2015
ISSN 1015-5589 Vol. XXIII No.1

World Safety Journal

ESP-Enhanced Safety Principles

In This Edition

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Articles for inclusion in this journal will be accepted at any time; however, there can be no guarantee that the article will appear in the following journal issue.

All articles shall be written in concise English and typed with a minimum font size of 12 point. Articles should have an abstract of not more than 200 words. Articles shall be submitted as Times New Roman print and presented in the form the writer wants published. On a separate page, the author should supply the author's name, contact details, professional qualifications, and current employment position. This should be submitted with the article.

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The WSO was founded in 1975 in Manila, The Republic of the Philippines, as a result of a gather of over 1,000 representatives of safety professionals from all continents at the First World Safety and Accident Prevention Congress. The WSO World Management Center was established in the United States of America in 1987 to be responsible for all WSO activities, the liaison with the United Nations, the co-operation with numerous Safety Councils, professional safety/environmental (and allied areas) organizations, WSO International Chapters/Offices, Member Corporations, companies, groups, societies, etc. The WSO is a not-for-profit corporation, non-sectarian, non-political movement to **"Make Safety a Way of Life…Worldwide."**

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Mining in Australia: An Aging Workforce

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To the Editor:

Working within the mining industry for more than 15 years, I have progressively watched the bulk of our workforce age. As statistics on injuries and ill health for workers 50 years and older have increased it has prompted an in-depth analysis into the causes. Take a snapshot of a Pilbara mine site in Western Australia, with 5,040 workers where 42% fall in the older worker category (Anon, 2013). From 2007 to 2013 injury and lost time rates for these workers increased by 28% and 33% respectively. Reports establish that 76% of mining workers are overweight or obese (Chalmers & O'Neill, 2012; Duffy, 2012) and with decreased participation in physical exercise, older workers will be at greater risk of developing chronic illnesses and suffer more from physiological and psychological health issues (Hsu, 2011; Wittink, Engelbert, & Takken, 2011). This suggests the type of work, onsite lifestyle habits, shiftwork, roster and fly-in fly-out (FIFO) arrangements have been major contributing factors to the injury and health status of older workers (Bohle, Pitts, & Quinlan, 2010; Giovanni Costa, 2005; G. Costa & Sartori, 2005; T. Parker, Worringham, Greig, & Woods, 2005). In Australia the average age within the mining industry is 39.3 years although the largest portion of workers fall within the 40-44 age group (DEEWR, 2013), therefore in 10 years, as more of our workers reach the older worker threshold, the challenge facing employers is to promote the prevention of diminishing work ability and performance now rather than later (Chan, Tan, & Koh, 2000; Morschhauser & Sochert, 2006; T. Parker et al., 2005; Streb, Voelpel, & Leibold, 2008).

Although literature is challenging society's perception that either (a) with ageing comes a decline in ability (Rix, 2011; Ross, 2010) or that (b) older workers are at no greater risk of work place incidents than younger workers (Jones, Latreille, Sloane, & Staneva, 2013; Ross, 2010; Salminen, 2004), there is evidence to suggest the contrary and that older workers will suffer major injuries and illnesses at a higher rate and take longer to return to work, increasing the cost of claims and the likelihood that persisting disability and decline in health will be a deciding factor on workers retiring early (Mackey, Maher, Wong, & Collins, 2007; A. W. Parker & Worringham, 2004; Pit, Shrestha, Schofield, & Passey, 2013; Pransky, Benjamin, & Savageau, 2005; WorkCover NSW, 2007).

Research validates that as we age, we look forward to diminishing physical, psychological and cognitive capacities (Chan et al., 2000; Crawford, Graveling, Cowie, & Dixon, 2010; Laflamme, Menckel, & Lundholm, 1996; Mackey et al., 2007; Perry, 2010; Seitsamo, Tuomi, & Martikainen, 2007; Shephard, 1999; Skirbekk, Stonawski, Bonsang, & Staudinger, 2013). Add this to the already poor health status and habits the mining lifestyle promotes, the risk of exposing older workers to more severe injuries and sustained ill health is greater. Although the WA Workers' Compensation and Injury Management Act 1981 and a range of other legislation mandates managing injuries and provision of a safe work environment free from discrimination, there tends to be a lack of quality programs and poor supervisory support when returning older workers to the workforce (Mackey et al., 2007). For time and cost saving, employers manage injured workers collectively which often overlooks the additional needs of individual older workers (Shaw-Mills, 2009) therefore affecting their work ability, emotional state and willingness to return to work (Chan et al., 2000; Krause, Dasinger, & Neuhauser, 1998).

Without a prevention program there will be the inevitable increase in costs to the employer in the form of absenteeism, decreased productivity, workers compensation claims and premiums, common law claims as well as the risk of higher turnover due to early retirement which is now being realised as our population has proportionally less of the younger generation in comparison to the older (Australian National Training Authority, n.d.; Commonwealth of Australia, 2004; Gringart, Helmes, & Speelman, 2008; Kunisch, Boehm, & Boppel, 2011; Radovic-Markovic, 2013; S.I.A, 2012). Government policies in Australia are moving toward incentives for people to remain in the labour force longer (Australian National Training Authority, n.d.; Commonwealth of Australia, 2004) which is reflective of the trend seen in European countries (Jones et al., 2013; Kunisch et al., 2011) and will lessen the stress of a future slow economy and retention of knowledge and experience (Streb et al., 2008). If this is to occur, more emphasis on healthy work promotion, review of roster and shift arrangements, post injury/illness rehabilitation and a focus on effective return to work programs is needed to ensure older workers are not only able but are more inclined to delay retirement which benefits not only the employer (Krause et al., 1998; Stein, Khoury Shakour, & Zuidema, 2000; Streb & Voelpel, 2009; WorkCover WA, 2012) but the employee assist in increasing their work ability and ability to sustain a healthy and more fulfilling lifestyle (Barrett & Browne, 2010; Forster, Veerman, Barendregt, & Vos, 2011; Lamarre & Pratt, 2006; Sparrow, 2006; Tuomi, Vanhala, Nykyri, & Janhonen, 2004).

Employers providing these programs will appreciate not only the long term cost benefits and greater productivity but also in the retention of valued experienced older workers ensuring their vast knowledge is not lost but rather passed on to the younger generation (Barrett, Cameron, & Jansz, 2011; Forster et al., 2011; Jeffery et al., 1993). Implementation of prevention programs is good business sense (Barrett et al., 2011).

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Safety Auditing: Development of Audit Protocols

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Abstract

The paper explains the development of safety audit protocols together with the assessment process and the rating criteria. Included are Western Australian experience and a description of the development of audit systems and checklists for safety auditing tested over a 7 year period in a number of SE Asian countries and over another 6 year period in Western Australia.

Key words: Safety auditing. Mining and mineral processing operations. Development of audit protocols. Rating criteria. Checklists for safety audits.

Introduction

The first article in this series (previous issue of this Journal) discussed the significance of safety auditing in the prevention of accidents and ill health at work. Major objectives, major elements and organizational aspects of safety auditing were discussed. Also recent Western Australian (WA) experience in the development of the safety auditing system was described, and a development of an international level not only of sound safety auditing practices, but also the training program for safety auditors developed by the WA team and tested extensively throughout South East Asia. The significance of well-prepared audit documents, audit protocols, and checklists were explained. This paper will deal in more detail with the development of audit protocols, rating system and of checklists for pre-audit survey and for the actual safety audit.

Safety Auditing – Western Australian Experience

A previous paper by Nedved (2014) described briefly the safety audit system development which took place at Alcoa in Western Australia. This Company decided to benchmark companies which had outstanding occupational safety and health programs. As a result of this benchmarking process a safety audit program was developed for application at all Alcoa sites in Australia and in the United States of America. Each operation is audited every three years by a team of external auditors; namely external to the operation being audited.

The teams of auditors comprised of Alcoa personnel, of both managers/line supervisors and of safety and health professionals. The second audit program includes inspection/ housekeeping audits usually on a monthly basis. Apart from that the company had decided to maintain a permanent, ongoing assessment of occupational safety and health by applying external audits once per year. This is integrating the safety audit program into the management of the company's operations.

The regular internal safety audit of each operation audits one of the 54 elements of the occupational safety and health program each month. Pre-audit activities include the selection of the audit team. This team is usually composed of the manager of a given operation, one supervisor, one-foreman, one or more health and safety representatives and a safety and health practitioner. Whilst such a safety and health practitioner contributes to the audit as a person outside the given operation providing an external input, the guarantee of the success of the audit program is the feeling of ownership of the program by all the operation's personnel - both the workers and the management.

During the pre-audit meeting, the team leader distributes all the relevant working documentation to the audit team members, since it is absolutely imperative that the auditors fully familiarize themselves with such documentation prior to their commencing the audit. Such documentation would typically include (not only in Alcoa, but also in general):

- previous audit summary related to the program element under review;
- technical documentation describing the operations;
- description of management responsibilities and the roles of all operators;
- relevant audit protocols;
- checklists purposely developed for this specific audit;
- performance measuring criteria to be used for the program element under review;
- elements of the occupational safety and health program related to the program element under review;
- information about relevant safety communications.

During the actual safety audit, the audit team firstly examines the physical working environment hazards. In the second stage, the auditors need to ascertain whether the operation's personnel actually understand and utilize the safety and health program procedures relevant to the element under review, and whether such practices are effective and efficient in the prevention of accidents and ill-health at work. The audit protocols guide and direct the auditors as to the observations that should be made and the questions to ask in order to effectively verify all the organizational aspects relevant to the program element under review. These aspects would typically include:

- all procedures and controls in place to improve the management of the program element under review;
- the involvement of all personnel in such relevant activities;
- safety communications, in particular how the information of safety audit is disseminated to all personnel;
- how are the safety problems under review rectified;
- what is the quality of safety management decisions related to the program element under review;
- whether or not there are any persistent problems related to the program element under review.

After the completion of the audit, the team of auditors arrives at the rating working through each of the performance levels - Poor, Fair, Good and Excellent. (Please refer to Nedved (2014) for more detail if required.) The recommendations to improve the future occupational safety and health performance represent the most important aspects of the audit for the operation or location under review. The task for the operation's management and personnel is to build on the current safety and health performance and to progress to the next higher performance level. In accordance with the company expectation, there have been a number of benefits associated with the audit programs. They raise awareness and educate the personnel from the managers to the employees of the health and safety processes critical to their centre. It has highlighted that safety is more than just having inspections and making the place safe. Instead there needs to be an infrastructure of systems and management processes to support a particular effort. In many ways they highlight that health and safety processes must be systematic and structured to achieve the end goals. These end goals or targets can be clearly defined using the audit protocols, helping people shift their goals from today's standards to an excellent standard.

The health and safety audit program is a proactive leading measure of health and safety management that considers the upstream responsibilities that are required in order to manage health and safety effectively. The audit program has been effective in allowing all personnel to be more involved in the assessment and improvement of health and safety systems. The simplicity of the audit working papers has enabled a Wide cross section of participation and through this participation employees have been able to get involved in influencing and making the improvement changes."

Development of Audit Protocols

The previous paragraph described how the company highlighted the significance of the audit working papers and their role in involving a wide cross section of workers' participation in safety auditing, and subsequently in occupational safety and health. Very positive outcomes have been experienced using the audit protocol working papers for the safety audit focusing on housekeeping and storage practices, and the audit protocols for contracted services safety. Both of these elements of the safety and health program are of crucial importance to most organizations. In this paper, the audit protocol for another very frequently discussed element of occupational safety and health program - personal protective equipment (PPE) is described.

Personal Protective Equipment - Audit Protocol

i Intent of the audit

To ensure that:

- All occupational health and hygiene job hazards are identified and evaluated.
- The appropriate personal protective equipment is selected to reduce the level of risk of injury and exposure to various working environment hazards.
- The users are trained in the personal protective equipment use, and that the provisions are made for their maintenance.

ii Useful contacts

- production and maintenance workers leading hands and first line supervisors;
- occupational safety and health department;
- store room attendant;
- purchasing department;
- production and maintenance managers.

iii Verification

a) Inquiry - whom should the auditors talk to and what types of questions to ask

- By what mechanisms are personal protective equipment suppliers selected?
- What processes are in place for the assessment of the needs for personal protective equipment?
- Who assesses such needs and what is the level of Worker's involvement in the process of the protective equipment selection?
- Are the relevant hazard assessment and protective equipment selection properly documented?
- Is the personal protective equipment regularly inspected?
- Does it really protect?
- Who is responsible for the PPE maintenance?
- Are employees properly trained in the use of the PPE? How frequently?
- Is the use of all relevant PPE incorporated in the work procedures?
- How is the use of the relevant PPE monitored and such monitoring documented?
- Are there regular audits carried out related to the PPE usage and management?

b) Observations of practices and procedures

- Attempt to check the condition of the personal protective equipment currently in use.
- Do all the PPE in use appear to be clean and properly maintained?
- Are there procedures in place (equally systematic and strict) for the use of relevant PPE by contractors' employees and visitors?
- Is there a procedure in place for the cooperation between the line management and the occupational safety and health practitioners related to the assessment of hazards posed by the working environment?
- Is there a procedure in place for the cooperation between the line management and the occupational safety and health practitioners related to the PPE selection?
- Is all the personal protective equipment suitable and effective for the jobs and operations for which it is provided?
- Are all necessary items of PPE readily accessible to employees?
- Is there an immediate replacement available in case of damage?

c) Testing in order to increase the auditors' confidence in their findings.

- Find out from the accident records whether any accidental injury had the deficiency in the PPE system as one of the contributory factors.

- Find out from the accident records whether the severity of specific accidental injuries was affected by the deficiency in the PPE usage.
- Find out whether operational procedures include relevant instructions on the proper use of the PPE.
- Review all relevant documentation in existence related to the assessment of the work environment hazards.
- Review all relevant documentation in existence related to the process of PPE selection and the training in the PPE usage.
- Find out whether regular audits of PPE usage take place. If yes, ask to see such audit reports.

The Assessment Guide - Rating Criteria

Nedved (2014) discussed the basis for the development of the Audit Rating criteria. For the audit of the personnel protective equipment system, the following ratings can be used.

POOR

- No assessment of the work environment hazards has been done.
- No systematic evaluation of the needs for the PPE has taken place.
- Some attempts have been made to issue the workers with some PPE items.
- PPE usage is not consistent.
- There is no system in place for the selection, distribution and use of the PPE.
- No training in the use and maintenance of the PPE is taking place.

FAIR

- Some assessments of the work environment hazards have been done.
- Some steps have been taken to assess the needs for the usage of PPE at work.
- Proper PPE is provided for the identified hazardous activities.
- PPE usage is not systematic.
- Some attempts have been made to train the workers in the use of their PPE.

GOOD

- A systematic, methodical assessment of the work environment hazard has been conducted.
- A systematic assessment of the needs for relevant PPE, with the employees' input, has been conducted.
- Proper PPE adequate for the identified working environment hazards has been issued to all identified workers.
- PPE usage is systematic and consistent.
- Training of the workers in the PPE usage takes place regularly.
- Operational procedures include relevant instructions on the proper use of the PPE.
- Appropriate storage and cleaning facilities for the PPE are available.
- The practices related to all the aspects of the PPE sys- tem comply with the relevant legal requirements.

EXCELLENT

- All elements as formulated under the heading GOOD above are in place
- The results of the assessment of the work environment hazards are being regularly communicated to all affected workers.
- The results of the assessment of the needs for relevant PPE are being regularly communicated to all affected workers.
- PPE available for the workers is being periodically reviewed and a new updated PPE is being made available.
- Regular tests are carried out to ascertain the effectiveness and the degree of protection offered by all available PPE.
- Periodical safety audits related to the PPE management system are being carried out.
- Information dissemination program related to the PPE is in place, using all available strategies motivating the workers towards the highest possible degree of PPE usage.

Checklists for Safety Audits

As outlined in the first article in this series (Nedved, 2014), one pre-audit activity is the familiarization visit to a department or plant to be audited. Walk through survey represent a good technique enabling the auditors to get the good feeling of the work environment and of the prevailing safety climate. The checklist for walk through surveys has been developed by the International Labor Organization (ILO) Team (Nedved et al, 1991) and has been extensively tested and updated by some ILO team members in Australia and some SE Asian countries between 2001 - 2007, and subsequently in Western Australia by the author between 2007 - 2013.

Chesson (1995) examined materials information in the context of its role as part of on- site hazardous materials management. A number of hazardous materials management system elements discussed in his paper should form a part of a good, effective checklist for safety auditing related to the PPE management system, as well as to the hazardous materials management system. Nedved (1994) in his paper included an example of a checklist developed for the purpose of safety auditing. This checklist helps in the identification of the widest range of occupational hazards, including frequently neglected human factors.

A comprehensive analysis of the role of safety audits and of the development of their various elements can be found in a publication by OSHA (2012). Publication by WorkCover Authority in NSW (1997) contains useful checklists for action on workplace health and safety, and checklists for auditing health and safety management systems. University of Wollongong (2013) uses the checklist suited for a large research or academic institution. Australian Standard AS 4801:2001 deals in detail with the methodology of safety audits and audit reports.

Conclusions

The safety audit protocols guide and direct the safety auditors as to the observations that should be made and the questions to ask in order to effectively verify all the organizational aspects relevant to the occupational safety and health program element under review by the safety audit. The following paper in this series will deal with the development of safety audits for the purpose of company's self-assessment, i.e., the development of self-audit system.

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Human Interaction within OHS Management Systems

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Abstract

Within a contemporary occupational environment a robust, coordinated and disciplined approach to managing health and safety is considered to be best practice. Such an approach is typically undertaken through some form of management system. This article examines the interaction that humans have within such an occupational health and safety management system, specifically in terms of their behaviours and compliance with its requirements.

Key words: OHS management systems, safety culture, risk management, compliance.

Introduction

The purpose of this paper is to examine the importance of human interaction within the context of an effective occupational health and safety management system (OHSMS). The level of effectiveness is considered with respect to ensuring a safe and continually improving occupational environment. In doing so it aims to present a concise argument demonstrating that people's behaviours as well as their overall compliance with an OHSMS's requirements, are critical towards ensuring an effective health and safety management program.

Angiullo (2009, p.147) states that "Any well designed safety program or system is only as effective as the day-to-day ability of everyone in the organisation to rigorously follow procedures correctly and safely every time".

This statement holds true, specifically in a contemporary occupational health and safety focussed environment and is reinforced further by the idea that if people are meeting required standards in the workplace, then relevant procedures are therefore aligned with actual practice thus demonstrating strong operational discipline (Angiullo, 2009).

This paper will discuss the importance of people within an OHSMS and the role that they play in ensuring its successful implementation. It will describe the importance of safety culture, operational discipline more generally, as well as the structure of OHSMS's and their significant elements. Finally the core elements required for the effective implementation of an OHSMS will be reviewed.

Human Interaction with OHS Management Systems

An OHSMS is a tool, providing a systematic approach to the management of health and safety in the workplace. Its main objective is injury and illness prevention. Such an approach combines various "system" elements in an effort to create a systemic and coordinated drive towards a goal of injury and illness reduction and/or elimination, whilst at the same time benchmarking performance and applying a continuous improvement focus across all activities (Dunn, 2012).

Within any effective OHSMS, one element consistently proves itself to be difficult to develop and implement effectively; safety culture. Safety culture is more than simply compliance with policies or health and safety procedure management, but instead is a complex area within the framework of an organisation's global culture (McCune, Lewis & Arendt, 2011). Safety culture is constructed from various beliefs, attitudes and experiences, combined with the influence of specific policies and procedures. As such, one can see the myriad of issues that could arise in trying to directly control and/or influence such culture (Dunn, 2012).

With a general introduction to both safety culture and health and OHSMS's, we can now examine Angiullo's statement further. His claim discusses the importance of everyone within an organisation complying with an OHSMS in order for it to be effective. In reality however in order to ensure such compliance, supervision and management is required. The most effective way to address this is to have those involved be voluntarily compliant with limited supervision, but with this extended goal comes the requirement for robust and strong leadership. Such leadership needs to be highly visible, inspiring and directive, whilst presenting itself at all levels from top management down to line managers and field supervisors (Angiullo, 2009).

From this we can see the strong organisational value in operational discipline, as well as the legitimacy of the claim made by Angiullo. Essentially a management system of any kind, but particularly an (OHSMS) will always be ineffective if not "lived" by the people it affects and at the same time aims to protect.

However in the contemporary workforce we need to also consider the changing nature of work, cultural considerations, ever increasing contracting arrangements, as well as barriers to compliance. With this in mind, to fully appreciate and address Angiullo's claim we must create organisational capabilities, whereby the OHSMS is capable of incorporating and developing in line with a diverse and continuously changing "people" focussed workforce (Flynn, 2014).

The Contemporary OHS Management System

As introduced earlier in this paper, an OHSMS provides a systematic approach to the management of health and safety in the workplace. There are a variety of systems available to guide the development, implementation and management of such systems, including international, national and industry specific standards based on best practice. One commonly applied standard in this area within the Australian context for example, is *AS/NZS 4801:2001 Occupational health and safety management systems - specification with guidance for use.*

Within the AS/NZS 4801:2001 standard, there are a variety of elements described, which seek to cover all management and operational areas that could be reasonably considered to influence occupational health and safety outcomes. These areas include occupational health and safety policy, planning, implementation, measurement and evaluation, as well as management review. It is important that this management system model and its included core elements are further considered at all times with an overarching continual improvement focus (Standards Australia, 2001).

Within any workplace the "end users" or those undertaking the work, are often best placed to fully appreciate the risks associated with particular activities and as a result are also often able to identify the most effective risk mitigation solutions. As such aside from the legal requirements placed upon duty holders, it is critical that such persons are consulted on all relevant matters and further that such consultation strategies are incorporated into the respective health and safety management system (Dunn, 2012). Further to the practical outcomes observed following effective consultation processes, the application of consultative practices within the workforce help to develop trust, whilst fostering a "partnership" with employees, thus creating a more inclusive culture (Sargeant, 2001).

With this partnership comes a need for highly developed and effective organisational communication. Research has demonstrated that effective communication regimes in the context of occupational health and safety management are more often than not aligned with positive safety performance. Further to this, greater participation and compliance with management systems is often also observed, indicating the importance of communication as an element within a contemporary OHSMS (Cigularov, Chen & Rosecrance, 2010). Communication differs from consultation in that communication is essentially sharing a message, as opposed to a consultative approach where other parties are involved to the point where they influence the message itself. In a perfect world we should be consulting and then communicating the shared message. This is particularly important as the traditional nature of work as well as the global trend of increased diverse and multicultural workforce makeup (Wang & Zhang, 2000).

Through the effective provision of education and training, managers and workers become better placed in the area of occupational health and safety risk identification, subsequently assisting in their ability to take responsibility for risks with their realm of control (Tulukcu, 2012). Beyond this a good understanding of not only "how", but "why" can greatly assist in strengthening knowledge, building commitment and engagement, ultimately influencing safety culture development. In doing so a focus should also be maintained around training people on-the job. Such a focus will better consolidate learning and knowledge for workers, especially those who are new or inexperienced in a particular environment (Tulukcu, 2012).

Within many organisations and particularly high reliability organisations, the theories behind human error management have long been investigated, developed and redeveloped, often with a strong systems focus (Reason, 2000). Human error relates to unsafe acts by people or instances where people err. As such, the theories surrounding this accident causation methodology relate to human behaviour and their interactions within a system (Reason, 1990).

Whilst these areas discussed are critical elements of an effective OHSMS, it must be noted that there are other elements that clearly impact on such a system's effectiveness and implementation. The described elements however are the most relevant in relation to people interaction and compliance with an OHSMS.

Accounting for People within an OHS Management System

After reviewing some of the more specifically relevant elements of OHSMS's in the context of Angiullo's discussion, it can be seen that whilst an OHSMS is required to guide and direct people, it is essentially useless with people following its rules, processes and guidelines.

One such means of implementing an OHSMS, with a view towards increased compliance with the system's requirements, is to carefully consider and plan for effective operational discipline. Operational discipline is in essence an ingrained commitment and dedication towards undertaking activities in accordance with policies, procedures and plans. (Klein & Vaughen, 2011). Through thoroughly implementing and addressing leadership, management processes and standards maintenance in a systematic and controlled manner, operation discipline can be instilled into an organisation providing the impetus for voluntary compliance. Some areas that would require specific attention may include felt leadership, value orientation, employee engagement and effective housekeeping (Angiullo, 2009). Through encouraging and demanding operational excellence on an ongoing basis, an organisation will see greater ownership and engagement from its staff and thus begin to see greater performance in the occupational health and safety area (Cantarella, 1998).

To add strength to this type of framework and to complement well developed operational discipline within an organisation, an element of Behaviour Based Safety (BBS) may also be incorporated into a health and safety management system. BBS is a methodology focussed on creating a system by which behaviours aimed at injury prevention are encouraged (Sulzer-Azaroff & Austin, 2000). In utilising a BBS system we can look to identify and focus on critical behaviours in a well communicated and consultative fashion. In doing so we again aim to influence behaviours, ultimately influencing and reinforcing specific behaviours, thus driving engagement and buy-in from personnel at all levels (Sulzer-Azaroff & Austin, 2000).

Key to the BBS methodology is a requirement for a strong communication regime. Over time strong communication has proven to be present in environments where strong compliance behaviours are displayed, particularly in an occupational health and safety context. (Cigularov et al., 2010). Essentially when a strong safety communication culture is applied effectively at all levels within an organisation, personnel increasingly discuss and share their health and safety experiences, ideas and related issues assisting the organisation to extract and gain value from these shared learnings (Cigularov et al., 2010).

Within the context of multicultural workforces and the various barriers that arise within such culturally diverse environments, effective OHSMS's need to address this and gain value from its strengths. Management systems need to address barriers including language, worker culture, institutional culture in such a way to still allow for effective communication and ultimately personnel engagement (Flynn, 2014). It is also important to note that whilst occupational health and safety effects individuals, it is also very much a group concept, thus raising issues of group culture and group values when we begin to consider safety culture within an organisation (Starren, Hornikx & Luijters, 2013).

Beyond day-to-day management visionary leadership is also required to implement these systems and lead personnel to achieve targets and objectives. Leaders need to be positioned and possess the skills required to determine the reality of what really occurs in their workforces, whilst at the same time being able to engage in productive safety conversations with their people (Hopkins, 2011). Based on this, the criticality of strong visible leadership can be clearly seen in the context of developing and continually improving organisational discipline and thus occupational health and safety performance (Anguillo, 2009).

From this we can see that a robust OHSMS will address behavioural issues if it seeks to identify, analyse and manage human behaviours. In saying this though it is essential that such humans are not limited to simply workers, but also include supervisors, front line managers, as well as senior management, as each party plays an essential role in the system.

Conclusion

The purpose of this paper was to examine the importance of human interaction within the context of an OHSMS, with respect to ensuring an effective and continually improving operational safety environment.

Through examining OHSMS's, with a particular focus on safety culture, it can be seen that operational discipline is an essential element that an organisation needs to significantly invest in to ensure compliance with legal and other management system and requirements (Anguillo, 2009).

It can be clearly seen that whilst an occupational health and management system may appear sound, human error and indifference can creep in and cause system failures. As such a strong focus on the "human" elements of the system is required and this is particularly so in the areas of communication and consultative arrangements (Dunn, 2012)

Tying these areas together, effective management of the "human" factor will be controlled if an OHSMS is comprehensive, robust and more importantly well implemented, whilst being supported by strong visible leadership. This will ensure commitment and discipline to the system's requirements as well as the behaviours required to maintain this discipline and ensure its sustainability. (Klein & Vaughen, 2011).

As can be seen from the evidence examined in this paper, the legitimacy of Anguillo's claims holds very true and highlight that human behaviour is the cornerstone of an effective OHSMS and further that a focussed and well-implemented OHSMS will address human behavioural issues that may arise.

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Overview on Major Hazard Installations

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Abstract

Fears generally prevail among public on environmental and personnel safety whenever any major hazard factory is planned to be set up. This was the situation during yester-years, but with the stringent statutory controls and risk control measures and methodologies prevailing in all countries; thanks to the initiatives of the International Labour Organization (ILO) and other international agencies in this regard, these fears are being gradually nullified .A close look at some of the controls these hazardous factories are subjected to is focused here for the general information of the WSO readers.

1. Preface

Among various categories of factories across the world, industries handling, storing and processing hazardous chemicals are well known for causing serious accidents resulting heavy loss of life. The disastrous accidents in Flexiborough (UK), Seveso, Italy, and Bhopal, India, prompted the European Union (EU) consisting of member nations and ILO to look into the problem and evolve suitable control measures to prevent any possible accidents in the industrial sectors. Accordingly, the EU issued directives referred to as Seveso Directives I, II, and III.

European Union (EU) Commission Directives
Seveso Directives I, II and III

Seveso I: *Council Directive 82/501/EEC on the major-accident hazards of certain industrial activities (OJ No L 230 of 5 August 1982) – the so-called Seveso directive – was adopted in 1982. The Directive was amended twice, in 1987 byDirective 87/216/ EEC of 19 March 1987 (OJ No L 85 of 28 March 1987) and in 1988 by Directive 88/610/EEC of 24 November 1988 (OJ No L 336 of 7 December 1988). Both amendments aimed at broadening the scope of the Directive, in particular to include the storage of dangerous substances. This was in response to severe accidents at the Union Carbide factory at Bhopal, India in 1984, where a leak of methyl isocyanate caused more than 2500 deaths, and at the Sandoz warehouse in Basel, Switzerland in 1986, where fire-fighting water contaminated with mercury, organophosphate pesticides and other chemicals caused massive pollution of the Rhine and the death of half a million fish.*

Seveso II: *On 9 December 1996, Council Directive 96/82/EC on the control of major-accident hazards – the so-called Seveso II Directive – was adopted and replaced the original Seveso Directive. Seveso II included a revision and extension of the scope; the introduction of new requirements relating to safety management systems; emergency planning and land-use planning; and a reinforcement of the provisions on inspections to be carried out by Member States.*

In the light of industrial accidents (Toulouse, Baia Mare and Enschede) and studies on carcinogens and substances dangerous for the environment, the Seveso II Directive was extended by Directive 2003/105/EC of the European Parliament and of the Council of 16 December 2003 amending Council Directive 96/82/EC. The most important extensions were to cover risks arising from storage and processing activities in mining; from pyrotechnic and explosive substances; and from the storage of ammonium nitrate and ammonium nitrate based fertilizers.

Seveso III: *Further adaptation of the provisions on major accidents occurred on 4 July 2012 with publication of a replacement directive - 2012/18/EU. The main changes in this, so-called, Seveso III Directive were:*

- *Technical updates to take account of changes in EU chemicals classification. In 2008, the Council and the European Parliament adopted a Regulation on the Classification, Labelling and Packaging (CLP) of substances and mixtures, adapting the EU system to the new UN international chemicals classification (Globally Harmonised System - GHS). In turn, this triggered the need to adapt the Seveso Directive, since its scope is based on the former chemicals classification which will be repealed by the CLP Regulation by June 2015.*
- *Better access for citizens to information about risks resulting from activities of nearby companies, and about how to behave in the event of an accident.*
- *More effective rules on participation, by the public concerned, in land-use planning projects related to Seveso plants.*
- *Access to justice for citizens who have not been granted appropriate access to information or participation.*
- *Stricter standards for inspections of establishments to ensure more effective enforcement of safety rules.*

The Seveso III Directive 2012/18/EU was adopted on 4th July 2012 and entered into force on 13th August 2012. Member States have to transpose and implement the Directive by 1st June 2015, which is also the date when the new chemicals classification legislation becomes fully applicable in Europe.

The ILO, in conjunction with United Nations Environment Program (UNEP) and World Health Organization (WHO) International Programme on Chemical Safety (IPCS), published the ***Major Hazard Control: A Practical Manual*** in 1988.

2. Toxic Substances (very toxic and toxic)[1]

Substances with the following toxicity values, physical and chemical properties which are capable of causing major accident hazards are brought under the purview of major hazard substances depending upon their storages.

1. Flammable Chemicals: Flammable gases; chemicals which in the gaseous state at normal pressure and mixed with air become flammable and the boiling point of which at normal pressure is 20°C or below;
2. Highly flammable liquids; chemicals which have a flash point lower than 21°C and the boiling point of which at normal pressure is above 20°C;

3. Flammable liquids: chemicals which have a flash point lower than 55° C and which remain liquids under pressure, where particular processing conditions, such as high pressure and high temperature, may create major accident hazards.
4. Explosives: chemicals which may explode under the effect of flame, heat or photo-chemical conditions or which are more sensitive to shocks or friction

For the properties and threshold capacities of hazardous substances please refer to the respective country legislation or refer to ***Major Hazard Control–A Practical Manual,*** ILO publication 1988, for guidance.

3. Typical Major Hazard Installations (MHI)

As per ***Major Hazard Control–A Practical Manual*** ILO publication, the following installations generally possess hazardous substances beyond the stipulated threshold quantities classifying them under MHI.

- Petrochemical works and Refineries;
- Chemical works and Chemical production plants;
- LPG storage and terminals;
- Stores and distribution centers for chemicals;
- Large Fertilizer Stores;
- Explosives factories;
- Works in which Chlorine is used in bulk quantities

Table 1: Toxicity Values

	LD50 Oral in Rats LD50 Mg /kg body weight	LD50 Cutaneous in Rats or Rabbits Mg/kg body weight	LC50 inhalation (4 hours in Rats mg/l (inhalation)
1	LD ≤50	LD50 ≤5 10	LC50 ≤ 0 .1
2	5 < LD 50 ≤ 25	10 < LD50 ≤5 50	01 <LC50 ≤ 0.5
3	25 < LD 50 ≤ 200	50 < LD50 ≤ 400	05 < LC50 ≤ 2

4. Statutory Requirements

Because severe consequences arise due to accidents in major hazard installations, in order to ensure that the occupier of the MHI is properly taking effective control over storages and manufacturing operations, the local Statutory Authority governing factories requires essential documents as detailed below at certain intervals.

5. Safety Report

The Safety Report is one among the three important documents to be submitted by the occupier to the statutory authority. It is a comprehensive document with plant layout, process description, and construction safety features of plant, safety management system, employee training, onsite emergency plan details, general operational hazards, inventory of hazardous substances,

Table 2: Regulatory Compliance Schedule for MHI

Rule	Requirement	Frequency	Applicability	Required documents	Time to comply	Authority
Relevant Local Statute	Approval of facility & obtaining license		New projects	1.Safety report 2.On-site Emergency Plan	6 months before construction commences	Local Regulatory Authority
	Carrying out safety audit & submission of safety report	yearly once	New & Existing units	1.Safety audit report 2 Updated safety report 3.On-site emergency plan	1 month of completion of audit	
	Advance intimation	Existing units: in case of changes, decrease or increase in thresh hold quantity of hazardous chemical		1.Updated Safety Report 2.Updated On-Site Emergency Plan	Before 3 months of making changes	

loading and unloading operations, and not the least complete details on Preliminary Hazard Analysis (PHA) on use of the hazardous chemicals.

6. Identification of Hazards

In order to have an effective study on PHA, methodologies like hazard operability (HAZOP), hazard identification (HAZID), accident consequence, fault tree analysis, failure mode and effects analysis (FMEA), etc., will have to be employed depending on the operational status of the installation.

If MHI is in project stage, a HAZOP study verifying with those of P & I diagrams and arriving at the Action Plan as per HAZOP Table 3 is a must, identifying hazards during process operation through pipelines and equipment level with appropriate control operations stage:

Table 3: HAZOP Table

Node: Drawings						
Sl.No	Guide Word	Causes	Consequences	Safeguards (Existing and Approved)	Further Mitigating Actions	Remarks

Risks generated out of HAZOP, HAZID can be further evaluated as per the 8-Step Risk Assessment Process, given in Figure1, shown at right.

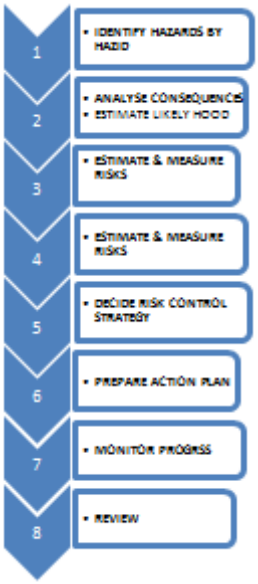


Figure 1: 8 Step Risk Assessment Process

8-Step Risk Assessment (RA) Process

Risk Matrix (Combining Impact and Likelihood): Qualitative Risk Criteria

Table 4: Risk/Impact Levels

LIKELYHOOD LEVELS		RISK/IMPACT LEVELS SEVERITY/INJURY				
		1	2	3	4	5
SEVERITY		Minor	Moderate	Severe	Major	CATASTROPHIC
INJURY		Insignificant	First Aid Injury	Minor Injury	Serious(Irreversible) Injury	Fatality/Multiple Fatalities
6	LIKELY	6	12	18	24	30
5	OCCASSIONAL	5	10	15	20	25
4	POSSIBLE	4	8	12	16	20
3	UNLIKELY	3	6	9	12	15
2	RARE	2	4	6	8	10
1	REMOTE	1	2	3	4	5

***Example**: Likelihood of 2 (Possible) x Impact of (Minor) 2=3x2=6 Dark Blue*

Table 5: Risk and Planned Corrective Action

	RISK & PLANNED CORRECTIVE ACTION		
	RISK LEVEL	**SEVERITY**	**TOLERABILITY**
	1-2	VERY LOW	ACCEPTABLE
	3-9	LOW	ACCEPTABLE
	4-12	MEDIUM	TOLERABLE
	15	HIGH	UNACCEPTABLE
	16 &ABOVE	VERY HIGH	UNACCEPTABLE

LEGEND: Risk Levels
Requires Priority Action
Must be brought down to ALARP LEVEL
Acceptable

Financial risks/impacts are not calculated in this matrix levels.

The Risk Matrix Diagram [2] given below is indeed a very useful tool in quickly assessing the severities and consequences.

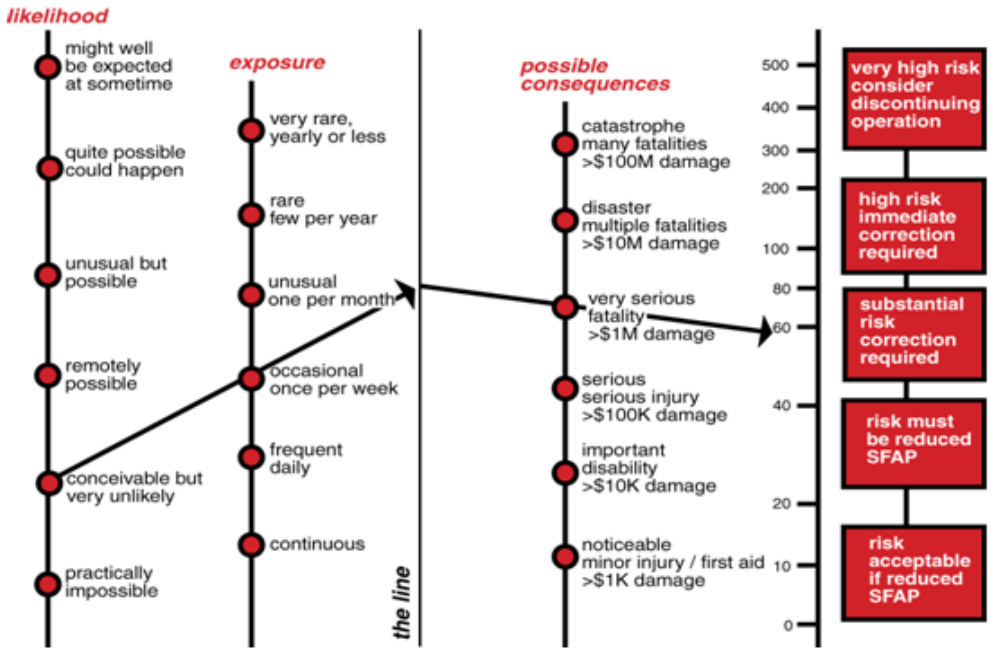


Figure 2: Risk Matrix Nomogram

SFAP in the above chart stands for "So Far As Practicable," a term used by Victorian Australia Occupational Health and Safety Regulations. Equally, ALARP ("As Low As Reasonably Practical"), a term used in majority in UK and in other countries, can also be used alternatively.

Once the hazard assessment for all the hazardous substances during the process and bulk storage is completed, the information may then be tabulated as per Table 6.

Table 6: RA Corrective Action

Sl.No	Incident	Scenario	Likelihood	Consequences	Risk Level	Correction Measures	Target Date For completion	Responsibility

This complete study report with graphical representation viz risk curves and threat zones with calculation of individual and societal risks is called as Quantitative Risk Assessment and is an important document to be submitted to the Regulatory Authority. (RA) along with Safety report in order to map the effects and risk curves, software models will be necessary.

An example of gas release giving the accident scenarios and the effects thereon to the individual fatalities and society at large is given vide Sl.No VIII for information of the readers.

7. Scenario Examples:

7.1 Bulk Storage of Propane: Consequences in case of accidental release of gas

A chemical factory has bulk storage of propane in a 150 KL Bullet installed within a dyke. A village is situated at a distance of one kilometer, with a population density of about 20 persons/ hectare. The minimum distance of the village from the storage is 100 meters. The village extends beyond the distance of 100 meters from the storage. The village occupies 20% of the area within 100 meters from the storage. The bullet is filled in by a road tanker depending on the necessity.

Various Loss of Containment (LOC) probabilities can be thought of as under:

- Vehicular Impact against pumps and pipes causing heavy leakage of propane
- Static Spark
- Tanker moves off with filling hose still connected to tank
- Transfer hose not secured correctly during filling operation
- External impact to tank wall or bund
- Containment Failure & Consequences
- Flange leakage
- Lightening
- Overfilling of Tank

Risk and severity consequences due to all probable incidences causing environmental, individual and societal risks are be assessed without which; the HARA/PHA Report does not serve its purpose.

Assuming of an incident causing a release of continuous flow of liquid propane, the following example with certain dispersion effects causing individual and societal threats is given for the general understanding of the readers.

7.2 Thermal Radiation at the Threat Zone

Total mass of propane gas leaked out**: 66 TONNES**
Threat Modeled: Thermal radiation from jet fire

- 10 meters – (10.0 kW/(sq m) = potentially lethal within 60 sec)
- Orange: 13 meters – (5.0 kW/(sq m) = 2nd degree burns within 60 sec)
- Yellow: 20 meters – (2.0 kW/(sq m) = pain within 60 sec)

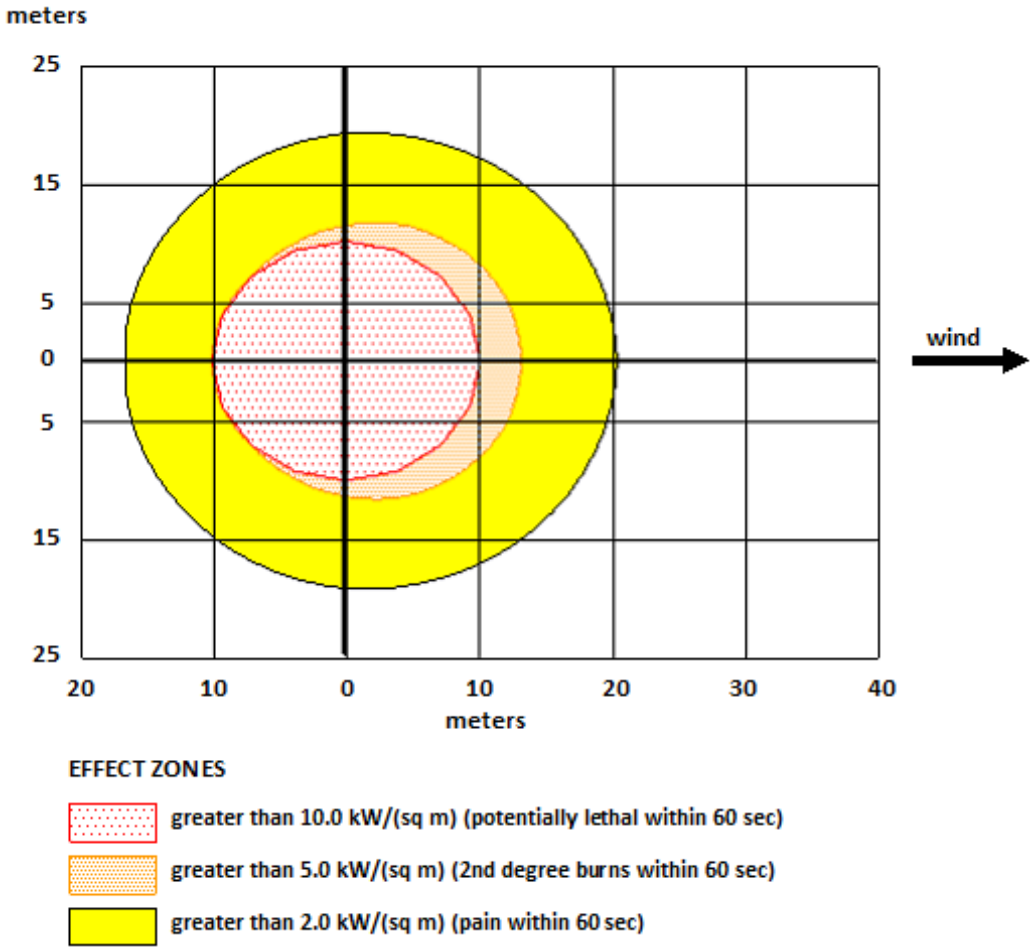


Figure 3: Model Dispersion Effects

Atmospheric Data (manual input of data)

Site Data:

Building Air Exchanges Per Hour: 0.51 (unsheltered single storied)

Chemical Data:

Chemical Name: PROPANE Molecular Weight: 44.10 g/mol
AEGL-1 (60 min): 5500 ppm AEGL-2 (60 min): 17000 ppm
AEGL-3 (60 min): 33000 ppm
IDLH: 2100 ppm LEL: 21000 ppm UEL: 95000 ppm
Ambient Boiling Point: -43.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

Wind: 5 miles/hour from ESE at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 60° F Stability Class: B
No Inversion Height Relative Humidity: 50%

Source Strength:

Leak from hole in horizontal cylindrical tank
Flammable chemical is burning as it escapes from tank
Tank Diameter: 8 meters Tank Length: 10 meters
Tank Volume: 503 cubic meters
Tank contains gas only Internal Temperature: 60° F
Chemical Mass in Tank: 2.13 tons

7.3 Individual and Societal Risks

i. ***Estimation of the number of fatalities:*** 12 fatalities as per established calculation guidelines

ii. ***Societal Risk Estimation of frequency of occurrence:*** 10^{-4} accidents/year

8. On-Site Emergency Plan

The Third document for submission to the RA is the On-Site Emergency Plan. The overall objectives of an emergency plan are:

- To localize the emergency and, if possible, eliminate it; and
- To minimize the effects of the accident on people and property.

This Plan consists of management's existing measures, onsite resources, to combat the emergency with trained manpower in first aid, firefighting and availability of fire protection systems.

9. Conclusion

There is no industry in the world without any hazard. Much depends on the organization's design features, its safety management system, employees' operational practices, and their prompt actions to mitigate site emergencies, and finally the management's compliance to such regulatory controls play a larger role in preventing serious accidents and creating a sustained zero risk atmosphere.

Further Suggested Reading

Major Hazard Control: A Practical Manual, an ILO publication (1988)

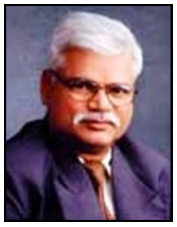
Hazardous Industry Planning Advisory Paper No. 3 – Risk Assessment

References

[1]***Major Hazard Control: A Practical Manual***, an ILO publication (1988)

[2]#Hazard Identification, Risk Assessment, and Control Measures for Major Hazard Facilities, published by Comcare. Gov. Au. https://www.comcare.gov.au/__.../Hazard_identification_risk_as...

About the Author



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Confined Spaces: for Rescue…to Whom Do You Turn?

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Abstract

Confined space entry can be dangerous work and can cause an entrant to unexpectedly become a victim. These entries require careful evaluation of the hazards and safe preparation for entry. This includes being prepared for an emergency. One of the most vital components of this preparation is by evaluating and choosing a rescue team.

The three most common choices are the local fire department, an employee based team or a private stand-by rescue team. The choice for who the rescue team should be is based on the organizational needs and availability of rescue resources. For example, if a local fire department does not have a rescue team it would not be a viable option.

The rescue team considered must be properly trained, adequately equipped and able to respond in a timely manner. It is the responsibility of the employer to evaluate the prospective rescue team to decide if they are qualified. This evaluation may include putting the rescue team through an exercise to evaluate their performance.

An organization bypassing this rescue requirement is leaving itself open for liability and inability to save the incapacitated/ unconscious workers. It may also result in the loss of any "would-be rescuers."

A number of articles in safety magazines address the subject of confined space rescue so many may be familiar with 1910.146 (d)(9). It states that a company entering permit-required confined spaces must: "*Develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, for summoning additional rescue and emergency services, and for preventing unauthorized personnel from attempting a rescue*".

Unfortunately, there is a large majority of companies who disregard these requirements and hope for the best. This will lead to a lack of preparation if an emergency occurs and the possibility of the injury, illness, or death of any "would-be rescuers." It's important to pre-plan for emergencies, which includes choosing a rescue team.

Would-be rescuers are generally co-workers who make an effort to rescue a disabled or unconscious entrant in a confined space but are unsuccessful and become victims themselves. This decision to attempt a rescue often results from the emotional distress with the fact that there are no rescue plans in place. With no viable options available, some workers will choose to enter the space in hopes of helping the entrant.

An example of this is from January of 2011 when a worker from a Los Angeles pharmaceutical company entered a 7-foot deep tank that had been purged with nitrogen earlier in the day. He was not aware of this and did not test the atmosphere or provide other required steps prior to entry. When he entered, he immediately became unconscious. Two other workers entered the tank, under direct orders from their supervisor, to assist the victim. They were both immediately overcome also. One would-be rescuer died and one recovered.

The difficulty happens when companies try to decide how to fulfill the rescue requirements. Who will be the rescue team? The confined space regulation, 29 CFR 1910.146, is performance-based and is not specific about how a company should comply. All of the options must be considered to see what will work best for your situation. This article will explore the available options, including local emergency services, an employee-based team, and private stand-by rescue teams.

Prior to 1999, many companies blindly relied on the fire department to provide confined space rescue. OSHA's confined space regulation at that time was vague on the subject, and it was often interpreted that using the fire department was allowed even though their capabilities were not known. Frequently, the only "Emergency Procedures" found on a confined space permit were "Dial 911." But at the beginning of 1999 came an updated regulation with more detail about the requirements for rescue.

In 1910.146(k)(i) and (ii), there is language addressing the requirements for a rescue team. A rescue team must be properly trained and adequately equipped to perform rescues from the confined spaces at a specific facility. Companies working in permit-required confined spaces are required to meet with the prospective rescue service and evaluate their capabilities. The regulation also includes the new "Appendix F (Rescue Team or Service Evaluation Criteria)," as a non-mandatory guide to the evaluation of the potential rescue team. It includes guidelines to help determine whether the rescue team has the equipment and training needed to perform rescues from the specific types of confined spaces found at the site. It also addresses whether they can provide a timely response to the spaces, given the degree of hazards found. The appendix suggests a performance evaluation of the team by holding a practice rescue that can be critiqued by a company representative or another qualified party.

Option One: The Local Fire Department

The first choice by many for a confined space rescue team is the *local fire department*. An evaluation of its capabilities using Appendix F will show whether the fire department can provide

the rescue service needed. Some fire departments have technical rescue teams that perform not only confined space rescue, but also high angle, trench, and/or water rescues. As a rule, they will be more than qualified to provide the service needed.

Many departments do not have rescue-trained firefighters or proper equipment to perform confined space rescues. This may be due to budgetary limitations, departmental priorities, or staffing issues. The local fire department may be a volunteer department and not able to respond quickly enough to meet the requirements of the regulation. Even large metropolitan fire departments may not be able to respond in a timely manner, because generally they will have only one or two rescue trucks to cover the entire area of responsibility and those trucks may not be close to the company requesting the service.

Initially, a fire department may not even consider being a "designated" rescue team. This can be from a fear of being contractually accountable for their rescue response or being held liable by OSHA under the confined space regulations. This does not mean the department will not respond if you call 911 for a confined space rescue--it means they may not provide the response that a company is required by regulation to have. Normally, a fire department is under no specific directive or regulation requiring them to provide confined space rescue to the public. It may take a bit of education and convincing to get them to open up to the idea.

If the evaluation finds a fire department to be deficient in training or equipment, some companies have provided funding for training fire department members in confined space rescue or have purchased rescue equipment to bring them up to the needed response level. This may be less expensive and more practical than other options. Some fire departments have developed a partnership with other agencies to provide a joint response team. This partnership may be with another public agency such as a water district, or their own public works division. Together they can fund a response trailer filled with confined space and trench rescue equipment, then cross-trained members of each agency. The firefighters were trained in confined spaces, and the water district and/or public works employees are trained in rescue. They jointly respond to any confined space emergencies occurring within their area of responsibility, thereby fulfilling their responsibility for rescue from permit-required spaces. The team also may respond to the local region for any public emergency responses.

Option Two: Employee-Based Rescue Team

If the evaluation of your local fire department shows it is not willing or able to provide the rescue response needed, you have to look at other options. One is to set up an *employee-based rescue team*. Many companies find that having employees trained and equipped for confined space rescue is the only way to provide a timely response. One advantage is that these employees will already be very familiar with their confined spaces and the hazards within. In addition, their response should be quicker since they work at, or near, the location of the entries.

A company must be prepared to dedicate the time and funding necessary to set up a properly established employee-based rescue team. Once the decision is made to set up this type of team, the company will have to provide rescue training to the employees chosen to be rescuers. This course should be 24 to 40 hours and taught by a reputable rescue training company. The length of the class depends on the number and types of spaces on site and degree of hazards found. The curriculum should follow NFPA 1670, "Standards on Operations and Training for Technical Rescue Incidents." The National Fire Protection Association created this standard in 1999 to provide criteria for a public or private rescue team. Although the use of this standard is not required by the confined space regulation it is cited in ANSI Z117.1-2003 (E15.2).

The rescue team should have a comprehensive cache of equipment. Primarily, the team can use normal confined space entry equipment such as a tripod, winch, blower, and atmospheric monitor, but this limited equipment will need to be supplemented with equipment such as rope, a stretcher, and SCBAs. Exactly what equipment a company will need depends on the site. A pre-plan of each space assists in determining what equipment will be needed. The team also will need a rescue plan to operate under, including procedures on how the team is contacted, how it responds to the scene, and the structure of the team.

Option Three: Stand-by Rescue Team

A company's evaluation of rescue needs may find the limited number of permit-required confined space entries do not warrant the time and financial commitment needed for an employee-based team. If permit entries are few, a private *stand-by rescue team* may be the answer.

A stand-by rescue team generally consists of professional rescuers with their own equipment cache who work under contract or on an as-needed basis. They can be called in when a permit-required entry is to occur and be on hand, on the ready, in case of an emergency. They are usually required to be on site before the entry in order to pre-plan the space, prepare their equipment, and be involved in the permitting of the space. Stand-by rescue teams are often reserved for more hazardous or complicated confined space entries, where the rescue needs may be beyond the capabilities of the local rescue team.

An example of a stand-by rescue team being used is with large water distribution agency in the southwest region of the U.S.. Annually, this agency enters canal siphons for inspection and cleaning. These siphons are about 20 to 25 feet in diameter, can range from one-half mile to 2 miles long and are remotely located. There are fall, atmospheric, and water engulfment hazards within the spaces. When these annual entries occur, a stand-by rescue team of five or more people is brought in. They may be on site for four to eight days, depending on the project.

Conclusion

Finding the right rescue team for a company can be an involved process but it is required if permit-required confined space entries are made. It takes more than just considering the use of the fire department: It takes an evaluation of the rescue needs.

Once the needs are determined, a decision must be made as to

which option suits the needs. Then comes an evaluation of the rescue team chosen, to determine who is capable and available. The local fire department, an employee-based rescue team, a stand-by rescue team, or a combination team are potential options to consider. Remember that the goal is life safety for your employees.

References

U.S. Department of Labor (1998), CFR 29 1910.146 "Permit-Required Confined Space", Occupational Safety and Health Administration.

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About the Author

Jeff Beeler was full-time Captain for the La Mesa Fire Department and worked in fire/rescue for more than 32 years. He was a member of FEMA's Urban Search and Rescue Team out of San Diego, California, filling the role of Rescue Team Manager. Beeler owns JB Safety Services, a safety and rescue training company, teaches health and safety at the University of California, San Diego Extension, and serves on the board for the World Safety Organization.

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World Safety Organization

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for their complete sincerity in professional service
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Members must be responsible for continuing improvement
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Members must be responsible
for their professional efforts to support the WSO motto:

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World Safety Organization

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Published by the WSO World Management Center
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Warrensburg, Missouri 64093 USA
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