Developing, administering and adhering to fall protection procedures is a critical aspect of a safe working environment. The ASSE/ANSI Z359.2-2007 standard and OSHA’s Fall Protection – Training Requirements regulation, 1926.503, both include procedures as an important element in an effective fall protection program. Both documents recognize that procedures are valuable tools for training and re-training workers—with the ultimate result being the proper use of fall protection systems.

Specifically for fall protection systems, OSHA states that they must be “designed, installed and used under the supervision of a qualified person.” The same qualified person that designs the system also needs to provide thorough fall protection procedures.

continued on page 4
Recently I received an envelope from ASSE. I was curious about what type of correspondence it was, since my dues are paid through next spring. To my surprise, it was a letter from ASSE President Trish Ennis, congratulating me on 25 years of service. Also enclosed was a pin featuring the ASSE logo circled with the inscription “25 Years of Service.” Has it really been that long?

It is amazing how time flies. Technically, my career has been longer than the pin signifies—I was a safety professional for 10 years before I passed my CSP examination and joined ASSE as a professional member.

This got me thinking about the meaning of service? Safety professionals and ASSE members provide a service to our employers, the employees we work with and, ideally, a service to the profession at large.

Looking back on my 35-year career, I am proud of what I have accomplished. Working for a major insurance company, I was trained in my chosen field and assisted the companies assigned to me to reduce losses and prevent injuries while ensuring the financial position of my employer. After 12 years in the private sector, I began my public career working for a self-insurance pool assisting 17 cities in efforts to reduce losses for their constituents and, again, preventing injury to many employees.

The second half of my career has been as the safety officer for two major cities in northern California, ensuring compliance with state employee safety regulations and preventing injuries to my fellow employees while at the same time protecting the assets of these great cities.

I have always felt that if we cannot be a part of the solution, then we are part of the problem. I had joined the Public Sector Division (now the Public Sector Practice Specialty), but was not pleased with the newsletter and voiced my opinion to the administrator. Shortly thereafter, he asked if I would volunteer to be the newsletter editor. There, my service to the profession began.

I spent 5 years in the editor position and as the assistant administrator. A few years later I was asked again to help out and volunteered to be the chair of the new Utilities Branch. And here we are today, four-and-a-half years later. What was once our branch is now our practice specialty. We are holding our first election for the new assistant administrator and David Driver is about to become our second administrator.

We start our careers providing a service to our employers and I hope we all have been able to do that well. We provide our service to help our fellow employees to go home at night in the same healthy (or even better) condition they came to work in. We take classes and exams to better ourselves and improve the service we provide.

There comes a point that we need to change and widen our focus to include our profession. You too can widen your focus by writing articles for our newsletter or volunteering for a position on our Executive Committee. Every little bit helps you and your fellow professional. Your service to ASSE at the chapter or practice specialty levels provides your fellow safety professionals with knowledge and you gain experience. Your service is a win-win.

Stephen Brooks
PAGE 1  FALL PROTECTION IN THE REAL WORLD
By Meg Phillips & Ellen Stewart
Developing, administering and adhering to fall protection procedures is a critical aspect of a safe working environment.

PAGE 8  FALL PROTECTION: YESTERDAY, TODAY & TOMORROW
By Thomas Kramer
The term fall protection has become synonymous with fall-arrest equipment, such as harnesses and lanyards. Ideally, fall protection measures should restrict or prevent workers from falling. This article discusses many advances made in fall protection over the past few decades.

PAGE 16  NEEDS ASSESSMENT CASE STUDY: DO-GOODER SAFETY PROGRAM
By Christian Adams, Verle-Ranae Hoskins, Jessica Richardson & Jaymie Reitmann
This case study illustrates the process behind a needs assessment of an organization’s safety program.

IDENTIFYING CONFINED SPACES
By Warren Brown
All facilities should be assessed for the presence of confined spaces. This article discusses the proof of the need, some definitions, the identification process and the documentation of the process.
It is important for safety managers to understand the elements of thorough system use and rescue procedure, so that they can be informed consumers—and ensure that they are receiving the appropriate information from their qualified persons.

Even if an organization has good intentions for creating and communicating fall protection procedures, several common pitfalls can derail the success of these documents:
- Policy is not clearly stated.
- Roles and responsibilities are not defined.
- Training on the procedures and the individual components included in the procedures is poor.
- Follow through and accountability to adhere to procedures is inconsistent.

**Procedure Types**

Any managed fall protection program should include a variety of different procedure types. Some general safety procedures that are common to fall protection programs are:
- Equipment component selection;
- Equipment inspection;
- Roof access;
- Safe ladder practices; and
- General rescue.

While the procedures in this list provide details for common tasks, it is critical to have system-specific use and rescue procedures with every active fall protection system. This type of procedure provides specific use instructions that a worker engaging with an active fall protection system can read and review before using the equipment. For fall arrest systems, procedures should also include information on proper rescue procedures, which can be reviewed prior to use to increase the chances of prompt rescue in the event of a fall.

**What the Standards Say**

In order for system-specific procedures to serve as a valuable tool for training and re-training workers, organizations must avoid the pitfalls listed above. The following aspects should be included to ensure that workers have a complete understanding of system use.
- Equipment required and common misuses of equipment. This section highlights common misuses of equipment and illustrates proper inspection techniques that can prevent misuse (ANSI Z359.6-2009 § 3.3.1.4 & 3.3.1.10).
- Reference information — this section includes any outside reference documents that may be applicable to the system, as well as information on the initial installation and certification dates of the system (ANSI Z359.6-2009 § 3.3.1.1 & 3.3.1.15).
- System use procedures — this section describes in detail what the worker(s) are required to do during the use of the fall protection system (ANSI Z359.6-2009 § 3.3.1.11).
- System reference images — this section includes graphics or photos that represent proper use of the system. (ANSI Z359.6-2009 § 3.3.1.2).
- Rescue procedures — this section is critical and provides guidance for performing a rescue if a fall takes place. (ANSI Z359.6-2009 § 3.3.1.12).
- Design data — this section includes design data for details on usage limitations and fall clearances. (ANSI Z359 § 3.3.1.7-3.3.1.9).

**Case Study**

Implementing effective procedures can be difficult for any organization. For the U.S. Army Corps of Engineers (USACE), which employs more than 37,000 people at numerous sites, the challenge is magnified.

**Getting Started**

USACE communicates its procedures by providing a fall protection guide to supplement the EM-385-1-1, Section 21. This general document includes a written fall protection program that was developed with a goal of maintaining consistency for all the program’s written procedures. Each facility or site adopted this program and added their site-specific local information. The result is a nationally standardized but locally specific, written program.

As with any long-term program, USACE knew it would need a group to champion the continued development and maintenance of its fall protection program. The
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High Hazard Working Group is now charged with maintaining the original EM-385 document and developing procedures and policies. The group also performs in-house risk surveys (Photo 1, p. 4) and provides fall protection expertise for incident investigations.

The High Hazard Working Group is also charged with communicating important information about fall protection to USACE personnel. The group produces a publication, maintains an online fall protection FAQ document, and disseminates lessons learned after incidents.

Specific Procedures
To provide guidance to USACE personnel around the world, the EM-385 document outlined procedures for specific activities that are common at USACE sites. Local, facility-specific information was added for many of these items, but the original procedure documents provided a consistent baseline for each site. The specific procedures addressed fall protection for these work tasks:

- communication towers;
- personnel lifting/hoisting;
- bridge inspection;
- dam inspection;
- electrical work on transformers;
- roof operations, maintenance and inspection;
- aerial/scissor lifts and mobile platforms;
- confined spaces;
- excavations;
- scaffolding;
- ladders (fixed and portable);
- stairs;
- wall openings;
- working over/near water;
- elevated work near guardrails;
- temporary equipment.

USACE also put a particular focus on rescue procedures. Information on rescue is required to be part of any project’s fall protection plan. Some key concepts included in rescue procedures are: communication methods, rescue equipment, rescue-specific anchorages and rescue training for certified rescuers.

Current Focus
To properly implement its fall protection program and related procedures, USACE has established high-focus areas, including:

- surveys at each USACE-owned facility;
- proper implementing of control methods (Photo 2);
- training for competent persons, qualified persons, rescuers and users;
- sharing lessons learned for new designs and existing facilities.

Conclusion
Simply writing fall protection procedures once is not a panacea for all fall issues, especially for an organization as vast and diverse as USACE. But, properly written and communicated procedures provide users with the information they need to interact with the systems the way they were designed to be used. But, even though you prepare fall protection procedures, it does not mean your workers are safe. A company must ensure that workers have been properly trained and that procedures are followed.

All fall protection measures are implemented with a goal of reducing risk and, ultimately, saving a fallen worker from injury or death. With proper training and written procedures, the chances of equipment misuse or applying systems outside their limitations greatly decreases. Developing and maintaining proper procedures are a critical step in protecting all workers at heights.

Meg Phillips, P.E., CSP, has more than 14 years in the fall protection and engineering consulting world and now focuses her efforts on supporting STEM initiatives for P-20 education levels.

Ellen Stewart, CSP, is senior safety engineer at U.S. Army Corps of Engineers.
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Fall Protection is a broad aspect of safety focused on preventing workers from falling and protecting them when they do. In the U.S., fall protection is often viewed as the methods used to save people from falling. The term fall protection has become synonymous with fall-arrest equipment, such as harnesses and lanyards. Ideally, fall protection measures should restrict or prevent workers from falling. This article discusses many advances made in fall protection over the past few decades.

One of the most important steps to increasing safety for workers at heights is for workers to take personal responsibility for their own safety, rather than having safety imposed upon them. In addition to the technological advances made in the future, ideally, the industry as a whole will focus more on teaching people to work more safely and efficiently—not just about how to employ equipment to catch them if or when they fall.

Concern about workers falling has been expressed since Biblical times—the first known reference to fall protection is in the Book of Deuteronomy. It wasn’t until recently that fall protection measures have consistently advanced safety. Today, regulations, standards, training programs, and modern equipment provide the support employers need to protect workers.

Despite all these advancements, a large number of workers are still falling to their deaths. The reality is that fall protection is complex—it is a blend between engineering and behavioral safety. To further complicate the issue, fall protection programs must strike a balance between cost efficiency, compliance, safety and usability in order to fit in today’s working environments. But when fall protection issues are properly addressed, the result is increased safety and reduced risk for workers at heights.

To fully understand where the fall protection industry has been and where it’s going, this article highlights the following core aspects of the industry:

•injury trends;
•regulations/standards;
•equipment;
•fall protection programs.
These aspects will be examined in the contexts of yesterday, today and tomorrow. For the purposes of this article, yesterday refers to information before 2000. Today refers to details in the last decade, and tomorrow references predictions about the future. The information is addressed from a U.S. statistical and regulatory perspective.

Injury Trends
Despite advances in technology and stricter regulations and standards regarding fall protection, workers continue to fall.

Yesterday
The earliest data on occupational injuries and fatalities shown on the U.S. Bureau of Labor Statistics (BLS) website is from 1989, but only data since 2003 is still
readily available for review. Recent data from BLS indicates that the number of fatalities in the U.S. increased 28% from 1995 to 2007. This time period is especially relevant since OSHA Subpart M (fall protection for construction activities) was released in 1994, with a focus on decreasing fall injuries. For the same time period, BLS reports that overall workplace fatalities decreased 12%.

Market research (U.S. Fall Protection Markets (5921-15), Frost & Sullivan) also indicates that the money spent on PPE for fall protection doubled over the same time period. When the number of fatalities increases 28% while overall workplace fatalities decrease 12% and the amount of money spent on PPE doubles, it appears that the regulation is not effective for its purpose of decreasing fatalities and injuries.

**Today**

In 2008 and 2009, the number of fatal falls decreased from a high of 847 in 2007. Although the data shows a reduction, many attribute the decrease to the nation’s economic slowdown—not to a downward trend in fall fatalities. As the economy recovers, and more workers are active in industry, the nature of the statistical decline will become more evident.

Besides the toll these fatalities take on the families affected, the high fatality rate has a significant impact on the financial aspects of business. According to the 2009 Liberty Mutual Workplace Safety Index, falls from heights ranked second in the list of Top 10 causes for disabling injury and third in cost to employers at $6.2 billion. This data only tracks injuries that required workers to miss 6 or more days of work, so the true financial impact of falls is even greater.

**Tomorrow**

Of course, the ideal trend moving forward is for injuries and fatalities related to falls to decrease. Specifically, the proposed OSHA 1910 general industry standards include a published goal of preventing 20 workplace fatalities and 3,700 injuries per year. While this is a noble goal, it is only a 10% reduction from current fall fatality statistics. As an industry, more can be done to decrease the number of injuries and fatalities—from education to enforcement to innovation.

**Regulations & Standards**

Ideally, all organizations proactively implement fall protection measures to protect the health and well being of their workers. Unfortunately, with the constant pressures of budget and schedule, fall protection cannot always be the first priority. The creation and maintenance of regulations and standards provides organizations with guidance on minimum measures to protect workers, as well as limited information on how to implement those measures. For many organizations, however, regulation proves to be challenging to understand and implement—let alone exceed.

Yesterday

In 1971, OSHA published the 1910 regulations, which mention fall protection measures for general industry applications. The next documents that provided guidance on fall protection were published by ANSI/ASSE: A10.14-1991 fall protection standard for construction industries and Z359.1-1992 fall protection standard for general industries.

One of the most significant developments in fall protection regulations occurred in 1994, when OSHA published Subpart M. This document, which provided fall protection regulations for the construction industry, effectively modernized American fall protection regulations. Unfortunately, as mentioned in the injury trends information, the regulation did not cause a decrease in fall fatalities, as expected.

Today

Fall protection is a published focus area for OSHA today, since it is regularly at the top of the organization’s list for violations, both in number and penalties. It is no secret that tension often exists between OSHA and employers when it comes to fall protection measures.

This tension comes as no surprise, considering that compliance officers are enforcing general industry regulations that do not reflect the advancements made in fall protection industry standards, processes and equipment throughout the past 40 years. Unfortunately, politics, special interests, other safety priorities, and myriad other issues have repeatedly derailed the updating of these regulations since their original release in 1971.

While the regulations were originally intended to provide guidance for protecting workers at heights, that well-intended guidance is now largely obsolete for today’s workplace. Thankfully, with the release of proposed changes to the 29 CFR 1910 general industry fall protection regulations in May 2010, OSHA is now working to become more relevant for today’s industry practices. The industry’s collective hope is that this proposed change will reverse the trend of stalled regulations and be made into law in the near future.

Although legal regulations have not been updated, the introduction of the ANSI Z359 family of standards in 2007 provided a groundbreaking step in the area of fall protection standards. This will be discussed more in the area of fall protection programs. Also released in this time frame was ANSI/ASSE A10.32-2004, which replaced A10.14-1991.

Tomorrow

Considering the continual globalization of the world’s economy, the creation of an international regulation for fall protection may be the next step toward increasing safety for all workers—no matter where in the world they are working. But, because of crucial differences in the existing regulations from various countries, this may prove difficult to achieve.
Some experts believe that the development of a more safety-conscious culture may stand to have the largest impact on decreasing fatalities. One recent European research project focused on educating children about risk prevention, PPE and safe behaviors. The results were improved risk awareness and increased knowledge of protective measures. Similar efforts have occurred on smaller scales in the U.S., so this may be one of many approaches taken to improve safety in the future.

**Equipment**

Fall protection equipment has advanced substantially from the makeshift guardrails and simple body belts that attempted to protect workers in the past. When used correctly, today’s equipment can protect workers in even the most precarious situations, and the innovations of tomorrow will provide even better protection.

**Yesterday**

Many in the fall protection industry claim that fall protection equipment dates back to Biblical times. Realistically, equipment designed specifically to protect people from falling while working was not introduced until the 1930s. At that time, all equipment was geared toward window washers on tall buildings in U.S. cities or large infrastructure projects. During the World War II era, testing and development began on the early versions of common equipment—self-retracting devices, rope grabs and body belts—chiefly for wartime applications.

After World War II through 1970, the industry experienced an upsurge in research into the body’s tolerance for shock load, as well as the refinement of existing products and development of new products. The next 20 years marked a period of rapid development of a large variety of fall protection equipment and systems by the world’s industrialized nations, led by France, Canada, Germany, Japan, the U.K. and the U.S. By 1990, the introduction of fall protection consensus standards and professional organizations compelled manufacturers to continue the modernization of equipment to protect workers at heights in a variety of work settings.

**Today**

Recent changes to fall protection standards have focused primarily in two areas: misuse scenarios and equipment testing procedures. First, standard writing bodies have looked at misuse scenarios and have modified existing test procedures or created new ones to address these issues. Some examples of this include the gate loading of snap hooks, for which the load has been increased to 3,600 lb in both directions from the original 220 lb to the front and 350 lb to the side.

This was first incorporated into the ANSI Z359.1-2007 standard. Another misuse scenario that is currently being addressed is the use of a self-retracting lanyard/lifeline over an edge. Subsequent to research performed in Germany, test procedures have been created to address these issues in the U.S. Another issue that has recently come to light is a phenomena often referred to as fall-back on a ladder climbing system. This issue is still in infancy and has not been incorporated into a standard yet. Items like these led to further development of the ANSI standards and the release of the Z359-2009 standards.

Second, manufacturers have refined test procedures to address new research in the area of fall protection. Initiated by research performed by Gravitec Systems, Inc. and other manufacturers from the U.S. and Canada, it was determined that a 220 lb test weight does not replicate a 310 lb worker as previously thought. This is often referred to as the 1.4 factor since 1.4 x 220 is approximately equal to 310. Current test procedures call for a 282 lb test weight to be used when energy-absorbing equipment is being dynamically tested.

**Tomorrow**

In addition to the continued refinement of existing technologies, some specific developments related to equipment are likely. First, the ANSI Z359 family of standards will continue to develop new standards to address issues related to fall protection equipment component testing. Second, it is probable that fit testing, similar to that required for using respirators, will be required for workers wearing full body harnesses. The fitness level of the individual makes a significant difference in their tolerance to trauma from impact and suspension. Another expected innovation is the use of airbag technology for fall protection. This technology, referred to as
the “personal airbag,” is already being used for motorcyclists and other fall-prone individuals.

**Fall Protection Programs**

Because fall protection is a complex aspect of occupational safety, it is not enough to purchase equipment and follow regulations. To properly execute fall protection, a coordinated program needs to be developed and managed—from initial policy development to training workers to program evaluation. Until the publication of ASSE/ANSI Z359.2 (Minimum Requirements for a Comprehensive Managed Fall Protection Program) in 2007, organizations had little guidance on the appropriate elements of a program.

**Yesterday**

Before this century, only the most forward-thinking companies were truly executing managed fall protection programs. In the early 1990s, a GM-UAW Safety Group worked with outside consultants to develop a modern fall protection program. The program, which was implemented throughout GM in 1993, was one of the first of its kind. Although other organizations were applying some program aspects, the GM program was the first large-scale managed program.

**Today**

With the publication of ASSE/ANSI Z359.2 (2007), organizations now have detailed guidance on creating and maintaining a comprehensive, managed fall protection program. The list below highlights key aspects of a fall protection program that are often overlooked. While many organizations focus on the important tasks of identifying and abating hazards, they neglect these fundamental aspects of a fall protection program:

- policies, duties and training;
- fall protection procedures;
- rescue;
- incident investigation and program evaluation.

The first two items are foundational aspects of a program that are critical for future success. When policies and procedures are thorough, consistent and enforced, chances of increasing safety are improved. When each person involved in fall protection understands their role and associated duties—and has the proper training to go with them—every individual can play an effective part in reducing risk for the organization.

The last two items emphasize that protection from falls is not the last step in an effective program. Rescue is a critical, but often overlooked, aspect of fall protection. Workers can be seriously injured or killed if they are not properly and promptly rescued from an arrested fall. Also, a program will only progress if it is evaluated regularly to discover deficiencies or areas for improvement. This is especially important after a fall incident or near miss. Although incidents can be trying times, they provide opportunity for evaluation and overall program enhancement.

**Tomorrow**

Although ASSE/ANSI Z359.2 (2007) provides significant guidance, it is only a consensus standard. The law does not require adherence to these guidelines. The ANSI committee is determined to maintain and update the standards regularly to provide this essential guidance to the industry. In addition, some program elements are included in the draft OSHA general industry fall protection regulations (1910), which are at the beginning stages of the legislative process. The adoption of even some elements of a managed fall protection program will be beneficial to the safety of workers.

One specific program aspect that will continually evolve is employee training. While the basic levels of training—authorized person, competent person, and qualified person—may not change, the manner in which training is conducted is likely to evolve. Training options that combine computer-based instruction and instructor-led classroom sessions make comprehensive fall protection training easier to schedule and budget. Individuals can complete online training at their convenience, around other work commitments. A web-based platform ensures content is consistent and lets participants spend the time they need to grasp critical concepts. When participants gain a baseline of important information through online training, classroom time can be minimized, focusing only on topics that require hands-on instruction. This approach saves training time and travel cost, which allows workers to receive proper education in a more digestible format.

**Conclusion**

All fall protection measures are implemented with a goal of reducing risk and, ultimately, saving a fallen worker from injury or death. Preferably, more falls will be prevented, rather than arrested, to further reduce risk to workers. Ideally, workers will become more personally responsible for their own safety.

The fall protection industry has evolved significantly from its first reference in the Bible to today’s modern equipment and systems. With the continued focus on increasing safety for tomorrow’s workers, the evolution of thought and technology related to fall protection is sure to continue. It is unlikely that a fall protection program will ever be easy or self-sustaining. By implementing coordinated programs and encouraging personal responsibility, we can work together to save more lives than ever before.

*Thomas E. Kramer, P.E., CSP, is president of the International Society for Fall Protection.*

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*The Utility Connection*  www.asse.org  2015
Some facilities may not have confined spaces and its occupants are not concerned about confined space entry. However, all facilities should be assessed for the presence of confined spaces. This article discusses the proof of the need, some definitions, the identification process and the documentation of the process.

When no confined space entry procedure is in place and something goes wrong, fatalities are often the result. Some of the typical outcomes are:

• unapproved lighting resulting in a fire,
• a flammable gas leaked into the space;
• a lockout procedure was not followed; and
• equipment failure or malfunction.

Entering confined spaces without following a procedure often results in death. Examples of fatal incidents include an instance where a clipboard was dropped in a confined space and a person went after it. That person died due to the lack of oxygen in the space. Another example is when an engineer went into a landfill area where there was inadequate oxygen and was overcome. A companion tried to rescue him and was also incapacitated. Both people died.

The first preventive step is to have an understanding of the definition of a confined space, so they can be isolated and marked for identification. A common definition of a confined space in the U.S. is an area that has limited or restricted means of entry or exit and is large enough for a worker to enter and perform an assigned task, and is not designed for continuous employee occupancy. Any open top tank or pit more than four ft deep that meets the above conditions is also considered a confined space. Some examples of confined spaces are storage tanks, ventilation ducts, machinery pits, and manholes. Also included are boilers, sewer tunnels, silos, and open surface tanks.

There may be spaces that a worker cannot completely enter but may as a result of the work task requirements introduce an atmospheric hazard. Although the space does not strictly meet the confined space requirements, some confined space procedures may need to be used. By definition, entry into a confined space occurs when any part of the entrant’s body enters the opening into the space. Other considerations are what has been previously stored in the confined space and what is being taken into the confined space.

After the space has been identified it must be evaluated and a determination made whether it is a permit-required confined space or a non-permit-required confined space. A sign must be posted at the space and a log of the spaces must be kept and updated as necessary. A non-permit-required confined space does not contain
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or have the potential to contain any hazard capable of causing death or serious physical harm. Examples would be areas with natural or permanent ventilation that will not allow accumulations of hazardous atmospheres. If there is a change in configuration, the area must be re-evaluated. A permit-required confined space contains or has the potential to contain one or more of the following: atmosphere hazard, engulfment hazard, configuration hazard or other recognized serious safety or health hazard.

A hazardous atmosphere may expose employees to serious risk of death, incapacitation, impairment, injury or acute illness.

Examples of hazardous atmospheres are: oxygen concentration below 19.5% or above 23.5%; a flammable gas, vapor or mist exceeds 10% of its lower flammable limit; there is an airborne dust concentration of a substance and the TLV exceeds acceptable standards, or any other atmosphere hazard that could impair an employee’s ability to escape or be immediately dangerous to life or health (IDLH).

An engulfment hazard exists when the surrounding and capture of a person by a liquid or finely divided flowable solid substance such as grain, salt, sand or plastic pellets could occur. The substance can either plug the respiratory system or constrict breathing by exerting pressure on the outside of the body. Trenching cave-ins could fall into this category as well as bridged materials in a silo, for example.

Configuration hazards exist when an internal configuration that could trap and asphyxiate an employee. Examples could be inwardly converging walls or a chute that tapers to a smaller cross section. Mixing tanks, grain-processing tanks, sand chutes and ductwork could fall into this category.

Other hazards are capable of causing death or serious physical harm. Examples could be high-pressure gas lines, steam lines, footing problems, temperature extremes, electrical concerns, sharp edges, minimum workroom and mechanical problems.

The identification process requires a visual inspection of the facilities using a confined space hazard analysis form. A good start is to make a walk through of the facilities to get an idea of what exists in the way of confined spaces. Procure a plant layout of the facilities making sure that all floors of the facility are represented. These layouts should include the roof, out buildings, storm sewers, water systems and any tankage that might be above or below ground.

Manufacturing and plant engineering personnel should be consulted as well as maintenance personnel. Plant security personnel are another source of potential information. At each potential site, complete the confined space hazard analysis form so you will have a documented assessment of all potential spaces. All spaces identified as confined spaces should be transferred to a confined space log for use by plant security and those who may have to enter the spaces. This log removes the chance that a space will not be properly categorized and entry could take place without proper precautions.

All spaces determined to be a confined space must have a sign indicating that they are either a non-permit confined space or a permit-required confined space. A communication program must be put in place to tell all employees that confined spaces exist in the facility and that they are not to enter them under any circumstances. Only employees who have attended a confined space entry training program will be allowed to enter the spaces and then only when following a very specific procedure.

**References**


Warren K. Brown, CSP, ARM, CSHM, is a former president of ASSE and an ASSE Fellow.

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**Improve Your Online Experience**

ASSE has launched a new and improved website that is designed to improve your interaction with the Society. New features include:

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**Confined Space Hazard Analysis Form Annotations**

The following is a step-by-step process to assist the PLANT NAME confined space team in the hazard analysis of a confined space. Each entry on the example **Hazard Analysis Form** is numbered for reference to the descriptions that follow. The Safe Entry Procedures will be established based on a combination of current and previous space evaluations and entry experience in the space. However, each entry supervisor must take into account the specific work activity and chemicals used in the each confined space entry. Note: A notation must be made in each space on the analysis form, Mark “N/A” if not appropriate.

1) Location and description of the confined space (i.e. Stamping B press slide lock)
2) Date hazard analysis is taking place.
3) Department where the confined space is located or department that “owns” the confined space.
4) Generate a confined space identification number; this number must coincide with confined space log numbering system. If it is a reevaluation of a space, utilize the number that is already assigned.
5) Enter the bay location of the confined space.
6) Name of person or persons completing the form.
7) Mark all boxes that apply to the area to determine if it is a confined space. For an area to be considered a confined space, all three boxes must be checked next to question #1 or the area must be an open-top pit as defined in question #2.
8) Once you have classified an area as a confined space, it must be determined if it is a permit-required-confined space. Mark all boxes that apply to the space—only one box needs to be checked for a space to meet the criteria of permit required. If the only hazard is atmospheric, the space may be classified as alternate-procedure permit-required.

9) Identify the potential hazards and describe the conditions for each hazard category. It should be noted how each hazard will be abated prior to entry. A space cannot be classified as alternate-procedure permit-required if there is any other hazard besides atmospheric:
   a. Atmospheric hazard
      i. Identify source of atmospheric hazard (i.e. sludge)
      A. Oxygen levels are below 19.5% or above 23.5%
      B. The Lower Flammable Limit is at or above 10%
      C. Airborne combustible dust at a concentration that meets or exceeds its LFL
      D. Exposure to a toxic substance in excess of permissible limits
      E. Any other atmospheric condition that is immediately dangerous to life or health.
      ii. Identify means of controlling the atmospheric hazard
      iii. Enter any additional comments related to the atmospheric hazard or controls.
   b. Engulfment hazard
      i. Identify source of engulfment hazard (i.e. wastewater)
      A. The surrounding of a person by a liquid or flowable solid that can be inhaled to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.
      ii. Identify means of controlling the engulfment hazard
      iii. Enter any additional comments related to the engulfment hazard or controls.
   c. Configuration hazard
      i. Identify source of configuration hazard
      A. Floors slope downward and/or taper
      B. Walls converge inward
      C. Obstructions and/or difficult to exit
      ii. Identify means of controlling the configuration hazard
      iii. Enter any additional comments related to the atmospheric hazard or controls.
   d. Other serious hazards
      i. Identify source of serious hazard
      A. High pressure steam lines
      B. Natural gas lines
      C. Chemical/Hazardous material lines
      D. Mechanical hazards
      E. Any other serious hazard not listed
      ii. Identify means of controlling the serious hazard
      iii. Enter any additional comments related to the serious hazard or control

10) “Other conditions” may exist that make working in a confined space hazardous. Typically these conditions do not cause a space to be classified as a permit-required confined space. It is up to the team that is performing the hazard analysis to decide.

11) List the equipment that will be used to test for atmospheric conditions and or toxic substances. Also list what is acceptable by OSHA standards.

12) Identify the atmospheric hazard that must be continuously monitored and the equipment to be used.

13) Identify the atmospheric hazard that must be periodically monitored and the equipment to be used, include how often it must be checked. At a minimum, periodic monitoring should be done following interruption of work or if a new hazard is introduced.

14) Enter any additional testing information or comments.

15) Identify the equipment needed to enter the space and describe the equipment if appropriate.

16) Mark the box that describes the classification of the confined space being analyzed.
Established in 1946, the Do-Gooder Non-Profit (pseudonym) began providing services that promote independence for children and adults living with disabilities. Do-Gooder operates over 50 locations including 14 retail sites offering a wide range of services, including pediatric therapy, case management, home health care, workforce development and hospice care.

**Needs Assessment Request**

One member of the needs assessment team is a Do-Gooder employee and was encouraged by the vice president of human resources to use the OPWL 529 class project to conduct a needs assessment of the organization’s safety program because of the importance of protecting clients, desire to highlight the importance of safety and to develop tools to increase safety awareness. Day-to-day safety culminates in an overall experience modification factor (MOD) score (see sidebar) for the organization that reflects accidents and loss to the organization through claims.

**Defining the Initial Performance Gap**

The needs assessment examined only the retail side of the organization. Retail employees are responsible for the intake of donations, sorting donations based on quality and pricing, and moving donations to the sales floor.

**Current level of performance:**

Incidents are increasing resulting in a MOD score of 1.19. The top four injuries on the job are: sprains/strains, cuts/punctures, slips/trips/falls, and bumps/hits.

**Desired level of performance:**

A stabilized MOD score of 0.8 (3 year average)

An injury and incident free environment for customers and employees, reducing the occurrence of sprains/strains, cuts/punctures, slips/trips/falls, and bumps/hits. (Although desired, this performance is unrealistic and is considered a goal.)

**Objectives**

The objectives of the needs assessment:

1) Use established assessment frameworks to identify the gap between current and desired performance.
2) Appropriately gather data that provides insight into the potential causes of the performance gap.
3) Recommend interventions that address the identified causes.
4) Prioritize interventions in relation to likelihood for success within the organization.

**Processes**

The assessment began with a document review to become familiar with the organization’s existing program as documented by policy and records. The team then completed a logic model and SWOT (strengths weaknesses opportunities and threats) analysis and presented it to the client to confirm and align the teams understanding of the program (Watkins, et al., 2012).

Interview questions were developed using both Mager and Pipe’s Performance Analysis Flow Diagram and Rummler and Brache’s Three Levels Framework. This methodology combined a systematic review of fast fixes to the three levels of performance (organization, process, and job/performer) with the three performance needs (goals, design, management) to determine the effectiveness of the system (Rummler & Brache, 1995). The data were recorded, transcribed, coded and analyzed.

A survey was deployed as a method for confirming interview responses and causal factors identified from the data and interview responses. Potential interventions were considered and compared, then the top five were recommended to the client.

**Data Collection Methods**

This needs assessment is supported by data collected from various sources both from an internal and external perspective.

**Document & Data Review**

The document and data review included:

• the safety and loss control program;
The assessment team conducted 10 semi-structured/open interviews by phone or in-person with four front-line employees, four supervisors, and two managers. The semi-structured approach allowed for employees to provide context and stories and for the interviewer to ask appropriate follow-up questions.

**Survey**

The team conducted a survey of all employees from one store. The survey was a method for confirming interview responses and the causal factors the team identified based on the data review and interview responses.

**Data Analysis & Gap Identification**

Data was analyzed using a top-down coding approach utilizing the Performance Analysis Flow Diagram and Three Levels Framework.

**Gaps Identified from Document Review:**

- Do-Gooder’s safety policy is spread out across multiple documents: safety and loss control program and the safety program.
- Policies outline general safety rules but not the specific safety rules referenced by employees (determined later during interviews).
- The safety and loss control program outlines a training process for hazardous communications but not...
bloodborne pathogens, which was also required by the policy.

• Based on injury reports from 2011 to 2013, the most common injuries were sprains/strains (50 occurrences), cut/punctures (46 occurrences), falling (44 occurrences), and bumped/hit (40 occurrences).

Gaps Identified During Interview Process
• Policies outline general safety rules but not the specific safety rules referenced during interviews.
• Some employees are unclear regarding reporting procedures and whether they differ for an “incident” versus an “accident.”
• Employees felt that stab and lift injuries (associated with donations), slips and trips (associated with the sales floor especially z-racks) were among the specific hazards associated with the jobs. This perception triangulates with and is confirmed by the actual injuries identified during the document review. (Gap: these injuries are happening, people know they are happening, and they still happen.)
• The recognition program may not be effective since some employees do not even know that it exists at all.
• Supervisors are unclear as to their responsibilities to administer first aid.
• Supervisors are not consistently provided the safety training required by the safety and loss control program upon being assigned as a supervisor.

Gaps Identified After Administering the Survey
• Injuries associated with sharp objects, lifting related injuries from donations, lifting related injuries from totes, and injuries related to z-racks are perceived by employees as the most likely to occur.
• There is no clear understanding of expectations as to whether or not employees are expected to perform first aid & CPR; nearly 50/50 split and nearly 40% of

Table 1 Recommendation Breakdown

<table>
<thead>
<tr>
<th>Criterion 1. Results you can expect after 3–6 months</th>
<th>Criterion 2. Total time required to execute intervention</th>
<th>Criterion 3. Feasibility of implementation</th>
<th>Criterion 4. Ability to accomplish Realistic outcomes</th>
<th>Criterion 5. Estimated cost of activity of first year. (10 LOW $)</th>
<th>Average Rating</th>
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<tbody>
<tr>
<td>On-the-job Training</td>
<td>5</td>
<td>3</td>
<td>9</td>
<td>6</td>
<td>7</td>
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<tr>
<td>Just-in-time Learning</td>
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<td>5</td>
<td>4</td>
<td>6</td>
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<tr>
<td>Performance Support Tool or Job Aid</td>
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<td>8</td>
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<td>9</td>
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<td>6.5</td>
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</table>

Ratings: 1 – 2 Very Low; 3 – 4 = Low; 5 – 6 = Medium; 7 – 8 = High; 9 – 10 = Very High
10 being the “best possible” and 1 being the “worst possible” outcome
Reference: (Van Tiem et al., 2012, pg 203-405)
employees respectively do not feel adequately prepared to perform first aid or CPR.

**Interventions Considered**

A multicriteria analysis was used to evaluate and compare the various interventions. This method was chosen for its systematic and quantitative nature. It proved useful as a justifiable method for analysis of a variety of potential interventions simultaneously by evaluating them against a specific set of chosen criteria (Watkins, 2012). Five criteria were chosen by the needs assessment team, which they believed to be important to the client and that would ensure the success and quality of interventions chosen. Multiple team members completed the analysis independently and results were averaged.

1) Results (quality of) you can expect after 3 to 6 months: It was important to both the client and needs assessment team that some tangible results are realized within a few months of completing the needs assessment and commencing interventions.

2) Total time required to execute intervention: The overall goal is to reduce the organization’s MOD score, which is an average developed over 3 years. Interventions that take longer to fully establish may cause undesirable delays in achieving the goal.

3) Feasibility of Intervention: The organization has existing constraints that may limit the effectiveness of various interventions; specifically, computer resources are generally unavailable to front line employees.

4) Ability to accomplish realistic outcomes: This is an estimation of the intervention’s ability to address the needs identified through the accomplishment of reasonable desired outcomes.

5) Estimated cost of activity of first year: This criterion is based on a general estimate of the expected costs associated with each intervention. It is unlikely that the client organization will have significant fiscal resources to allocate towards interventions.

**Decisions or Recommendations**

The needs assessment produced several recommendations, which address the operational, tactical and strategic goals of the organization. The team identified and recommended five (high and low priority) interventions in order to remove the barriers to the desired performance, close the gaps, smoothly integrate with current organizational conditions and ultimately lead to less injuries, a lower MOD score and lower workers’ compensation costs.

The high priority recommendations proposed by the team were:

- documentation and standards provision;
- ergonomic learning;
- performance support tool/job aid.

The lower priority recommendations proposed by the team were:

- on-the-job training (OJT);
- key performance indicators.

**Documentation and standards:** The team recommended that the organization consider consolidating the multiple policy documents which currently exist into as few as possible and establishing a standards repository. Hard copies should be made conveniently accessible to employees who do not have computer access.

**Ergonomic learning:** Focusing on ergonomic learning in the workplace should drastically cut down on employee injuries and the majority of workers’ compensation claims in a relatively short amount of time. The team recommended that the organization consult with a safety/ergonomics professional to provide ergonomic risk assessments at the retail stores and provide recommendations (e.g., workplace design) to lower ergonomic risk.

**Performance Support Tool/Job Aid:** Operationally, the team suggested that the organization create a job aid concerning safety training. A checklist system would increase accountability of safety training. Performance support tools should be placed at each retail store in strategic locations that have been identified as high hazard. For example, a job aid with the proper lifting technique visualized could be posted at the donation door, where many injuries occur on the job.

**On-the-job training:** The team recommended the existing OJT be formalized, that managers, supervisors and experienced employees should have pre-set OJT learning topics to teach each new employee during orientation and periodic training process and document the completion of the OJT.

**Key performance indicators (KPIs):** The team recommended strategic goals set by leading indicators rather than current lagging indicators that are in use. Lagging or trailing indicators are linked to the outcome of an incident, while leading indicators are linked to injury preventive actions. Focusing on injury prevention, rather than a MOD score will strategically align the organization for true safety success. The desired performance of “zero injuries” may be unrealistic. Industry safety standards be utilized in determining KPIs.

**References**


Watkins, R., West Meiers, M. & Visser, Y. (2012). A guide to assessing needs: Essential tools for collecting information, making decisions and achieving develop-

Christian Adams is an active duty Coast Guard Lieutenant and graduate student at Boise State. He is currently the assistant school chief of the National Aids to Navigation School in Yorktown, VA.

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Although ASSE’s Health & Wellness Branch is sponsored by the Society’s Healthcare Practice Specialty, the branch focuses on health and its impact on safety, rather than healthcare. As Deborah Fell-Carlson writes in an informative article, “As safety professionals, we may not think about the fact that healthy, alert workers suffer fewer on-the-job injuries and recover more quickly when hurt. This can have significant impact on our workers’ compensation costs. Although it may be difficult to measure the impact, we know that managing wellness and injury together is a win-win.”

The branch is eager to guide other safety professionals to help shape worker attitudes, thinking and behaviors that may result in improved personal and global health and well-being. For more information on the branch and how to become involved, click here.
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