workers for an extended time to attend training can be problematic, even when organizations want to do the right thing. These current realities highlight the need for creative training solutions that allow employees to learn and develop, while still maintaining production flow.

2) Limited organizational resources.
Training is a huge financial, time and personnel investment. American Society for Training and Development (ASTD, 2011) points out that, in 2009, U.S. organizations spent approximately $125 billion on employee learning and development, including training. This figure highlights the value many companies place on employee training. However, increasing economic pressure and fewer organizational resources often means that training budgets are tight and there is a push to do more with less.

3) Geographic location of the workforce.
Typically, training occurs in a classroom setting, requiring trainees to be physically present in one location for the duration of a program. Today, employees work in different parts of the company, in different locations around the world and on different work schedules. Coordinating a time and place for employees to jointly participate in training can be challenging with a traditional training approach.

4) Transient nature of many workforces.
It is commonplace today, especially in project-based work, for employees to enter and leave an organization on a regular basis. While this is often an economic reality, it becomes difficult to maintain complete knowledge transfer when there is an ever-changing blend of new hires and tenured workers on site. As such, a traditional training approach is not ideal for organizations with transient worker populations.

These tactical barriers affect how training is logistically delivered and can drive organizations to make decisions based on what is possible rather than on what is required. In terms of safety leadership and safety culture training, the authors have seen companies choose to train only certain segments of the organization, generally management, then rely on those leaders to pass on what they learned. As a result, those most in harm’s way do not receive training that could help them function more safely and productively on the job. These decisions also can compound the next type of barriers: how training knowledge is transferred to daily practice.

Transfer Barriers
The second category of obstacles associated with traditional training approaches is transfer barriers. Transfer barriers include failure to use and apply the knowledge and skills learned in training after returning to the job. Saks (2002) found that about 40% of trainees fail to transfer learning to practice immediately after training, 70% fail to transfer learning 1 year after training and, ultimately, only 50% of training investments result in actual organizational or individual improvement. The authors suggest that transfer failures are common in traditional training approaches due to several barriers.

1) Lack of relevance/perceived value.
Those who feel that the knowledge and skills they are learning are relevant to their jobs are more likely to seek opportunities to actually use what they learn at work than trainees who do not see the relevance of the training (Warr & Bunce, 1995). If employees believe that a training program will help them perform their jobs better, they are more likely to transfer the learned knowledge and skills to daily practice. It is critical that training content be appropriate and relevant for its audience.

2) Lack of authenticity.
Traditional training programs often take place outside the work environment in a classroom setting. While it can be valuable to take employees away from their workplace while training (and free them from possible distractions), there are drawbacks to this approach.

For example, classroom-based training may be too contrived and too removed from the work context for trainees to see the connection between what they are learning and how to actually apply this knowledge on the job. A more innovative training approach is needed that embeds training into the actual work context, thus decreasing...
Best Practices

Cutting-Edge Solutions

So, how do we tackle such formidable barriers? This has been a key challenge for effective training across groups of people, across types of training, and across industries and settings. Two trends in training can transform current models for safety training: mobile learning and microtraining. Each trend addresses different tactical or transfer barriers and, when used together, can radically change how safety training is provided.

Mobile Learning

Electronic learning (e-learning) has been around for some time with mixed results. The efficiency of being able to deliver training via computer was a big step forward when done well. Where e-learning moved learning away from the classroom, mobile learning (m-learning) is moving learning away from a fixed location (Cnuk, 2007). The ability to deliver mobile training opens up a new frontier for training of all kinds, including safety training. As Quinn noted (Abernathy, 2001), m-learning takes an e-learning approach and adds two key features: 

- **mobility**
- **ubiquity**

Mobility allows content to be delivered conveniently, feasibly and immediately, while ubiquity means learners have on-demand learning available, whenever and wherever (Peng, Su, Chou et al., 2009).

Truly effective m-learning approaches share several key characteristics (Tucker, 2010):

1. **Social interactivity**: Training supports collaboration, active participation, critical reflection and real-time interactivity. M-learning that allows partici-

pants to interact with each other and the material can lead to better decision making and engagement.

2. **Individuality and context sensitivity**: Training is customized and personalized such that learners see it as relevant and authentic to their situation.

3. **Portability**: Training is at the users’ fingertips and ready when they are.

4. **Economic viability**: With newer devices, it is possible to have similar computing capabilities as laptops and computers but for lower cost.

These features have revolutionized delivery of information, whether it is a mobile game or a safety training course. The m-learning approach to training tackles key logistical barriers to delivering training on-demand, wherever and whenever. For an m-learning approach to be effective for safety training, close attention is needed to the interactivity and relevance components.

A Microtraining Approach

Another aspect of the new frontier of safety training involves how much content is delivered and when. Microtraining refers to learning and development that takes place over short segments of time. These segments can be delivered via face-to-face, online or m-learning formats. With a foundation on key learning principles, microtraining has great potential to boost transfer effects.

First, a microtraining approach supports informal learning (Marsick & Watkins, 1997). Because such training is broken up into small segments of information, it is easier to fit into everyday work life, is less disruptive to workflow and production, and can provide a platform for individuals to learn new knowledge within the context of their own work environments.

Second, a microtraining approach is learner-focused, such that learners (trainees) have some decision-making influence over when they would like to go through the training material (e.g., time of day, day of week), how fast they want to complete the training, and where they would like to complete the training (e.g., on site, off site). To be optimally effective, training must be designed in ways that motivate learners to participate and engage (Brown & Ford, 2002). A learner-centered microtraining approach can help trainees become more active participants in their own learning and development.

Additionally, a microtraining approach supports active learning through a focus on spaced learning techniques, or exposure to small amounts of material spread out over time. This is in contrast to traditional training approaches that are often based on massed learning techniques (i.e., learning a lot of information in a short period), which can easily lead to information overload. Spaced learning can help increase knowledge retention and absorption capacity, and the superiority of spaced learning techniques versus massed learning techniques has been consistently supported within the learning literature (Cepeda, Pashler, Vul et al., 2006).

Finally, a microtraining approach is based on adult learning principles, which state that individuals are more likely to apply training knowledge and skills when they believe the content is relevant to their work, is problem-centered versus content-based, and can be immediately applied (Knowles, 1990). Microtraining easily capitalizes on these principles.

For example, there is evidence that transfer is optimized when aspects of the training are similar to work environments, and vice versa (Bower, 1981). With a microtraining approach, learning can be easily incorporated into everyday work life, ultimately blending together the training and work environments. All in all, a microtraining approach is founded in key learning principles that support learning, skill acquisition and training transfer.

Going Mobile & Micro

As discussed, using an m-learning approach to safety training surmounts some tactical barriers to training. Adding a microtraining approach to m-learning technology can tackle some learning transfer problems that have dogged traditional training formats. So, what does it take to do this? What are key considerations for a mobile, microtraining approach?

Case Example

A large mining services provider with a geographically diverse workforce wanted to provide cognitive safety leadership training throughout
its organization. Many tactical barriers had prevented traditional training from being delivered to the workforce in the field and the typical transfer of learning challenges from the classroom to the field were present. A mobile, microtraining approach was chosen to overcome some of these barriers to effective training.

In developing this solution, several decision points and features have been important to address.

1) Mobile, microtraining provided key benefits over traditional training. Given tactical barriers to taking personnel out of production and the geographically dispersed nature of the workforce, m-learning via mobile devices provided a realistic avenue for training personnel beyond management. This approach also provided a new way to transfer learning to practice. Rather than a “data dump” approach, training was designed to be completed in small, manageable sessions incorporated into daily routines.

2) Key stakeholders and organizational support were engaged. Senior managers needed to recognize themselves as actively part of the overall approach rather than perceiving the training as for the field only. Safety personnel were actively engaged in providing specific input into the content itself to ensure that training was relevant and true to various work environments. Beyond contributing to the content, safety personnel were engaged as key support to field personnel using the training and to provide organizational links back to senior management.

3) Interactivity and relevance were prime considerations. To be effective, the training was designed to be interactive and take advantage of mobile device capabilities, rather than being an “information push” that left participants passive and potentially disengaged. Making sure content was representative of the environments and types of situations faced by the workforce supported perceived relevance, active learning and adult learning principles.

4) Mobile training allowed data collection that is often impossible in traditional training approaches. With interactivity an essential part of the design, this approach allows data to be collected about how the training is perceived and used, how participants view their current work environments in terms of safety and more traditional feedback data.

5) The user experience drove design. Making the user interface as easy to use as possible was a prime consideration, and computer literacy was not assumed. Keeping the user firmly in mind is key. Given that one goal of this type of training is increased interaction and discussion of safety, the training also was designed to support and encourage peer interaction rather than isolated, individual training common in many online learning approaches.

Taking these points into consideration resulted in training that addresses several traditional barriers to effectiveness. Reception by field personnel has been positive as evidenced by the following comment by a participant:

“This training is one I’ve done that feels like it is actually for us, rather than for the guys in the corporate office.”

When designed well and supported by the organization, such an approach can provide effective safety training and also have positive effects on engagement and culture.

Conclusion

Safety training faces the same hurdles that any training encounters. Traditional approaches can falter in the face of tactical barriers such as geography, transient workforces, limited resources and real-time impact on production, along with barriers to transferring learning to practice. With the advancement of mobile devices and by recognizing potential benefits of breaking down training into smaller chunks, SH&E professionals can pioneer new training approaches. Anytime, anywhere training is now possible, and combining this with microtraining, using small chunks of information easily applied in the moment, gives SH&E professionals a new way to engage individuals across an organization.

Key considerations for undertaking a mobile, microtraining approach include:

- Assess the potential costs and benefits to such an approach; identify and engage key stakeholders and sources of organizational support; and design the training with relevance, interactivity and the user experience front and center. SH&E professionals and organizations have reached a new frontier in safety training that holds potential solutions for meeting challenges to training and ultimately can serve as a new route to increasing safety performance and strengthening safety cultures.

References


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Refresher Training
Considerations in the Public Sector

By James H. Olds

The working world consists of two groups, the public sector, which includes all levels of government (including tribal organizations), and the private sector, which includes all other businesses (including multinational corporations). While OSHA oversees and enforces workplace safety regulations in most settings, the OSH Act does not delineate enforcement authority over employees of the state or its political subdivisions. However, Section 18 (paragraph b) of the OSH Act allows states to assume responsibility for development and enforcement of standards relating to occupational safety or health with respect to which a federal standard has been promulgated. In short, states may adopt federal OSHA regulations or establish a state agency to enforce safety standards based on those regulations that require the same (or a higher) degree of safety.

In Florida, the state legislature created the Division of Safety to regulate safety for state employees and employees of any political subdivision of the state (e.g., counties, cities, school districts). However, on July 1, 2000, the division was sunsetted, a term used to mean shut down via a state statute (F.S. 442).

As a result, SH&E professionals working within state agencies or their political subdivisions must enforce their own safety standards and procedures. At times, this can be challenging, particularly given constrained budgets. However, this does not eliminate the need for personnel to attend safety training and refresher training. Professional groups such as law enforcement and electrical line workers must demonstrate proficiency in first aid/CPR each year. Additionally, safety-related requirements such as fire extinguisher training, HazCom and bloodborne pathogens affect public-service personnel and require refresher training.

Nine years ago, the city of Lakeland, a medium-size municipality located in central Florida, instituted a training program to fulfill refresher training requirements identified in the city’s policies and procedures manual. These requirements are based on industry standards and OSHA regulations.

To qualify, employees must complete initial training in specific safety standards (Table 1). All classes are based on commercially available standardized training products with student manuals, instructor guides and subject-specific DVDs/videos.

To improve these products, the group adds items such as subject-specific student training booklets. The intent is to provide trainees (city employees) with information that is relevant to their specific area of work; create a vehicle that can be readily updated; and reduce overall program cost.

To best support the training program, the city strives to ensure that certified/authorized instructors are available to conduct each session and to underwrite the entire safety program. Therefore, all safety team members—four safety coordinators and one safety manager—are authorized instructors in accordance with the OSHA 500 and OSHA 501 courses. Each team member also must maintain an active forklift instructor certification through National Safety Council (NSC), and first-aid/CPR instructor certification through a nationally recognized organization. Since the team has only five members, city personnel with specific expertise are asked to voluntarily assist in refresher training. For example, lifeguards from the city’s Aquatic Division are first-aid/CPR instructors/evaluators, and the individual in charge of process safety management (PSM) at the city’s main electric power plant is the PSM evaluator.

Program Challenges
Three stumbling blocks were encountered when creating this program. The first emerged while the city was attempting to establish first-aid/CPR refresher training. Several certifying agency programs (e.g., NSC, American Red Cross, Citizen CPR) were evaluated. Most require that refresher training be conducted in a similar manner to initial training. City officials envisioned a condensed training program in which participants could demonstrate skills and satisfy requirements deemed critical by the certifying agency for refresher training. The program chosen provided the best fit.
Another stumbling block involved backhoe operator refresher training. No safety team member had solid backhoe operator experience. To fill this void, the five (of 18) departments with backhoes were asked to designate at least one experienced operator for additional training. These individuals were sent to a local equipment company that either sold or leased backhoes and had a nationally recognized backhoe training program. Upon completion of the specialized training, each individual was considered a subject-matter expert (SME) for backhoe operations. Instructors for backhoe refresher training were chosen from this group.

The final roadblock was to identify skill sets needed to exercise effective refresher training. In some areas, the OSHA standard provided guidance. For example, OSHA’s standard for portable fire extinguisher use (29 CFR 1910.157) states that the employer will ensure that those employees expected to use a fire extinguisher attend annual refresher training that covers fire extinguisher use and the hazards associated with the incipient-stage firefighting. Other standards are less specific while other tasks introduce hazards that are not regulated (e.g., heat stress).

In such cases, the city had to establish the skill set to be demonstrated during refresher training. To achieve this, SH&E professionals met with SMEs for specific tasks, such as a foreman or supervisor who routinely works in confined spaces, or personnel whose occupations require advanced education in a specific skill (e.g., city nurse discussing heat stress, laboratory personnel from wastewater facility discussing HazCom). Others who routinely perform specific duties, such as a PSM coordinator, may be called on as well. These individuals help identify the skills to be addressed in refresher training. Once these skills are identified, the method of how to test those skills must be determined. Then, these skill sets are added to a safety scorecard (Figure 1, p. 46).

Although not a stumbling block, scoring criteria were a concern. Specifically, the concern was testing individuals at the same time that they read the material (essentially an open-book test). To offset this and given that employees had completed initial training and regularly performed the skills to be tested, a written quiz passing score was established at 80% or higher; for a few specific tasks, the written quiz score was set at 100% depending on the criticality of the skill sets.

Initially, the team felt delivery method could affect training quality, but this was mitigated by creating a one-on-one relationship between employee and evaluator. When subjects were presented in a large classroom, employees were reluctant to ask questions; this was especially true for those with limited speaking ability or for whom English is a second language.

However, in the refresher training setting, employees were less reluctant to ask questions and often had pointed inquiries. Another benefit was that the employee could take as long as needed to review the information and was asked to perform at least one hands-on component at the evaluator table. In addition, employees learn from others in this setting.

Once initial subject-specific safety training is conducted, results are added to a computerized training record for each individual by department. Refresher training is conducted at an annual safety fair. During the fair, evaluation stations are erected for each refresher subject.

At each table or booth, an employee receives a booklet containing information and a written exam. The employee reads the information and completes the exam, then returns it to the station monitor. The monitor then reviews answers with the employee on a one-on-one basis. To award a passing score (or a “go”) at each station, the monitor may ask an employee to perform an additional set of task-specific skills. For example, an employee may be asked to conduct a preoperational forklift inspection; maneuver the forklift between a series of cones and stack pallets; operate a confined space air monitor (four-gas meter); or read and correctly interpret an MSDS.

The retraining process is based on preprinted scorecards, color-coded to identify an individual’s city department [e.g., police personnel receive dark blue scorecards; water department employees receive light blue (freshwater) or a light green (wastewater); public works, orange; parks department, dark green; linemen, red]. On the scorecard, each foreman circles the particular tasks each employee is to complete during the safety fair based on that employee’s craft or trade.

Tasks that everyone must complete are designated with an asterisk. Each station consists of a table, and at least one station monitor/evaluator subject-specific booklets with attached quiz and supporting material. Where appropriate, small items the employee must use are available as well (e.g., hand sanitizer at the bloodborne pathogen station, one-way valve at the first-aid/CPR station).

Table 1

<table>
<thead>
<tr>
<th>Class name</th>
<th>Class length</th>
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</thead>
<tbody>
<tr>
<td>HazCom</td>
<td>1 hour</td>
</tr>
<tr>
<td>Bloodborne pathogens</td>
<td>1 hour</td>
</tr>
<tr>
<td>First aid/CPR/AED</td>
<td>4 to 5 hours</td>
</tr>
<tr>
<td>Respiratory protection</td>
<td>1 hour</td>
</tr>
<tr>
<td>Fire extinguisher training</td>
<td>1 hour</td>
</tr>
<tr>
<td>Confined space training</td>
<td>24 hours</td>
</tr>
<tr>
<td>Trenching and shoring</td>
<td>16 hours</td>
</tr>
<tr>
<td>Backhoe operations</td>
<td>2 hours</td>
</tr>
<tr>
<td>Forklift operation</td>
<td>4 hours</td>
</tr>
<tr>
<td>Heat stress</td>
<td>1 hour</td>
</tr>
<tr>
<td>Pole-top rescue/harness inspection</td>
<td>4 hours</td>
</tr>
<tr>
<td>Maintenance of traffic</td>
<td>16 hours</td>
</tr>
<tr>
<td>Process safety management</td>
<td>2 hours</td>
</tr>
</tbody>
</table>

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Figure 1 Safety Scorecard

<table>
<thead>
<tr>
<th>Topic</th>
<th>Score</th>
<th>Needs</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Stress RMHEAT</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1. Successfully answers 8 out of 10 true/false questions on the back of his/her booklet</td>
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<td></td>
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<tr>
<td>2. Describes symptoms of heat stress (stroke or exhaustion)</td>
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<tr>
<td>3. Describes how much fluid should be consumed in a 20-30 minute period for proper hydration</td>
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<td></td>
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<tr>
<td>Overall</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic</th>
<th>Score</th>
<th>Needs</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confined Space RMCCREF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Correctly places the air monitor into service and describes what he/she would monitor the atmosphere for</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Correctly identifies the safe levels of oxygen</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Describes the need and duties of the attendant</td>
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<td></td>
<td></td>
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<tr>
<td>4. Correctly completes permit</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic</th>
<th>Score</th>
<th>Needs</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory Protection RMRESR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Accurately obtain a positive seal on their issued respirator</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Accurately finds at least two items that are unserviceable on the respirator at the station</td>
<td></td>
<td></td>
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<tr>
<td>3. Describe how to clean their own respirator and how often is this to be done</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic</th>
<th>Score</th>
<th>Needs</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Extinguisher Training RMFIRE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Accurately identifies proper extinguisher for use based on info provided by station monitor</td>
<td></td>
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<td></td>
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<tr>
<td>2. Properly places the extinguisher into operation and extinguish fire</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. Informs supervisor that fire existed</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
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</tbody>
</table>

Station Operation

Sign In

The first station is the sign-in table (Photo 1). An employee presents his/her scorecard, which is checked for accuracy and to ensure that the employee’s name and employee number are on the card. The employee then prints his/her name on a roster (to help the safety team track the number of people at each station). Once signed in, the worker moves to whichever station s/he wishes to visit first.

Hazardous Communications

The employee receives a booklet and quiz, then completes the quiz and returns it to the station evaluator for grading. For each incorrect answer, the evaluator reviews the question and explains the correct answer. The employee must then review an MSDS and identify the particular hazard(s) associated with the product and any required PPE. Police officers and anyone with a HazMat endorsement also must identify a placard by use of the emergency response guide.

The station evaluator is a safety professional, a police trainer or an individual with HazMat experience. To pass this station, an employee must score at least 80% on the written quiz, properly identify a product with the MSDS, discuss safe handling procedures for the product, describe proper PPE and discuss any disposal criteria.

First-Aid/CPR/Automated External Defibrillator

Everyone must complete the first-aid/CPR/automated external defibrillator (AED) station (Photo 2); linemen [29 CFR 1910.269(b)(10)] and law enforcement personnel must certify each year that they can perform CPR, while other city employees must demonstrate their ability to use an AED. The certifying agency used allows refresher training to be accomplished by scoring 80% or higher on a multiple-choice test for first aid and CPR.

Upon completion of the test, an employee must properly demonstrate, to the station evaluator’s satisfaction, at least two CPR skills and two first-aid skills. To facilitate this process, the test is provided through a proxy 2 weeks before the safety fair. Those who do not pass the multiple-choice test are noted on a roster for the station evaluator to check before the individual completes the hands-on portion of the test. If an employee could not take the test before the fair, additional testing is available that day, but this is discouraged due to time constraints. If the employee passes both the written and hands-on test, his/her first-aid/CPR card may be renewed. However, if the individual does not score at least 80% on the multiple-choice test or fails to properly perform the hands-on tasks.
correctly, s/he is tabbed for additional training (usually a 4- to 5-hour class). Typically, this station is manned by a certified lifeguard from the city’s Aquatic Division; it features a full-size resuscitation manikin and a mouillage kit to resemble injuries to be treated for first aid. It also features an AED trainer for testing. The city has 22 AEDs in various locations and the trainer is a replica of those units. To pass, the employee must turn on the unit and understand the instructions it provides. Employees also receive a small disposable one-way valve.

**Respiratory Protection**
In accordance with 29 CFR 1910.134(f)(2), employees who must wear a tight-fitting air-purifying respirator must be fit tested annually. Thus, the respiratory protection station evaluator is the city’s respiratory program administrator who has advanced training in the subject. To participate at this station (Photo 3), an employee must bring his/her personal respirator as well as documentation which confirms that his/her annual medical evaluation has been completed and that s/he is qualified for fit testing.

Again, the employee receives an informational booklet and quiz. The station evaluator grades each quiz and reviews any incomplete answers. To complete this station, an employee must score at least 80% on the written quiz; properly don his/her assigned respirator; obtain a positive seal; identify at least two unserviceable items on an unserviceable respirator provided by the evaluator; and describe proper cleaning methods for the assigned respirator and how often such cleaning is to be performed. Finally, fit testing is conducted utilizing irritant smoke.

**Fire Extinguishers**
In accordance with 29 CFR 1910.157(g)(2), anyone expected to use a fire extinguisher must complete training to become familiar with operation of the extinguisher. Thus, all city employees must complete the fire extinguisher station (Photo 4). Some personnel in the Facilities Maintenance Division are certified to work on fire systems such as portable fire extinguishers, hood systems, sprinkler systems and alarms (the “Fire Team”). Evaluators at this station are drawn from this team or may be supported by the local fire department.

Originally, this station featured standard ABC dry chemical fire extinguishers and a propane burner. The group eventually switched to a BullEx training system. Several factors prompted this change. Use of dry chemical extinguishers can affect employees with respiratory difficulties, and the dry chemical can be corrosive to painted surfaces. A site also must consider the effect of taking active extinguishers out of service (use/refilling) to support training.

To pass the station, the individual must pass the written quiz, accurately identify proper extinguisher based on fire type, put the extinguisher into operation and extinguish the flame. Finally, the employee must state that s/he would report the fire incident to the supervisor.

**Confined Spaces**
Lakeland has more than 800 confined spaces that city workers must regularly enter; these include underground utilities, storm water inlets, wastewater lines and access to mechanical devices at various power plants. Therefore, city personnel whose job function routinely requires confined space entry must complete this station. The station evaluator typically has extensive experience with permit-required confined spaces, and may come from the city’s power plant or wastewater group, or may serve on the fire department’s technical rescue team.

Once the quiz is passed, the employee must turn on a gas meter, walk through the process of monitoring atmospheric conditions and explain how to properly complete a confined space permit. In addition to scoring at least 80% on the quiz, an employee must properly operate the air monitor and describe what s/he is monitoring; correctly state the safe level of oxygen; describe the needs and duties of the attendant or entrant; and correctly complete a confined space permit.

**Trenching & Shoring**
For the trenching and shoring station, a trench with several intentional flaws is dug near the location of the safety fair. Any employee who either digs or works in a trench must complete this station (Photo 5, p. 48). The station evaluator has extensive trenching knowledge and typically is a foreman who routinely performs such work.

Once the employee completes the quiz and reviews any incorrect answers with the station evaluator, s/he must correctly identify at least three problem areas in the trench in order to pass. Standard problem areas include soil pile should be moved back from the edge; trench must have a ladder; cave-in protection; and call for a utility location before digging.

**Backhoe Operation**
The backhoe operation station is set up in conjunction with the trenching and shoring station (Photo 5, p. 48). Any city employee who operates a backhoe must complete this station. As noted, individuals with extensive backhoe-operating experience complete a vendor course to ensure that they know proper operating procedures. Despite extensive use, an employee may not operate the equipment correctly. So, before an individual be-
Specialty topics covered during the fair include trenching/shoring and backhoe operation (Photo 5, left) and pole-top rescue (Photo 6, right).
related risks of exposure, such as members of law enforcement. Skills tested include donning/doffing of barrier devices and proper disposal techniques. In addition to passing the written quiz, an employee must properly describe protective measures necessary to limit exposure to blood and bodily fluids. Additionally, police officers must demonstrate how to properly don/doff protective gloves.

Wrap Up

Once an employee completes all tasks highlighted on the scorecard, s/he returns the scorecard to the sign-in desk, where its completeness is verified. The employee also receives a raffle ticket. One part of which is used for door prizes, which typically feature items such as smoke detectors, fire extinguishers or emergency kits. The other half of the ticket is used for admission to lunch, which is provided each day of the fair by the city-owned golf course. The event is considered an incentive to participate.

Looking to the Future

Using this 4-day training fair approach, the city of Lakeland provides refresher training for up to 850 employees. The city may expand the fair to include topics such as blood pressure, substance abuse awareness, employee assistance programs, sexual harassment, diversity, workplace violence, personal security, stormwater pollution control awareness and incident command. PS

Supporting Statistics: Assessing a Key Correlation

To assess the effectiveness of this type of training, a hypothesis was proposed that no direct correlation existed between the refresher training with active participation in the fair and reduction of injuries in the departments that participate.

Water Department employees work at wastewater and freshwater treatment facilities, perform water engineering or lay/repair underground water systems. The linemen group consists of linemen, substation workers and electrical engineers. Parks and recreation (P&R) employees work at various recreation centers, ball fields, golf course, cemeteries and gymnasiums, and public works (PW) employees are involved in roadway maintenance, traffic signals and fleet operations. The police group includes only individuals on the day shift (sworn and unsworn).

Data were collected over the past 5 years, and this formula was used for correlation coefficients:

\[ \rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} \]

A simple Spearman correlation coefficient was conducted. The value of this correlation may run from -1.00, meaning a negative correlation (data do not correlate) to +1.00 indicating a positive correlation between the training and reduced number of reportable injuries (Newmark, 1988). As shown in Table 2, the data indicate a strong correlation between participation in the safety fair and overall reduction of reportable injuries within the departments that regularly participate; the greater the participation, the lower number of reportable injuries.

However, correlation coefficients cannot always be accepted at face value. These coefficients generally only take two variables into consideration, an X variable (in this case average attendance) and a Y variable (the average number of reportable injuries). Often, other variables must be considered, such as improper equipment, poor weather conditions and supervisory priorities.

Table 2

<table>
<thead>
<tr>
<th>Department</th>
<th>Percentage</th>
<th>Average attendance</th>
<th>Average attendance rank (X)</th>
<th>Average number of reportable injuries</th>
<th>Incident ranks (Y)</th>
<th>(X-Y)</th>
<th>(X-Y)^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>0.76</td>
<td>155</td>
<td>2</td>
<td>12.4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Linemen</td>
<td>0.87</td>
<td>181</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>P&amp;R</td>
<td>0.42</td>
<td>155</td>
<td>5</td>
<td>28</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>PW</td>
<td>0.62</td>
<td>166</td>
<td>3</td>
<td>21.8</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Police</td>
<td>0.58</td>
<td>202</td>
<td>4</td>
<td>48.8</td>
<td>5</td>
<td>-1</td>
<td>1</td>
</tr>
</tbody>
</table>

\[ 1 - [(6 \times 2)/5(25 - 1)] = 0.9 \]

One aspect that stands out is that employees know what to do and have demonstrated proficiency in following correct procedures. In the future, other areas will be tested, such as drawing larger samples or the use of questionnaires. With respect to the police group, many of their injuries occur during arrests, which can become physical. Therefore, some information contained in Table 2 may be somewhat skewed. To determine the validity or reliability of this correlation factor, a reliability test was conducted utilizing the formula:

\[ r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}} \]

The closer the data are to +1.00, the more reliable the correlation is considered. In this case, the resulting value of 0.163 indicates that other variables are possibly affecting and, thus, skewing the data.

Ladders are widely used by workers on many jobsites, and falls from ladders occur at a high frequency. Falls from ladders account for a large portion of workplace injuries related to falls from heights. In fact, in 2010, 129 workers died after falling from a ladder (BLS, 2010a) and 14,710 suffered an injury that required at least 1 day out of work, with the median number of days away from work being 25 (BLS, 2010b). The frequency of falls from ladders and the severity of the injuries involved create a critical safety issue.

A recent study of workers who were injured while using a ladder found that 51.3% reported standing and working on the ladder when the incident occurred (Lombardi, Smith, Courtney, et al., 2011). Furthermore, 51.0% of falls occurred while the individual was using a stepladder. Stepladders have a large base of support and are traditionally formed in an “A” shape, with upper treads narrower than lower treads. Although guidelines recommend that the body remain within the rails of the ladder (the “belly button” or “belt buckle” rule), many falls occur because of lateral movement and extended reaching while performing a task. Injuries can occur because the individual loses balance and falls off the ladder, or because the ladder tips over, causing the individual to fall with it.

Numerous factors may interact to influence reaching behavior while working on a stepladder. For example, research indicates that the more familiar users are with a product, the less likely they are to look for or read warning information (Dorris & Purswell, 1977; Godfrey & Laughery, 1993). That is, users with greater familiarity of a product tend to perceive less of a hazard associated with its use, which, in turn, decreases the likelihood of their complying with associated safety precautions. Therefore, novice ladder users might be expected to take fewer risks than more experienced users and to increase their level of risk-taking as experience increases.

The proper working height required to safely complete a task will influence the height of the ladder selected. Research has shown that physical manifestations of anxiety are present for many individuals while at higher working levels. This anxiety detrimentally affects postural control (Davis, Campbell, Adkin, et al., 2009; Huffman, Horslen, Carpenter, et al., 2009) and will likely influence lateral reach distances. Many people use 4- and 6-ft stepladders to perform household chores. Low working heights such as these have a minimal effect on postural control and increased familiarity over time also may re-
duce anxiety. Since the use of taller ladders is less common away from jobsites, it is supposed that the novice user would initially be more careful on taller ladders and, therefore, would not reach as far.

Training is another important factor. In their study, Lombardi, et al. (2011), indicated that 50% of the injured workers had less than 3 years’ job experience and 62% had no on-site safety training. Without proper safety training, workers may not be aware of the repercussions associated with overreaching while working on a ladder. Direct experience or observations of others using a ladder may provide on-the-job training, but such learning can take time and the information gathered may be erroneous (e.g., watching a coworker overreach without falling). Ladder users must understand that having successfully overreached in the past (i.e., without falling) or having observed others doing so is no guarantee that they will not fall in the future; it may simply mean they were lucky.

Even with proper training, workers may have other motivations to overreach (e.g., “The faster I finish this job, the earlier I’ll go home”). Workers may determine that it is worth not taking the time to climb down the ladder, reposition it and climb back up, especially if additional tools or equipment must be carried or moved. The company’s attitude and priority placed on safety as dictated by coworkers and management as compared to productivity and rapid task completion also play an important role during this decision-making process.

**Experiment**

A laboratory study was conducted to explore the effects of acclimation (practice) and motivation (task completion) on lateral reach distances while working on a stepladder. The scope of the data presented here is limited to findings based on novice ladder users; these results should not be extrapolated to more experienced ladder users. The research team hypothesized that 1) reaches would be shorter on a higher ladder than on a lower ladder; 2) as novice users’ experience (i.e., acclimation) working on a stepladder increased, their reaching would increase (reflecting decreased risk perception); and 3) novice ladder users would reach farther when motivated to do so.

Twenty-four male novice ladder users age 18 to 67, free of musculoskeletal injury and disease, were recruited. A participant was considered to be a novice if he had never used a ladder as part of employment or received training on proper ladder use and setup. Mean (SD) age, height and weight of the participants were 39.7 (6.3) years, 170.9 (6.3) cm and 85.5 (26.5) kg, respectively.

Uniform below-ankle hiking shoes (Nike Bandolier II) were provided to all participants. Before the experimental protocol was initiated, all participants completed an informed consent procedure approved by the Institutional Review Board. A full body harness attached to a relay system (a fall arrest system that used a rope and carabiner combination attached to an upright post bolted to the ground to create friction and prevent an individual from falling) was used to maintain participant safety throughout the experiment.

New Type 1A fiberglass 6- and 12-ft stepladders were used during the experiment (Photo 1). Extra-heavy-duty industrial ladders rated for up to 300 lb (Type 1A) were chosen since they are most commonly used in commercial settings such as construction sites. Motion capture markers were placed on the participant’s body to identify the location of body segments. Additional markers were placed on the ladders to identify the location of rails and rungs relative to the body (e.g., reaching arm). Motion capture data were collected at 100 Hz using Motion Analysis System Eagle cameras and Cortex software (Santa Rosa, CA).

Lateral reaches toward the right side of the ladder were performed while participants stood on the third rung from the top. For each ladder height, the order of which was randomly presented, a participant initially performed a lateral reach with the instructions to “reach as far as you feel comfortable.” For the second trial, the participant was asked to “reach as far as you can.” This trial established the initial maximum reach distance and was used to establish the lateral target locations used in the subsequent trials. Reach distance was defined as the distance from the ladder rail to the right wrist. The distance to the end of the hand was not used to determine reach distance so as not to influence the technique used to push the target by dictating which finger should be used.

A target (key from a computer keyboard) was placed at a vertical height midway between the right shoulder and elbow heights. A motivated maximum reach distance was determined using the target and a modified method of constant stimuli procedure. Participants were required to reach and press the target, which required a low level of force but some level of motor control (Photo 2). Participants were not allowed to lean on or brace against the target to maintain balance.

The target was placed closer to and farther from the ladder rail until a maximum motivated lateral reach distance was established. If the participant was able to reach the target, the subsequent reach distance was presented without substantial delay. If the participant felt he could not reach the target at the current location, the participant had to climb down from the ladder and perform a short card-sorting task. In this manner, the participant was motivated to reach for the target since the instructions implied that successful reaches would result in decreased time to complete the experiment. Each participant was paid a flat rate for completing the experiment so taking longer did not deliver a financial benefit.

After the motivated maximum reach distance was determined, the target was removed and another unmotivated trial was performed. This reach distance, called the accli-
Photo 3 depicts the influence of acclimation (46 mm; 1.81 in.) and motivation (66 mm; 2.60 in.) on lateral reach distance.

Experimental Results

Data analysis indicated that the average maximum lateral reach distance was 66 mm (2.60 in.) shorter on the 12-ft stepladder than on the 6-ft ladder, whereas the distance of the belly button from the rail was only 46 mm (1.81 in.) shorter on the 12-ft ladder. An analysis of variance, controlling for any effect of age or participant, indicated that ladder height significantly affected both the lateral reach distance and the distance of the belly button from the rail ($p < 0.001$).

The total time to complete all trials comprising each condition was approximately 15 minutes. The acclimation and increased familiarity that occurred during this time led to a 35 mm (1.38 in.) increase in unmotivated reach distances for the two ladder heights combined and a 19 mm (0.75 in.) increase in the distance of the belly button from the rail. However, these differences were not found to be statistically different from the initial maximum distances.

Motivation, which was introduced by the concrete targeting task, generated an additional increase of 66 mm (2.60 in.) in reach distance as compared to the acclimated maximum reach distance. Therefore, participants reached 101 mm (3.98 in.) farther when performing a concrete task after a short period of acclimation. Similarly, the distance of the belly button from the rail increased 56 mm (2.20 in.) when participants were motivated by a concrete task. Thus, the total increase in the distance of the belly button from the rail was 75 mm (2.95 in.). Changes in distances due to motivation were statistically different from the initial maximum and acclimated distances.

Photo 3 is a graphical illustration of the effect of acclimation and motivation on lateral reach distance as compared to the length of the hand. The photo depicts data combined from both ladder heights. Figure 1 illustrates the differences in lateral reach distance for each condition and ladder height. Data trends were similar for the distance of the belly button from the side rail. The interaction between ladder height and reach condition (or belly button distance) was not found to be significant for either measure ($p = 0.999$, $p = 0.963$).

Guidelines recommend that the belly button not move past a ladder’s side rail during reaching or working on a ladder in order to prevent overreaching and tipping. Therefore, movement of the belly button due to acclimation and motivation is not necessarily detrimental unless it causes excessive movement. Although ladder movement was observed during this experiment, all participants maintained enough control to prevent the ladder from tipping over. Table 1 indicates the number of participants whose belly button moved past the side rail during each condition and ladder height.

Interpretation of Results

Ladders are common equipment on many jobsites that workers may be familiar with and use regularly. Although falls from ladders occur frequently, workers continue to disregard safety guidelines and increase fall risk by overreaching while on a ladder. Many factors influence workers’ behaviors on the jobsite, including risk perception, peer pressure and time constraints imposed by management.

Individuals who associate a high level of fall risk with working on ladders may be less inclined to overreach. Since anxiety caused by working at heights may affect postural control (Huffman, et al., 2009; Davis, et al., 2009), it is not surprising that novice users would be less willing to reach farther on a taller ladder. Several participants were comfortable on a ladder, as shown by their willingness to reach far enough to place their belly button outside the side rails without practice or motivation.

The effect of working at height, determined by ladder size in this experiment, becomes more apparent when individuals are asked to alter their initial behavior. More participants (9 for the 6-ft ladder, 3 for the 12-ft ladder) were willing to reach past the side rail after minimal practice while standing on the shorter ladder.

Although all participants could be motivated to reach past the side rail of the 6-ft ladder, 5 participants were still not comfortable placing their belly button outside the side rail while standing on the 12-ft ladder. These results may indicate a differing level of risk perception depending...
on working height, but all work at elevation is potentially dangerous; therefore, individuals must be aware of and abide by safety guidelines regardless of working height. Often, an individual’s assessment of risk is not adequate and may lead to unsafe behaviors.

While this study did not find a significant effect of acclimation, it should be noted that the time on the ladder was relatively brief (~15 minutes); it may be that greater effects would be observed over longer durations. Further research is necessary to answer this question.

It also is of interest to assess the ramifications of the changes in lateral reach distances as indicated by changes in forces beneath the ladder feet and reaching techniques used to extend reach distances (e.g., lifting opposite leg and only maintaining two points of contact with the ladder). Since the change in belly button distance and lateral reach distance were not the same, it is clear that participants were implementing different reaching techniques (i.e., altered body segment locations and angles). Some reaching techniques do not follow safe guidelines for ladder use and, consequently, increase the risk of a fall even if the ladder itself does not tip over.

The introduction of a concrete task and a time component had a significant effect on reaching distance. People generally want to complete tasks and do so in an efficient and timely manner. This desire may alter an individual’s assessment of risk, leading that person to perform tasks that s/he may deem unsafe in other circumstances. This desire may be intensified in newer employees trying to impress coworkers and managers. Therefore, management and peers must clearly articulate that safety is a priority on the jobsite.

The scenarios used in the current experiment were designed to simulate real-world influences on workers, but the laboratory environment could not replicate the high levels of pressure placed on workers or the physical challenges that may occur during a work task (e.g., uneven surface under-foot, handling of a heavy tool). Real-world situations would be expected to intensify the effects found during this experiment. This makes it even more critical that workers abide by guidelines for working safely on a ladder.

Recommendations for Practitioners

Several participants initially performed reaches that would be defined as safe according to the belly button rule, even though they may not have been aware of the guideline. However, after minimal practice many of those individuals were reaching far enough for the belly button to surpass the rail; when motivation was applied, all participants surpassed the rail on the 6-ft ladder and most of them did so on the 12-ft ladder as well. These data indicate that novice ladder users are capable of overreaching even though they might be expected to lack the confidence of more experienced ladder users. Further research is needed to determine whether proper training and prioritization by management can convince ladder users to reach at a safe level even though it may be less than their capabilities.

Ladder-specific safety training is essential as is continuous reinforcement that safety is more important than task completion speed. The criticality of ladder usage is an important message since falls from ladders often produce serious injuries, leading to multiple lost workdays. This message must be reiterated often since the proportion of falls to use may be low. Emphasizing the history of injuries due to ladders on the jobsite may be beneficial.

Stepladders are prevalent on jobsites due to their compact nature and the relative ease with which they can be moved during a task or between jobsites. Manufacturers have attempted to modify designs and create accessories to enhance stepladder stability, but it is unclear whether these changes affect worker behaviors; it also is possible that safer designs and accessories may decrease workers’ risk perception, encouraging workers to reach even farther and possibly fall. To prevent falls from ladders, particularly when training and warnings seem to be ineffective, alternative equipment (e.g., rolling scaffold) must be considered and incorporated into a job plan to complete tasks at elevation.

References


BLS. (2010b.) Number and percent distribution of nonfatal occupational injuries and illnesses involving days away from work by event or exposure leading to injury or illness and number of days away from work private industry, 2010. Washington, DC: U.S. Department of Labor, Author. Retrieved from www.bls.gov/iif/os/hcwc/os/hcwc/case/ostb2894.txt


Table 1

<table>
<thead>
<tr>
<th></th>
<th>6-ft ladder</th>
<th>12-ft ladder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial maximum</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Acclimated maximum</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Motivated maximum</td>
<td>24</td>
<td>19</td>
</tr>
</tbody>
</table>

Acknowledgments

The authors thank Don Tolbert, Chien-Chi Chang, Jacob Banks, Amanda Rivard, Richard Hollian and Tim Anson for their valuable contributions to this project.
Consider these three related truisms: **To err is human. Workers are fallible. Errors are inevitable (as well as predictable).** These are some fundamentals of the human performance approach to understanding safety. Generally speaking, human performance encompasses the way workers, the organization, the environment and the management system (e.g., programs and processes) work synergistically as an entire system. Workers are the focal points of this system, since any flaws in the system can affect workers’ performance and, conversely, any worker flaws can affect the system. Errors are largely viewed as consequences of working in a flawed system.

Given this human performance perspective, it should not be surprising that workplace incidents are triggered by human actions and in many cases the human actions causing these events are errors (which are unintentional actions without malice or forethought). About 80% of all incidents are attributed initially to human error (Perrow, 1984; Reason, 1990; U.S. DOE, 2009a). The remainder involves elements such as equipment and material failures. But, when the 80% human error is analyzed in detail, the analysis reveals that most errors are associated with events that stem from latent organizational weaknesses, whereas about 30% are caused by individual workers interfacing “erroneously” with systems and equipment (U.S. DOE, 2009).

Thus, incidents result from a combination of factors both within and beyond the control of workers. Although error is universal, the traditional belief that human performance is a worker-controlled phenomenon and that failures are introduced to the system only through the inherent unreliability of workers is in itself an error of understanding. Since experience indicates that weaknesses in organizational processes and cultural values are involved in most incidents, reducing human errors that are often the result of organizational weaknesses will reduce the likelihood that such events will occur.

Susceptibility to error is heightened when workers operate within complex systems that contain concealed weaknesses. These latent conditions either provoke error or weaken controls against the consequences of error. From a human performance perspective, Figure 1 diagrams the framework for incidents involving these organizational and human elements. The two ways to prevent human error from affecting operations are to 1) keep workers from making active errors (error prevention) or 2) stop the errors from having an effect (controls). Figure 1 provides clues regarding intervention mechanisms that workers can use to prevent human error arising from the provocation of error at the workplace or the weakening of controls. Breaking the component linkages as presented in this figure prevents events from occurring. Using this model, events can be avoided.

This article explores the human performance tools workers can use to defend themselves against...
flawed organizational safety management systems as well as their own fallibility in order to reduce human error and, thus, workplace incidents. In a study sponsored by the Alcoa Foundation, the research team canvassed several known high-performing organizations in various sectors (e.g., nuclear operations, power generation, aviation, heavy manufacturing, government) regarding the human performance tools they have successfully used to reduce error and improve safety performance.

These tools are discussed in this article. They are emphatically worker-centric in that they engage workers to be more aware of their safety, error precursors, tasks to be performed, and their conditions and surroundings. Discussion will also address why engagement and other factors are critical in making these tools effective. However, to fully understand these tools and how they work, let’s first review the human performance approach to managing and reducing error.

A Primer on the Human Performance Approach to Reducing Error


What Are Latent Organizational Weaknesses?

Latent organizational weaknesses are hidden deficiencies in management processes or values which can create workplace conditions that provoke errors and their precursors and/or degrade the integrity of controls (Figure 1). These weaknesses lie dormant until uncovered—typically during incident investigations. These weaknesses either create the preconditions for error, or fail to prevent, catch or mitigate the effects of error. Latent errors are normally management’s to identify and resolve. However, workers often are in a position to observe the preconditions for error, such as workplace distractions, that result from these latent organizational weaknesses. Many human prevention tools help workers discern and deal with these error preconditions.

What Are Initiating Actions & Active Errors?

Typically, workplace incidents are triggered by human actions, which can be acts of commission or omission. These errors are human actions that unintentionally depart from expected behaviors or performance. Active errors are physical, initiating actions that have immediate, observable and undesirable outcomes. Workers on the front-line commit most active errors because they “touch” the work, task or equipment. Most errors are insignificant in nature, resulting in few or no consequences. However, since most initiating actions are active errors, a strategic approach to preventing incidents includes workers anticipating and preventing active errors through the use of human performance tools.

Errors also can be categorized as slips, lapses and mistakes. Slips occur when physical actions (e.g., turn the wrong valve) fail to achieve their intended outcome. Lapses involve a failure of memory or recall (e.g., forget to turn off the valve). Mistakes occur when workers use inadequate plans to achieve the intended outcome (e.g., use an incorrect procedure to determine which valve to turn). Mistakes usually involve misinterpretations or lack of knowledge. On the other hand, violations involve the deliberate deviation or departure from sanctioned and expected behaviors, policies, rules or procedures. However, violations often are well-intentioned, arising from desires to complete the job according to management’s direction.

Provoking Error: Is It Intrinsic in Human Nature?

Human error is provoked by a mismatch between human limitations and workplace conditions, including inappropriate management and
leadership practices and organizational weaknesses that set up the conditions for performance (or lack of performance). In some cases, however, errors are provoked by human nature. Workers may judge risk poorly, typically underestimating it. Some workers operate under illusions of certainty that make them believe elements with risk are not risky. Also, there may be a general lack of appreciation of human limits, such as limited working memory and attention resources. The amount of information that can be held in working memory is typically limited to 7 +/- 2 items (Wickens, 1992). Working memory can create a logjam for incoming information. Various human performance tools are geared toward more accurately estimating risk levels of activities and dealing with human limitations.

Human stress can provoke error as well. Stress increases as familiarity with situations and conditions decreases. Workers generally try to avoid mental stress. Humans are reluctant to engage in lengthy concentrated thinking, as it requires high levels of attention for extended periods. Consequently, workers tend to look for familiar patterns and apply well-tried solutions to solve problems. This leads to the temptation to settle for less-than-optimal solutions rather than continue to seek the best solutions.

Mental shortcuts, or biases, are often used to reduce mental effort and speed decision making. Originating in the area of psychology, these include the following biases:

- **Confirmation bias:** Reluctance to change one’s mind in light of conflicting information due to the investment of effort/time in the current solution.
- **Similarity bias:** Tendency to recall solutions from situations that appear similar to those that have proved useful from past experience.
- **Frequency bias:** The notion that a frequently used solution will work or giving greater weight to information that occurs more recently or frequently.
- **Availability bias:** Tendency to settle on actions that readily come to mind and appear satisfactory, or giving more weight to available information even if the information may be wrong.

Unsafe attitudes and at-risk behaviors can provoke error. Awareness of these detrimental attitudes or mind-sets (e.g., feelings of invulnerability; pride; heroic behavior; everything-is-fine attitude) among workers is the first step toward effectively applying error-avoidance methods.

However, many workers may find it difficult to see or admit their own faults, vulnerabilities or errors. Thus, many human performance tools are geared toward self-awareness of one’s biases, vulnerabilities, deficiencies, assumptions and limitations, as well as on providing a more informed view of risk.

### What Are Error Precursors & Error Traps?

Simply stated, error precursors are conditions that provoke error. They are unfavorable conditions that interfere with successful performance and increase the probability for error when conducting specific actions. These precursors are not cryptic or unintelligible to workers. They are observable and can be corrected. If these precursors are discovered and removed, work conditions can be changed to minimize the chance of error.

<table>
<thead>
<tr>
<th>Task demands</th>
<th>Individual capabilities and skills (worker specific)</th>
<th>Individual cognitive characteristics (worker specific)</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time pressure; high workload pressure; mental pressure</td>
<td>Unfamiliarity with task/first time or nonroutine or infrequent task</td>
<td>Assumptions, dispositions and habits</td>
<td>Distractions and interruptions</td>
</tr>
<tr>
<td>Simultaneous, multiple actions; multitasking</td>
<td>New techniques not used before</td>
<td>Overconfidence</td>
<td>Changes and departures from routine</td>
</tr>
<tr>
<td>Requirements for interpreting information and procedures; vague procedures</td>
<td>Lack of knowledge, proficiency or experience</td>
<td>Mental short cuts or biases</td>
<td>Confusing controls and displays</td>
</tr>
<tr>
<td>Unclear goals, roles or responsibilities; lack of clear standards; vague or imprecise work guidance; conflicting information</td>
<td>Poor communication or problem-solving skills</td>
<td>Limited short-term memory</td>
<td>Unexpected equipment conditions or performance</td>
</tr>
<tr>
<td>Repetitive or monotonous actions</td>
<td>Illness or fatigue; general poor health or injury</td>
<td>Inaccurate risk perception</td>
<td>Environmental factors such as noise, temperature and lighting</td>
</tr>
<tr>
<td>End of shift work; last shift before holiday; first shift back from holiday</td>
<td>Ability to handle stress</td>
<td>Unsafe attitudes</td>
<td></td>
</tr>
</tbody>
</table>

Error precursors can be grouped into four major areas: task demands, individual skills connected to accomplishing a task, individual cognitive capabilities and workplace environment. Table 1 lists typical error precursors found at workplaces in these four areas. Many human performance tools help workers take note of the presence of these error precursors.

Associated with the presence of error precursors are error-likely situations (e.g., situations in which the presence of error precursors are more common). Error-likely situations are those which present greater chances for error when performing certain actions or tasks in the presence of these error precursors (e.g., working on a particular piece of equipment that requires multitasking). Error-likely situations typically exist when the demands of tasks exceed worker capabilities or when work conditions aggravate the limitations of human nature. Error-likely situations also are known as error traps.

In a study conducted at Indiana University of Pennsylvania (IUP), the research team asked approximately 2,300 employees (some of whom worked at high-performing organizations) to respond to a series of questions regarding the presence of error precursors and working conditions in their organizations. Workers also were asked to report the number of injuries and near misses they experienced in the preceding 6-month period. Based on previous investigations, 6 months is the maximum time over which employees should be asked to recall injuries they have sustained with any accuracy (Veazie, Landen, Bender, et al., 1994; Zacharatos, Barling & Iverson, 2005).

Ten Likert-scale statements related to error precursors or worker conditions were provided and respondents were asked to indicate their level of agreement (1 = strongly disagree to 5 = strongly agree). The results are presented in Table 2. As shown, the most common error precursors identified were multitasking, high workload, time pressures and conducting nonroutine tasks.

Each response was then associated with the self-reported near misses, first-aid injuries and injuries resulting in medical treatment beyond first aid that were reported by each employee. These associations are reported in Table 3 (p. 57). As shown, most of these error precursors situations are systematically, positively and significantly associated with the number of near misses, first-aid injuries and injuries beyond first aid. Thus, error precursors are indeed associated with events in the workplace.

### What Are Modes of Performance?

Three modes of worker performance are key to understanding how and at what frequency errors occur, as well as how human performance tools can be used to combat errors when operating in these particular modes of performance.

#### Skill-Based Performance

Skill-based performance involves highly practiced, largely physical actions conducted in very familiar situations. Such actions are usually executed from memory without significant conscious thought or attention. In skill-based mode, workers function effectively by using preprogrammed sequences of behavior that do not require much conscious control. Examples are using hand tools, recording gauge information, using test equipment or clicking valve positions. One problem with skill-based performance is that the greater the familiarity with the task, the less likely the perceived risk will match actual risk. Workers become comfortable with risk and can eventually grow insensitive to hazards.

Inattention is the primary error mode for skill-based performance. Skill-based errors are primarily execution errors, involving action slips and lapses in attention or concentration. Under ideal conditions, the chance for error is less than 1 in 10,000, according to a study in the nuclear power industry. Roughly 90% of a person’s daily activities are spent in skill-based performance mode. However, the nuclear power industry has found that only 25% of all errors are attributable to skill-based errors (U.S. DOE, 2009a).

#### Rule-Based Performance

Rules may be necessary for less-familiar, less-practiced work activities for which employees may not be highly skilled. Also, workers often switch to a rule-based performance level when they notice a
need to modify their largely preprogrammed behavior to account for some changes in work situation. In addition, certain job situations (including those that are safety critical tasks) simply lend themselves more to following a set of rules and procedures.

In rule-based performance, workers apply memorized or written rules to managing work situations. Typically, rule-based performance follows an if (symptom), then (do this) logic. In applying these rules, workers operate by matching the signs and symptoms of the work situation to some stored knowledge. One concern with rule-based performance is how to improve workers’ interpretation of situations so that appropriate responses are selected and used. This is why written procedures (e.g., predetermined solutions to possible work situations that require specific responses) are prepared for anticipated situations.

Since rule-based activities require interpretation using an if-then logic, the prevalent error mode is misinterpretation. Errors include deviating from an approved procedure, applying the wrong response (e.g., procedure) or applying a flawed response (e.g., bad procedure). Rule-based errors are often classified as failure of expertise mistakes.

Rule-based modes involve making choices. The chance for error increases to roughly 1 to 1,000 (99.9% reliability). In the nuclear power industry, studies have shown that roughly 60% of all errors are rule-based (U.S. DOE, 2009a).

Knowledge-Based Performance

Workers enter knowledge-based performance when they are unsure what to do. Knowledge-based behaviors are responses to unfamiliar situations (where no skills or rules are recognizable to workers). Workers must rely on their understanding and knowledge, perceptions of present circumstances, similarities to previous circumstances, and the scientific principles and fundamental theories related to the perceived situation. Operating in this mode, to effectively gain more information about what they are doing or about to do, workers must be more focused than with skill-based performance. Knowledge-based situations are often puzzling and unusual to workers and the understanding of the problem is patchy, inaccurate or both. Knowledge-based errors are primarily lack of expertise mistakes.

Knowledge-based activities require diagnosis and problem-solving skills. Decision making can become erroneous if problem solving is based on inaccurate information. The prevalent error mode is an inaccurate mental model of the system, process or facility status. Thus, it is not surprising that workers do not perform well under these higher stress, unfamiliar situations in which they must think on their feet in the absence of rules, routines and procedures to handle the situation.

Therefore, under such circumstances, the chance of error is particularly high, approximately 1 in 2 to 1 in 10. In the nuclear power industry, studies indicate that roughly 15% of all errors are knowledge-based (U.S. DOE, 2009a). For many organizations that are embracing human performance philosophy, the goal is to move processes from knowledge-based to rule-based due to the fact that the error rates decrease by at least a factor of 10 in the rule-based mode.

In the IUP study, the researchers asked approximately 2,450 workers to respond to a question designed to determine which performance mode they

### Table 3

<table>
<thead>
<tr>
<th>Measure</th>
<th>Near misses</th>
<th>First aid</th>
<th>Beyond first aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>At work, there are time pressures. I feel rushed.</td>
<td>.19*</td>
<td>.10*</td>
<td>.08*</td>
</tr>
<tr>
<td>At work, there are mental pressures. I find it difficult to concentrate.</td>
<td>.16*</td>
<td>.08*</td>
<td>.06*</td>
</tr>
<tr>
<td>At work, I conduct many nonroutine tasks.</td>
<td>.12*</td>
<td>.06*</td>
<td>.04</td>
</tr>
<tr>
<td>At work, I conduct many new/unfamiliar tasks</td>
<td>.10*</td>
<td>.06*</td>
<td>.05*</td>
</tr>
<tr>
<td>At work, I typically have a high workload.</td>
<td>.11*</td>
<td>.02</td>
<td>.04</td>
</tr>
<tr>
<td>At work, I typically multitask—doing many different things at the same time.</td>
<td>.03</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
<td>At work, I receive work guidance that is at times vague or imprecise</td>
<td>.16*</td>
<td>.08*</td>
<td>.05*</td>
</tr>
<tr>
<td>At work, there are many distractions around me.</td>
<td>.23*</td>
<td>.09*</td>
<td>.08*</td>
</tr>
<tr>
<td>At work, there is low likelihood of management detecting a violation of safety rules.</td>
<td>.16*</td>
<td>.09*</td>
<td>.06*</td>
</tr>
<tr>
<td>At work, safety requirements are very inconvenient to comply with.</td>
<td>.19*</td>
<td>.10*</td>
<td>.09*</td>
</tr>
</tbody>
</table>

Note. *p < .05; Polychoric correlations were calculated using scale data. This statistical method provides a better estimate of correlation between non-continuous variables.
would use to respond to uncertainty (e.g., error-prone situations, such as those associated with knowledge-based modes of performance). The results (Table 4) show that the most prominent performance response mode for survey participants is that found typically in skill-based operations (e.g., stop and seek guidance). It is encouraging that nearly half of the respondents are inclined to deal with uncertainty (when hypothetically pushed to operate in a higher-risk, knowledge-based mode) by using a skill-based response, which has the lowest rate of error associated with it. Safety-critical industries attempt to move from knowledge- and rule-based modes to skill-based modes in which error rates are lower.

Keys to Reducing Error
A strategic approach for improving human performance involves the anticipation, prevention, identification and recovery from active errors on the job, especially at critical steps, where error-free performance is absolutely necessary. Events can be avoided by understanding the reasons mistakes occur and applying lessons learned from past events and errors. Anticipating and preventing active errors often relies first on identifying error precursors and error traps, which is the primary role of many human performance tools.

One can take three basic approaches to reducing error: through planning, through performance, and through communication and feedback.

Planning
Planning activities can identify and control error precursors, traps and the potential for active errors. Planning includes identifying the scope of work, associated hazards and critical steps, and determining what is to be avoided; conducting jobsite reviews and walk downs (identifying potential challenges to error-free performance); performing appropriate task assignments (matching the right people to the job based on its task demands); and conducting task previews and prejob briefings (anticipating hazards, error precursors and possible active errors and their consequences). Such activities are the basis of many human performance tools.

Performance
During the execution of work, active errors can be minimized by performing work with a sense of uneasiness; maintaining situational awareness; avoiding unsafe or at-risk work practices; and being supported through the use of teamwork. Some effective human performance tools are geared toward achieving and maintaining this sense of worker situational awareness and uneasiness.

Communication & Feedback
Active errors may be averted by workers reporting workplace information (e.g., conveying information on the quality of work preparation, resource allocations and workplace conditions) to managers and by managers and workers conducting in-the-field observations (e.g., workers receive coaching and reinforcement on their performance through observation by managers and peers). Some human performance tools engage workers by promoting communication and feedback.

Worker Engagement
Are there general defenses that workers have within their control that will keep them safe and make them aware of their ever-changing surroundings, error-prone conditions, the fallibility of safety management systems and the limitations they have? The overarching answer perhaps is in the ability of workers to become engaged in the safety aspects of their work. Recent research (Wachter & Yorio, 2012a, 2012b; Yorio & Wachter, 2012) shows that safety management system practices and employee perception constructs “work” to improve objective safety performance by engaging workers (e.g., worker engagement acts as an important mediator between safety predictors and safety outcomes).

In engagement, an organization’s workers execute their roles by driving personal energy into physical, cognitive and emotional labors and, by so doing, achieve active, full work performance. Engagement occurs when individuals are emotionally connected to others and cognitively vigilant (Harter, Schmidt & Hayes, 2002; Kahn, 1990). Connection and vigilance can be described as being psychologically present, attentive, integrated and focused in

Table 4
Survey Results on Response Performance Modes Used in Error-Prone Situations

<table>
<thead>
<tr>
<th>Question: When I am confronted with really abnormal conditions or unusual situations, my strongest tendency is to do which of the following:</th>
<th>Percent response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill-based response: I stop work and seek guidance as to how to proceed.</td>
<td>41.6%</td>
</tr>
<tr>
<td>Rule-based response: I apply rules, procedures, and protocols and use them as guidance as to how to proceed.</td>
<td>28.2%</td>
</tr>
<tr>
<td>Knowledge-based response: I draw upon my own existing knowledge and use it as guidance as to how to proceed (e.g., thinking things through on the spot).</td>
<td>22.5%</td>
</tr>
</tbody>
</table>

Note. Number of workers responding to this inquiry was 2,449: skill-based N = 1019; rule-based N = 691; knowledge-based N = 552, and no response N = 187 (7.6%).

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Human Performance Tools

Human performance tools can be used to reduce human error. The specific tools chosen are frequently based on the employees’ primary performance mode (skilled-, rule- or knowledge-based).

Using human performance tools reduces human error in various ways, including these possible outcomes:

• heightened sense of situational awareness concerning safety, presence of error precursors and error traps, tasks to be performed, conditions and surroundings;
• increased deliberation, cautiousness and mindfulness in workers as they approach and perform their tasks;
• more accurate estimates of risk levels of activities;
• higher levels of self-awareness, including a more informed understanding of one’s biases, vulnerabilities, deficiencies and limitations;
• communication and feedback promotion, including facilitation of interactions with others;
• slowing down activities to give workers more time to think about tasks;
• identification of warning signals that indicate that the situation is degrading or trouble is brewing;
• recognition of assumptions that need to be challenged;
• continual improvement of procedures;
• higher levels of worker engagement.

Their role performance. Therefore, given the strong mental and emotional being-there aspect of worker engagement, it may be viewed as an important defense against the presence of error traps and latent organizational errors.

Worker engagement in safety functions may reduce the probability of human errors by making employees more involved in and aware of their tasks/surroundings and associated risks (e.g., heightened sense of situational awareness), including the error traps that could be present. Thus, increased levels of worker engagement in safety activities could be related to increased safety performance as measured by standard safety outcomes (e.g., recordable case rates). Therefore, it is not surprising that the human performance error prevention tools being used by high-performing companies often are associated with high levels of worker engagement to make them effective.

Human Performance Tools

By improving human performance, active errors are reduced. By reducing active errors, organizations help eliminate unwanted events. Human performance tools are designed to help people anticipate, prevent and catch active errors. In short, human performance tools help workers maintain positive control of work situations. Positive control means that what is intended to happen actually happens—and it is all that happens.

These tools are oriented toward preventing active errors, and many of them work by detecting and recognizing error precursors, error traps and hazards. These tools are vehicles for providing mental and social skills that complement workers’ technical skills to promote safe and efficient task performance, such as carving out time to think about work, particularly critical steps (Muschara, 2012) or the error traps associated with the work to be conducted. Many human performance tools deliberately slow work down; this is counterintuitive since error precursors often arise due to the deliberate speeding up of work planning and execution processes. When used conscientiously, these tools give workers more time to think about the tasks at hand—about what is happening, what will happen and what to do if things do not go as expected.

Many of these tools might be characterized as situational awareness tools. Situational awareness is defined as the accuracy of a worker’s current knowledge and understanding of actual conditions compared to expected conditions at a given time and location. These tools help workers form an accurate understanding of the work and equipment environment, and foster an attitude sensitive to the presence of hazards, error precursors and error traps and the possible consequences of an error.

Situational awareness means that workers clearly understand the job requirements, equipment condition and work environment before acting. In short, the situational awareness tools improve workers’ insightfulness and abilities to detect and respond to unsafe conditions they may not see otherwise. They are particularly helpful in skill-based work performance.

Other human prevention tools help workers look for warning signals (even slight warning signs) which indicate that the situation is degrading or that trouble is brewing. Some are geared toward looking for deviations or deviation drift from normal conditions. Others force workers to challenge assumptions. Assumptions tend to occur more often when workers experience uncertainty. Assumptions also can be a result of unsafe attitudes and inaccurate mental models. Since assumptions are often treated as facts, challenging them is important in improving mental models, solving problems and optimizing team performance (Summers, 2012).

Error detection or prevention depends on people. Some human performance tools force interaction with others or with workers themselves. For example, self-checking tools provide employees with the means to avoid or detect mistakes by having workers observe themselves, while peer checking and three-way communication tools engage other workers in this process.

The mode of performance often determines which human performance tool to use. Several tools are designed to help anticipate, prevent or catch skill-based errors. These include self-checking and three-way communication primarily, as well as previewing tasks, jobsite reviews, questioning attitude, stopping when unsure, peer checking and concurrent verification. Also, when working in skill-based modes, workers may benefit from triggers such as operating aids and reminders.

Rule-based errors can be detected and mitigated by using tools that promote self-checking and exhibiting a questioning attitude, and that encourage calling time outs, stopping work when workers are unsure, conducting task previews and prepjob briefings, and performing peer-checks and concurrent verification. Peer checks are particularly important in helping workers avoid critical consequential er-
rors. However, the primary tool suggested for rule-based work is procedure use and adherence. In addition, some errors that occur when working in this mode may be corrected through retraining in certain instances (e.g., when workers have misinterpreted procedures, requirements or rules).

Knowledge-based human performance tools include conducting prejob task briefings; project planning activities; problem-solving and decision-making methods; and peer reviews. For workers operating in the knowledge-based mode, where their understanding of problems are often incomplete and/or inaccurate, and where slow and thoughtful thinking is needed, collaboration with small teams of attentive, committed and experienced workers often facilitates problem solving and decision making.

However, the most fundamental tool for knowledge-based work is to stop when unsure. The organization must constantly reinforce that when workers are unsure of what to do, observe conditions not addressed in prejob briefs or work instructions, or feel uneasy, the proper action is to stop, reassess the situation, confer with team-mates, supervisors or job experts, and proceed only when people agree that the task can be performed safely and correctly.

Corrective action to reduce knowledge-based errors is challenging. Coaching is a proactive solution that can help employees avoid error and its consequences when working in any performance mode, but particularly for knowledge-based modes.

The Top 10 Human Performance Tools

In a study sponsored by the Alcoa Foundation, the authors canvassed several known high-performing organizations in various sectors (e.g., nuclear operations, aviation, power generation, heavy manufacturing) regarding human performance tools they have used with success. The information was subjectively analyzed, and the 10 leading tools were identified and are presented here. Inclusion on this list was related to both the frequency of organizations using these tools and the perceived and actual impact these tools had on avoiding and reducing active errors.

Most of these tools are worker-centric in that they tend to engage workers to be more aware of their surroundings, error traps, tasks to be performed, conditions/surroundings and safety in general. Supporting information on these tools was adapted from Cornell, Kramme and Synder (2012); Ferguson, Ferguson and Barger (2012); Fisher (2012); Muschara (2012); Shockey, Holland and Shelby (2012); Summer (2012); and U.S. DOE (2009b, 2012).

Tool 1: Pretask & Posttask Briefings

The canvassed organizations identify pre/post-task briefings as a tool that works especially if it engages workers to take ownership and if the briefings are conducted from a human performance perspective (e.g., identifying error precursors, modes of performances and additional tools to be used during the day/task to reduce the potential for active errors). These briefings should be applied to nonroutine and routine work. Considering the number and variety of factors involved with a specific job, many things can change, even with simple, repetitive tasks; consequently, no work should really be considered routine.

Pretask Briefings

The intent is for workers to look through a human performance lens and have engaging conversations before beginning work. Topics can include critical tasks steps and their associated hazards, stop work criteria, safety precautions, potential error traps, applicable performance modes of operation (skill-based, rule-based, knowledge-based) and determining the high-risk activity for the day. During these briefings, roles and responsibilities, conditions, resource needs, PPE requirements and emergency procedures also can be discussed. Important questions include: What could surprise us? What may go wrong? What hazards have we considered? What hazards could be discovered? What is the worst credible thing that could happen? What conditions could stop this job? What do we want to achieve in this task? What do we want to avoid in this task? What can we uncover and prevent? What lessons did we learn from yesterday?

Pretask briefings often follow the S-A-F-E-R pattern:

1. Summarize the critical steps.
2. Anticipate errors and error precursors for each critical step.
3. Foresee probable and worst-case consequences should errors occur at critical steps.
4. Evaluate controls and contingencies at each step to prevent, catch and recover from errors and/or reduce their consequences.
5. Review previous experience and lessons learned relevant to the specific tasks and their critical steps.

Posttask Briefings

During these briefings, staff should review job environments, identify program gaps and discuss corrective actions. These reviews are essential when complications have occurred, after completing a nonroutine or important work activity, or after each high-risk phase of an important project. However, this tool also should be used for routine work, especially where improvements have been identified.

Other topics covered may include unexpected outcomes, usability and quality of work documents, knowledge and skill shortcomings, deviations from standards, and adequacy of tools and resources. These briefings are important learning opportunities that can be used to identify latent organizational weaknesses, the presence of error traps and ways to reduce human error. In addition, workers must continually adapt to ever-changing tasks and job conditions. How adaptation occurred at the jobsite and necessary improvements can be discussed during the briefing.

Pre- and posttask briefings and pre- and posttask reviews are similar. However, briefings could note more communication and engagement with
workers, while reviews are often conducted independently of task employees (e.g., by supervisors and safety managers).

Based on the research conducted, it appears the best pre/postjob briefings involve workers taking control and ownership of these briefings. Some organizations provide marker boards on which workers can check off error traps that may be present for that day’s tasks and identify performance modes that will be used and critical tasks.

**Tool 2: Self-Checking/S-T-A-R**

Most companies surveyed identified self-checking tools as important. These tools involve developing and implementing worker-based approaches such as S-T-A-R (Stop-Think-Act-Review). They are most applicable when operating in skill-based and rule-based performance modes, and are particularly effective for repetitive tasks. Self-checking helps workers focus attention on the appropriate action, think about that action, understand the expected outcomes and verify results. This tool promotes situational and self-awareness.

Following is a description of the S-T-A-R steps:
- **Stop** (or slow down). Pause to focus attention on the immediate task.
- **Think.** Think methodically and identify correct actions to perform and understand what will happen when correct/incorrect action is performed.
- **Act.** Perform the action.
- **Review.** Confirm anticipated result has occurred or apply contingency if required.

This tool necessarily engages workers because they perform it on themselves.

**Tool 3: Take-a-Minute/Jobsite Review**

Jobsite review, popular for use in field locations, can improve workers’ situational awareness, especially when first arriving at a jobsite. By taking a minute (sometimes referred to as a 2-minute review or take two), workers explore the site and compare current conditions with prejob briefing information. Using this tool, deviations, unexpected hazards, precautions and complicating factors and conditions can be discussed, especially if these involve safety critical steps. Based on this revised risk status at the site, hazards can be eliminated, appropriate defenses can be installed or contingencies can be developed. This tool necessarily engages workers because they perform it themselves or in a team setting.

**Tool 4: Stop & Seek/Stop When Unsure/ Pause When Unsure**

Developing and implementing stop work criteria and seek help approaches/procedures are important, especially when workers operate in knowledge-based modes. This tool promotes awareness of workers’ knowledge limitations as applied to dealing with specific work situations/deviations/uncertainties. Workers will seek help (typically from supervisors and possibly coworkers) to continue work and deal with these uncertainties and/or lack of knowledge.

The pause-when-unsure tool supports the notion that employees should approach their work deliberately, cautiously and mindful of their capacity to commit errors and of the presence of error precursors, error traps and hidden threats. This heightens workers sensitivity to the possibility of committing active errors. Again, this tool engages workers because they perform it themselves (e.g., self-manage it).

**Tool 5: Questioning Attitude**

Many high-performing organizations support a culture where questioning is an acceptable and promoted practice and value. A questioning attitude endorses a preference for facts over opinions and assumptions. It fosters thought about safety before actions are taken. It helps workers maintain an accurate understanding of work conditions at any given time. This tool is predicated on a stop-look-listen mentality.

One process that reflects a questioning attitude is described as follows: workers proactively search for situations that foretell uncertainty; they ask questions; they gather relevant information; they stop when unsure; they do not proceed in the face of uncertainty and ask for expert help; they proceed if sure and continue the activity if the uncertainty has been removed with facts.

This tool is worker-centric in that workers are in the best position to question actions and workplace conditions. Workers can question the presence of error precursors and error traps, as well as observed deviations. One way to use this tool is adopt it as a leading safety indicator for the organization.

**Tool 6: Identifying Critical Steps**

Critical steps are actions that will trigger immediate, intolerable and irreversible harm (if that action or preceding action is performed improperly). In terms of reducing human error, if critical steps are identified, then workers will be more cautious when performing these steps and should be less apt to operate erroneously using skill-, rule- and knowledge-based behaviors. This promotes workers’ situational awareness and heightens the sense of uneasiness. Examples of critical steps are workers entering a confined space or touching a rotating pump. Once critical steps are identified, workers can anticipate errors that can occur at each critical step, estimate their consequences, then evaluate the existence of controls, contingencies and stop work criteria.

**Tool 7: Coaching & Observation**

Coaching and observation involve managers and workers. Some high-performing organizations have on-the-floor human performance coaches. Integration of human performance principles can be promoted by coaching workers on potential hazards, performance modes, error traps and the use of other human performance tools. Through coaching, workers can identify minor issues before they become major problems. Workers can identify error precursors and error traps before having an active error or an event. Injuries can be reduced
by providing employees with the knowledge and recognition skills to know when they are operating in a specific error trap and how to escape it using these various tools.

The purpose of in-the-field observations is to review the quality and effectiveness of work preparations, practices and performance. Observations can be performed by both managers and employees. Observation scope should include the total job, not just worker behavior. In-the-field observations by managers or employees look at what error traps employees may be encountering based on signals they are providing (e.g., nonverbal cues that they do not have the knowledge or skills to perform a certain task). Tools are then provided to reduce the potential error. These observations may uncover critical learning that needs to be institutionalized to reduce or eliminate potential errors.

**Tool 8: Three-Way Communication**

In three-way communication, the sender (worker) states the message, the receiver (probably another worker) acknowledges the sender and repeats the message in a paraphrased form, and the sender acknowledges the receiver’s reply. This method can be used to communicate changes to physical facility equipment during work activities via face-to-face, telephone or radio modes of communication. It also is used to ensure that critical steps (e.g., within a safety critical procedure) are being strictly followed. Like the other tools, this one engages workers because they perform it themselves as a communication team.

**Tool 9: Concurrent Verification/Peer Checking**

Concurrent verification involves a series of actions by two individuals working together at the same time and place to separately confirm the condition of a component before, during and after an action, especially when consequences of an incorrect condition or action would produce great harm. Using this tool, the performer and verifier agree on the action to be taken; they separately self-check the action to be performed; they agree once again; the verifier observes the performer during execution; and the verifier stops the performer if action is incorrect.

Concurrent verification is typically applied to verifying conditions, while peer checking is more oriented toward verifying actions. Peer checking is used to prevent an error by the performer and augments self-checking by the performer. This technique takes advantage of a fresh set of eyes. The performer (worker) self-checks the correct component or hazard present; the peer self-checks the correct component or hazard present; the performer and peer agree on the action; the peer observes the performer before and during execution; the performer executes the intended action; the peer stops the performer if the performer’s action is incorrect; if the performer’s action is correct, the peer informs the performer of such.

These tools engage workers mentally and physically because they use these tools themselves in tandem or as a team.

**Tool 10: Procedure Use, Adherence & Review**

To use, follow and review a procedure, workers must first understand its intent and purpose. Workers then follow the procedure as written, step-by-step, with mindfulness and an appraisal orientation. Situational awareness transforms into procedural awareness.

However if the procedure is written incorrectly or cannot be implemented safely, then work is stopped and the procedure is revised before work restarts. Workers are vigilant in terms of assessing a procedure’s accuracy, completeness, usability, lack of vagueness and internal consistency. Thus, a major outcome of using this tool is the continual improvement and relevance of procedures by workers engaged in this review and improvement process. Organizations would use this tool for activities associated with the rule-based performance mode.

Many error precursors are procedure related. Common examples include vague work guidance or instructions; need for users to make decisions with no real guidance; users have multiple options for choosing course of actions; users have options to choose next course of action contingent on conditions, which requires the user to determine whether such conditions are present; procedures with multiple actions included in one step; and procedures with embedded actions that could be easily missed.

**Another View on Human Performance & Safety Management**

This article has posited that workers should be on the defensive against active errors and their precursors in the workplace, which can be achieved by using human performance tools that promote worker engagement. This argument is not being primarily made because workers commit these active errors and, therefore, should be responsible for their control. Rather, workers cannot rely solely on management and management systems to identify and remove error precursors, let alone latent organizational weaknesses that may have led to these error precursors in the first place. Latent system weaknesses are land mines waiting to detonate and workers, unless they adopt their own personal defenses, will be the ones injured by the proverbial shrapnel.

Since safety can be viewed as the presence of defenses in processes, procedures, facilities, methods and practices (Muschara, 2012), workers must become defensive safety warriors. Workers are in the best position to identify conditions and precursors that could lead to error and, therefore, they should be armed with situational awareness and be mindful of uneasiness in the workplace. Workers need to be wary and aware of their own vulnerabilities and limitations.

But another practical reason exists for placing workers at the center of error identification/avoidance and performance improvement. Safety management systems are always flawed during their development and implementation. Perhaps this is because such systems cannot anticipate and control all possible work situations (due to economic and
practical reasons) or are slow to adapt to changing and variable situations or uncertainty because of their rigid, controlled and complicated structures.

Safety is the ability to perform work in varying and unpredictable work environments (Conklin, 2012). Where work is performed in a constantly changing workplace, workers who are capable of error are implementing flawed safety management systems. Active errors occur at this "sharp" edge, where flawed safety management systems touch potentially flawed workers and potentially flawed workers touch tasks being performed that are shrouded by veils of uncertainty.

The human performance system model of human error posits that events are caused by the totality of the organization contributing to initiating events and failing to contain the results. Another approach is the pessimistic person model of human error which believes that errors and violations originate from the perversity and unreliability of human nature. Both models are probably correct to some extent and the concept of preparing workers to be defensive against unknown latent errors and error precursors caused by the organization as well as potential active errors caused by their own deficiencies combines these two approaches from a pragmatic perspective.

Systems are often not well designed and maintained; designers cannot foresee and anticipate every contingency; procedures may be incomplete or inaccurate; and workers may not behave as they are expected to behave (Conklin, 2012). However, engaged workers are remarkably adaptive and compensating to uncertainty and threats in the workplace—and things can go right in light of such uncertainty because of workers’ personal defenses and concern for their own well-being. This can be demonstrated by engaged workers successfully using human performance tools to manage both their organizations and themselves, in spite of their organizations and themselves.

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DuPont Sustainable Solutions has unveiled CoastalFlix, a video delivery solution that enables employees to experience DuPont content from any web-enabled device. Portable platform offers employees instant access and more flexible delivery options. Streamlined access eliminates shipping costs and minimizes complicated hardware/software installations.
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www.uvex.us

Shoe Traction
Diamond Grip footwear traction from ICEtrekkers provides traction in snowy or icy conditions. Product's case-hardened, alloy steel grippers are affixed to the bottom of a shoe. Slip-on cleat provides a rectangle of gripping beads under the ball of the foot and a triangle under the heel. Beads are attached with a hardened steel chain and steel rivets to a rubber sling that slips over the toe and heel of a shoe. Product reportedly grips to ice, snow, rock or gravel.
www.icetrekkers.com

Label Maker
K-Sun's line of PEARLabel printer systems provides mobile printing applications, wide formats and expanded bar coding. According to manufacturer, high-resolution labels are ideal for identifying ANSI safety or OSHA warning labels, training, signage or specialized equipment. PEARLabel 270 and 360 models are equipped with hundreds of symbols, chevrons and graphics.
www.ksun.com

To submit a product for this section, send an e-mail to professionalsafety@asse.org. Be sure to include product and contact information, along with a high-resolution product photo.

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**Product Pulse**

**Safety Boot**
HyTest Safety Footwear’s new collection of boots are made of full-grain tumbled leather with a slip-resistant rubber outsole. Boot features mesh upper lining, cushioned removable footbed and impact protective instep.

www.hytest.com

**Clean Room Crane**
David Round Co. introduces its line of all-stainless articulating jib cranes designed for pharmaceutical manufacturing. Device can lift bulk bags or other materials up to 1,000 lb. Crane features fully enclosed mechanical components for use in clean room environments. Explosion-proof models also are available.

www.davidround.com

**Fall Protection**
DBI-SALA EZ-Stop lanyard from Capital Safety is designed with components that can be replaced individually when worn or damaged. The 0.75-in. webbing and small shock pack reduce weight and excess bulk, while one-handed quick-connect design offers versatility. All components are made with water-repellent webbing, while lanyard is equipped with i-Safe technology that allows device to be tracked in inventory and tagged with usage data.

www.capitalsafety.com

**Forklift PC**
The E4500 vehicle mount forklift terminal from Glacier Computer provides additional configuration options for warehouse, distribution, manufacturing and logistics markets. Manufacturer ensures reliable performance in rugged environments due to product’s Windows and Linux operating systems, vibration testing and a wide range of operational temperatures.

www.glaciercomputer.com

**Machine Guard**
Danray Products LLC offers its heavy-duty steel lathe chuck shield for lathes or similar machines. Product provides a safeguard between a worker and point-of-operation or rotating hazards, and protects a worker from flying debris. Shield hinges left and rests at a 30° angle above the headstock, which reportedly provides ease when changing the chuck.

www.danrayproducts.com

**Worker Safety**
Vital ID’s Worker Safety Hard Hat ID adheres to the exterior of a worker’s hardhat to store critical medical and personal information. Having worker information accessible during a serious incident helps first responders speed communication with family members. Product is ideal in large, transient workforces, high-risk occupations and remote work environments.

www.workersafetyid.com
Lift Table
Tally Machinery Corp.’s automated laundry lift table replaces manual handling and transfer of clean linens for folding and packaging. System reportedly eliminates heavy lifting and increases work flow. Ideal for commercial or industrial settings, product is available in four standard models and can be customized. www.TallyMachinery.com

HazCom Training
Emergency Film Group has released Global Harmonization & The Hazard Communication Standard, a DVD-based training program for workers and emergency responders. The 28-minute program covers classifications and categories for physical and health hazards of chemicals, as well as requirements for labels, pictograms, signal words and the new 16-part format for safety data sheets. Program includes instructor’s CD, PowerPoint, quiz and reference materials. www.efilmgroup.com

Materials Handling
NuStar Inc.’s stainless steel pedestrian-operated Power Pusher is ideal for moving heavy loads. Product is battery operated and does not emit any harmful exhausts or fumes during operation. According to manufacturer, product can pull and maneuver wheeled loads up to 150,000 lb. www.powerpusher.com

Respiratory Protection
3M announces its free mobile application for respiratory protection information. Designed for industrial hygienists, product provides a respirator selection guide, fit-testing protocols and allows user to conduct a fit test. App also serves as a 3M product catalog and allows user to check the 3M respirator selection guide. www.3M.com

Welding Glove
Galeton has expanded its line of gloves to include the Panther Premium Leather Welder’s glove that offers improved heat protection. Glove features a double-layer thumb joint and thick lining to protect worker’s hand from heat and hot tools, while cuff provides added heat protection. www.galeton.com

Gas Detection
MSA’s Galaxy GX2 Automated Test System allows user to manage portable gas detection fleets through testing and calibration of the firm’s Altair line of gas detectors. System starts automatically and provides simultaneous tests of up to 10 instruments. At-a-glance indicators include low calibration gas volume, expiration warnings and test stand status. Software provides dashboard overview and total recordkeeping. www.msa-safety.com

Fire Protection
General Monitors’ multispectrum infrared FL400H flame detector provides flame monitoring and false-alarm immunity. According to manufacturing, product has one of the industry’s longest detection ranges with a wide field of view. www.generalmonitors.com
Tips for Beginning a Career in SH&E

By Robert D. LaMarsh

Each semester, institutions of higher learning graduate young men and women with bachelor’s and/or master’s degrees in occupational or industrial safety. Likewise, individuals working within the discipline of engineering, production, human resources or other areas are given oversight responsibilities for SH&E as an adjunct to other duties. Whichever the case, the challenge of taking responsibility for administering an existing SH&E program or actually initiating a new program can be quite daunting without any or limited practical experience.

This article provides novice professionals several sound, practical suggestions learned via the time-honored tradition of trial and error.

- Join your local ASSE and AIHA chapters, as both offer great opportunities to network with individuals who share the same professional interests. These practitioners are an outstanding resource. Many veteran practitioners welcome the opportunity to mentor a beginner. Take advantage of the knowledge from a group of professionals who can legitimately say, “been there, done that and this is what you need to do.” The monthly chapter meetings are another opportunity to learn and grow. Some chapters sponsor professional development conferences or seminars that can be tremendous sources of enlightenment.

- Most insurance companies possess a wealth of beneficial information that they willingly share. Utilize the time, talent and data that are available from the carrier that underwrites the property and casualty insurance for your employer. Work with their consultant engineers or field representatives to solve in-house SH&E issues. Some of these representatives may hold the CSP and/or CIH designation. Insist that the carrier performs thorough annual inspections that conclude with comprehensive written reports and applicable recommendations for improvement. This service may be a part of the annual premium. Some major insurance carriers provide free seminars or offer online training tools.

- Develop a working relationship with local fire service officials. If this group does not already perform annual fire safety inspections, then invite it to do so. Based on such an inspection, the fire department can make recommendations for improving fire safety; annual visits also give the agency an opportunity to become familiar with the facility, which reduces the potential that a firefighter will be injured while responding to a future alarm. Some local fire departments also conduct hands-on fire extinguisher training at low or no cost.

- If you are a recent college graduate, stay in touch with your professors as they may be able to provide further...
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complete understanding of the processes. Staff will recognize and appreciate your willingness to learn what is important to them. You will develop a greater appreciation for what they do and be able to sympathize with the challenges they face each day. Also, when it is time to implement a new safety-related program or procedure, you will have a greater understanding of the potential difficulties this initiative may introduce.

By demonstrating this knowledge, you may save yourself from hearing, “I’ve been doing this job since before you were born. What could you know that I don’t?” Spend as much time as possible where the physical action takes place in the company and resist the temptation to work primarily in your office or cubicle.

• Maintain good documentation of every incident investigated; this includes written details and photographs. At some point, someone from human resources and/or the company’s legal team will ask you for information and your attention to detail may prevent financial loss. It will make you more valuable to your employer as well. Also, never loan anyone your files. Once originals are gone they may be difficult to replace.

• Maintain an excellent filing or recordkeeping system. If unsure how to create a functional system, seek help from a seasoned administrative assistant. Having information and being able to retrieve it within seconds may win you respect and possible favor, especially with your superiors.

• Fully understand what you are agreeing to before you tell a fellow employee that what s/he has described “sounds okay.” If physically unable to see what is being proposed, then request photographs that you can review before giving approval. Key point: Should some incident occur resulting in a follow-up investigation, the first defensive response will likely be, “Well, [your name] told me it was okay.”

• Realize and maintain the reality that regardless of what you were taught, have read, seen or heard, safety is not the most important entity within your organization. While a safety program is important, much like quality, it does not generate revenue. The company’s products and/or services are most important. However, without a functional safety and product quality program, production will eventually suffer as customers and/or regulatory agencies become a deciding factor in the company’s continued success.

While the safety department does not generate revenue, it can prevent revenue loss. The relationship between production, safety and product quality can be compared to a three-legged stool. Shorten any one of the legs and the stability as well as the functionality is severely compromised.

Learn as much as possible about your company’s products/services and how they are produced so that you can communicate with confidence to every level of the organization and have a complete understanding of the processes. Staff will recognize and appreciate your willingness to learn what is important to them.

• Select quality over price when purchasing equipment, services, PPE or other safety-related items. Lower-priced items are usually that way for a reason, and you will likely need to replace them sooner, which translates into wasted time and subpar performance (which may eventually cost more than the higher-quality items).

• To increase your understanding of the various types of fire suppression systems, consider attending a course such as the 2.5-day Hands-On Training Session at Liberty Mutual’s fire lab. To increase your knowledge of machine guarding, consider a course such as Rockford Systems’ 2.5-day machine guarding seminar. Both courses are fee-based but they are worth the expense.

• Follow up on every project, whether it is providing a $3 pair of gloves to a production line worker or overseeing the installation of a $250,000 fume collection system. Verify that everything is satisfactory. Whether working with an outside contractor or in-house personnel, inspect the work and confirm that it was performed correctly and in the manner expected. Do not hesitate to request revisions. You bear the responsibility to make sure it is correct. Even if it is just gloves, the employee will appreciate the personal concern demonstrated to make sure s/he is satisfied.

• For some projects that directly affect the safety and well-being of others, you will have to rely on another entity to implement or install. If the execution of this project is repeatedly delayed because of other priorities, then address the delay, in writing, with your superior and ask that s/he intervene and establish a company mandate for completion. The key point is, should an incident occur that would have been prevented had the project been completed in a timely manner, then your conscience should be clear knowing you acted in an appropriate, responsible manner.

• Always present your views based on fact, not opinion. If challenged by others, it can be beneficial to recite hard data or acknowledge recognized resources that support your position. Resist the temptation to fake it when asked a question for which you do not know the answer. You will gain more respect by simply stating, “I don’t know; however, I will certainly find out.” Then follow up and provide the correct answer.

• Love what you do. At the very least, respect the responsibility of the position to protect employee well-being. At times, you may fall short of the overall goal as a result of inadequate knowledge or uncertainty; however, sincerity in effort is a redeeming factor. Never hesitate to admit, “I made a mistake and I apologize for my error.”

Best wishes to all of you who are beginning your career or coming to terms with your new SH&E duties. Hopefully, these suggestions will make your journey a little easier and more rewarding.

Robert D. LaMarsh has 39 years’ experience working for various manufacturing companies in the St. Louis metropolitan area, including 21 years as director of safety/health for True Manufacturing Co. LaMarsh is a member of the St. Louis chapters of ASSE, AIHA and the Society of Manufacturing Engineers. He holds B.S. from Eastern Illinois University, an M.B.A. from Lindenwood University, an M.S. in Industrial Safety Management from Central Missouri State University, and a Master of Engineering in Manufacturing Engineering from the University of Missouri-Rolla.
Tenure-Track Safety Sciences Faculty Position

The Department of Safety Sciences at Indiana University of Pennsylvania (IUP) invites applications for one assistant professor tenure-track position beginning August 2013. IUP offers a B.S., M.S. and Ph.D. in Safety Sciences. The M.S. and Ph.D. programs are offered with online courses. This position is part of an expansion of a campus-wide interdisciplinary research cluster in energy sustainability, focused on multiple aspects of natural resource development and extraction.

Qualifications: A doctorate in safety sciences or related field is required by time of appointment. Candidates also must possess a master’s degree in safety sciences or closely related field (e.g., industrial hygiene, ergonomics), possess a current safety certification (e.g., CSP, CIH, CPE) or be eligible and willing to become certified. Candidates with an established record of accomplishment in professional work in the field, teaching, scholarship and service are preferred. A background or interest in conducting safety research in various industries including the oil and gas industry, the construction industry and general industry is preferred. Candidates must communicate effectively and perform well during the interview(s), which will include a teaching demonstration. All applicants must be work eligible.

Responsibilities: Candidate will be expected to develop and teach courses in the B.S., M.S. and Ph.D. degree programs, and should have a strong background in safety sciences. Candidates must meet continuing scholarly growth requirements that include publishing scholarly work and presenting work at professional conferences. Candidate must fulfill service responsibilities to the university and profession. The successful candidate will be required to provide instruction through distance education and possibly off campus.

Applications are due by March 15, 2013. Questions regarding the tenure-track position should be directed to Dr. Christopher Janicak, (724) 357-3274 or cjanicak@iup.edu, www.iup.edu/safetysciences.

IUP is an equal opportunity employer M/F/H/V. IUP is a member of the Pennsylvania State System of Higher Education.
DaVinci’s Dream

Among Leonardo DaVinci’s numerous talents and studies, he created his own personal flying machine, known as an ornithopter. Reportedly he reflected on kites, birds and bats as inspirations for his machine. DaVinci never built his flying machine, but his notes and sketches show that its wingspan exceeded 33 ft and the frame was to be made of pine covered in raw silk. To power the plane, the pilot would pedal a crank connected to a rod-and-pulley system, and a hand crank for increased energy would have been available, as well as a headpiece for steering. Whether his flying machine could have actually gotten off the ground is debated, but once in the air, DaVinci may have soared through his dream.

Shoo, Fly, Don’t Bother Me

A Harvard University project created the ultimate fly on the wall. It’s a life-size robotic fly that has a wingspan of 3 cm and a weight of only 60 mg. The reason for this project is not to create an indestructible nuisance, but rather to create an alternative new form of surveillance robots. MIT Technology Review reports that the U.S. Defense Advanced Research Projects Agency funded the research project in hopes that it could be used in battlefield and urban environments.

Airport Factoids

World’s closest airports: A flight between the gateways to Papa Westray and Westray, islands in the Scottish Orkneys, takes an average of 96 seconds.

World’s shortest commercially serviceable runway: Juancho E. Yrausquin Airport on the island of Saba is just 1,300 ft.

World’s highest airport: Tibet’s Qamdo Bangda Airport is located at 14,219 ft above sea level.

World’s largest airport building: Terminal 3 in the Dubai airport is 12.76 million sq. ft.

“Flying may not be all plain sailing, but the fun of it is worth the price.”
Amelia Earhart

“That’s not flying, that’s just falling with style.”
Woody, from the 1996 movie Toy Story

If you have a cartoon, anecdote, joke or interesting safety item you’d like to submit for publication on this page, send your contribution to professionalsafety@asse.org. Submissions will not be returned.
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