Confined Spaces Working - Towards Zero Fatalities

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Abstract

In view of the number of confined spaces accidents still occurring in the 1990s, many with fatal consequences, the need to manage safe confined spaces entry effectively became one of the key focuses for the enforcement bodies across the world. Since 1993 specific confined spaces legislation has been introduced in USA, Canada, Australia, New Zealand and GB. Later in 1999, Ireland, north and south will have confined spaces law on the statutes. This paper draws on the authors' transglobal confined spaces expertise to examine the level of compliance, analyse the nature of confined spaces accidents and put forward a framework for eliminating fatalities in confined spaces.

Key Words

Confined spaces, dangerous atmospheres, accident analysis, violations, legislation, risk assessment.

Introduction

There should never be another fatality within a confined space. Technologically and intellectually we have it within our capability to prevent fatal accidents from ever

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occurring in confined spaces. Perhaps what is still needed is for industry to accept the managerial intricacies needed to propel us towards the achievement of that goal.

Defining the confined space

The term "confined space" has a wide application throughout industry. In many instances confined spaces are fairly obvious, for example reaction vessels, enclosed tanks, large ducts and sewer pipelines. There are others which are less obvious, yet they are equally as dangerous, for example open topped tanks and vats (particularly where heavier-than-air gases and vapours may be present), closed and unventilated rooms and furnaces/ ovens, in which dangerous accumulations of gases can build up as a result of restricted air circulation. Open spaces have , on occasions, become confined spaces by virtue of the prevailing conditions, aggravated by adverse weather conditions. Examples include; the vicinity of farmyard slurry pits, roof depressions and on top of chimney stacks.

The different national statutory safety bodies (NSSB) across the world will have their own form of words to define or describe confined spaces. However, while many of their definitions may be quite complex an acceptable generalised description of a confined space is that it is a workplace with one or more of the following characteristics;

- limited openings for entry and exit,
- unfavourable natural ventilation, or
- has not been designed for continuous worker occupancy.

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A confined space, within the workplace, having a combination of these characteristics will complicate the working and emergency rescue operations. If you are constructing or working in a chamber, tank, vat, pit, flue, boiler, degreaser, furnace, pipeline, pumping station, reaction or process vessel, septic tank, sewage digester, sewer, silo, ship's hold, utility vault, or similar type enclosure you are working in a confined space.

Legislation and problems with compliance

In the last quarter of the twentieth century considerable advances in safety legislation have been made on both sides of the Atlantic, with the Health and Safety at Work Act 1974 in the UK and the Occupational Safety & Health Act 1971 in the US as the parent legislation for standards, orders and regulations covering a wide range of hazardous work situations. Recent years has seen the introduction of specific Regulations that develop enforceable standards for confined space entry with 29 CFR1910.146 in the US and Confined Space Regulations 1998 in the UK. Similar Regulations come into force in the North of Ireland (NI) in June 1999 and in the Republic of Ireland at the end of 1999.

Since we do have the capability to prevent fatal accidents occurring, certainly within confined spaces, why do they continue to occur? Is it that standards are insufficient or somehow inadequate? Even if this was the case, and we do not argue that it is, there is still the intellectual capacity to analyse past accidents, and on the principal of foreseeability, design safe systems of work that ensure the safety of workers and public. Indeed there is a legal duty on employers to assess the potential risks in any work situation and to take appropriate steps to reduce those risks to the lowest acceptable level. Amputations, serious injury, debilitating health conditions and fatalities could hardly be

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considered the lowest acceptable level of risk. Are we to conclude that not enough consideration is being given to the hazards of work, or that safe systems of working are not being adhered to, for what ever reason. If that is so then it can be argued that accidents result less from an indeterminate compliance failure and more conclusively from compliance violations.

The Health and Safety Executive (HSE 1995) classified violations under four categories, routine, situational, exceptional and optimising.

Routine violations are those where it has become the norm to behave in opposition to the rule, for example through cutting corners, a general belief that the rule no longer is applicable or experienced managers/ workers feeling they don't need the restrictions. It is incumbent upon management to re-evaluate safety procedures on a regular basis and remove or change redundant procedures, however, enforcement of the rules must remain consistent and absolute until they are formally changed. Informal determinations that the procedure is no longer necessary, or that the worker is too experienced to need to follow the procedure cannot be excused. Such behaviour adds to a general dilution of safety consciousness with a consequent increase in the accident rate.

If left unchecked, routine violations become accepted practice which is then passed on to less experienced workers and new starts. While lack of enforcement by management implies tacit sanctioning of the violation there are occasions where managers ignore their own rules. A classic example happened a few years ago when a manager came upon an isolated water treatment site and found the chlorine supply low. Instead of calling on the operatives he set about the task of changing the chlorine gas cylinders, without any breathing apparatus. He had done it many times, it only took a few minutes, gas leaks

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were minor and besides he always held his breath at the crucial moment. On the day he last attempted this activity the pipework fractured and he was exposed to a high level of chlorine gas. It was his good fortune that a visitor to the site was able to effect a rescue.

Situational violations occur when factors in the immediate work space or environment affect the work process, making it impossible or extremely difficult to apply the safety rules. Example of this include the design and condition of the work area, time pressure, staff levels, supervision, equipment, weather and time of day. So where the demands of production and safety are in conflict often it is production that gets priority. In such circumstances violations may be sanctioned, not through neglect but cognitively to achieve productivity targets.

Exceptional violations occur rarely and usually when something goes wrong, tempting individuals to violate safety procedures in order to resolve the problem. These violations, generally associated with high risk, often result in accidents where a serious injury or fatality is the outcome. Skilled rescue workers are not immune from violations. There are recorded confined spaces incidents where rescue workers have died while trying to effect a rescue. It appears that in the urgency of the moment basic rules were ignored, the space was entered without the atmosphere being testing and that RPE was not available. This is testimony to the fact that when things happen suddenly and stress impinges, even experienced people can act in illogical ways (Larken 1998).

Finally, optimising violations are described as being motivated by a desire to optimise a work situation, for example in testing the boundaries of a system or simply through inquisitiveness.

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HSE observed, correctly, that violations from whatever classification, when they are allowed to happen can quickly become routine. If it appears that routine violations have management sanction this could led to further violations in other areas, thus creating a downward spiral in safety standards.

Whatever the merits of the above classifications of safety violation, there are a number of key observations that can be made of all of them. Firstly, the violations are seen to be committed in the main by workers with a low level of employer culpability discerned. Where culpability is suggested at levels other than the violators' it is rarely made strong enough to take it beyond the first or second level of supervision or management. Secondly, by suggesting that routine violations are often automatically and unconsciously carried out, the classifications would appear to explain them in a manner that makes them understandable, possibly even excusable.

It has been a long established practice of health and safety inspectors to try to engender improvements in safety by persuasion rather than through strict enforcement methods. The thinking is that it is better to have employer support for safety than to have a hostile employer reluctantly and halfheartedly applying the minimum safety procedures. The US Occupational Health and Safety Administration (OSHA) are also attempting this through their Voluntary Protection Program (VPP) which they encourage employers to sign up to. HSE findings (1995) support the persuasion method although there is still much to be done at employee, employer, industry and enforcer level. Each of the distinct groups need to be able to work together, in partnership, to achieve what everyone publicly desires; a much reduced level of accidents in the workplace. Safety professionals have a facilitating role to play, using their expertise to help find workable solutions.

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Enforcement authorities have and will continue to take stern measures when necessary. In the UK the more serious accidents and persistent failures to implement the terms of improvement notices have lead to prosecutions. However, the nature of prosecutions and the outcomes have often done little to further the HSE's cause or to satisfy the needs of victims of work related accidents. Dix (1997) argues that the UK courts are restricted in their sentencing options to applying a monetary fine to companies for safety failures. Where is the inducement to punish present and deter future failures, or even to rehabilitate company behaviour? It is virtually impossible to bring a prosecution against a company for manslaughter where a breach of safety obligations has resulted in a fatality, without first establishing that there is sufficient evidence to convict a senior company officer for the same offence (Dix 1997). The Lyme Bay canoeing accident is the only incident where such a prosecution has been successful. In the US several safety authorities, without negating the part played by employee behaviour and poor supervision, are arguing that compliance failures often result from more deliberate and conscious violations on the part of the company at a corporate level.

Notwithstanding the problems of under reporting of accidents, common on both sides of the Atlantic, many employers still seem to place short term savings over longer term benefits. Thus safety measures, including training are amongst the first to be cut when savings are required. This behaviour is more common amongst small to medium sized companies where safety costs are proportionately greater than those of large companies. In the absence of serious injury or fatality and for as long as companies can get away with it, there is the chance that their obligations to safety will not receive top priority. Karr (1999) reports that the low rate of reported accidents in the US, coupled with an inspection probability of once in every 66 years further promotes this ethos of short-cutting safety.

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It is also argued (Karr 1999) that the strength of the economy is a contributory factor in compliance violations. The trade unions argue that whilst the economy is booming and competitive pressure is high, companies find it difficult to devote time to training and workplace safety. This would seem to imply excusability, with the priority on saving jobs. The increase in high technology operations that require fewer workers on very complex, often automated, equipment is a safety manager's nightmare.

High productivity + faster processes + complex equipment + fewer workers + deskilling = accident increase.

It must be remembered that the actions of the enforcement authorities directly effects the behaviour of companies. Targeting companies with high reported accident rates could have the negative effect of persuading some companies to deliberately under report. Clearly there is a need to maintain the balance between targeting campaigns and random inspections.

In US concerns have been voiced that the 'flavour of the month' approach to safety promotion leaves many companies only paying attention to the safety standard currently being enforced[1]. For example several years ago, when OSHA's confined spaces standard 29 CFR 1910.146 was the target for the enforcers, employers and safety consultants put a lot of energy into this area. Currently the emphasis is on the lock out/tag out standard, 29 CFR 1910.147, and reports are that employers are focusing less on the other elements of confined space safety. Indeed throughout the 1990s the confined space standard has not featured in OSHA's top 10 most frequently cited standards (Karr 1998). This is not because confined space safety has improved sufficiently that it no longer merits the

[1] Conversations between authors and US safety professionals at NSC Safety Expo, LA 1998.

attention of the enforcement agencies. Eighty seven fatalities in the US, in 1997, attributed to oxygen deficiency proves this.

Accident Analysis

Deacon (1997) argues that an organisation must maintain and further improve its contribution to overall business success through a recognised set of performance measures; economic, product/ service and personnel. Within each of these areas there is scope to integrate health and safety management such as;

- Economic including; uninsured costs, budget, insurance premiums and enforcement costs,
- Product/ service including; audit scores, benchmarking, safety awards and targets achieved, and
- Personnel including; accident and injury rates, dangerous occurrences and first-aid incidents.

It is not beyond the bounds of reason that an organisation should be more specific when setting its performance measures. For instance; where there has been a particular increase in a specific type of accident or injury or where audit scores demonstrate non-conformances in high-risk activities. This would be viewed as a responsible management decision for companies working with limited resources. After all HSE also have finite resources and they make no secret of the fact that they will target industries with poor safety records. It will always be to the benefit of an organisation that has the

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ability to demonstrate to HSE that it is taking all the necessary steps to improve safety performance.

Many serious accidents have occurred whilst work is being done inside confined spaces. The chief hazards faced are those associated with toxic and/or flammable gases, fumes and vapours. Other hazards include the presence of free flowing solids, liquids and temperature extremes. Neglect or ignorance of the necessary precautions can lead to tragic and often fatal results. In many cases the consequences extend beyond the workers inside the space to those who carry out unauthorised rescue attempts.

Baker (1986) reported that deaths in the UK due to confined spaces working accounts for 5 to 7 per cent of all workplace fatalities. In Canada, for every 1400 normal workplace accidents one results in a death yet where confined spaces working is concerned the ratio is one in ten (Ibbetson 1998). Confined spaces fatalities in the US, in recent years, have been in the order of 80 to 100 per annum[2] while in UK they have fallen from a high of 36 in 1986 to the present level of circa 5 to 10 per annum (Figure 1). With a population ratio in the order of 5:1 it can be assumed that the UK figures are marginally better, however there is no cause for complacency. Looking beyond the fatalities the major injuries statistics remain a source of alarm. For every confined spaces fatality in the UK over the last ten years 8 to 10 people have suffered the effects of exposure to harmful substances. The reasons why there have not been more fatalities is anybody's guess, however it would not be safe to assume that it is all down to good management. With effective safety management all exposures to dangerous atmospheres could be eradicated from confined spaces work operations.

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[2] Figures extracted from the US government's Bureau of Labor Statistics

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Considering the number of confined spaces deaths and reportable injuries there have been in recent years a wise employer would treat risk control for such work activities as top priority. Granted there are other types of injuries and incidents within confined spaces but eliminating all life-threatening accidents before tackling any of the others must come first. Performance measures set to deal with the critical aspects of confined spaces safety must have zero fatalities and zero major injuries targets, particularly where immediately dangerous to life or health (IDLH) atmospheres are involved. It is entirely conceivable that in managing these critical safety aspects that many of the other issues will be addressed. For example the development and operation of an isolation (lock out/ tag out) procedure to prevent the ingress of dangerous atmospheres is no different, in principle, to that for isolating liquids, loose granular material or power sources. Consequently risk control systems to prevent drowning or engulfment can be in place without any additional effort or unnecessary resources.

Over the years some unusual and many more reasonably foreseeable incidents have occurred in confined spaces. Unfortunately fatalities, in particular amongst rescuers, are not uncommon events and often similar events end with the same tragic results. Tolley (1999) described an incident in 1959 where a doctor attempting the rescue of two workmen down a well was overcome by carbon monoxide fumes. Nearly thirty years later in NI an almost identical event resulted in the death of two would-be rescuers. While it might seem unreasonable to expect that everyone be conversant with the 1959 case, had the lessons and the transfer of the knowledge occurred the NI incident would have been foreseeable and avoidable. It is not possible to risk assess the unforeseen, however the telltale signs, often so obvious with hindsight, need to be highlighted and the lessons learnt if we are to break the cycle of repeat accidents. Foreseeability transcends company

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boundaries. One of the more unusual lessons of the Abbeystead explosion[3] was highlighted in the HSE report into the incident (1985);

"The fact that methane is soluble in water and increasingly so above ambient pressure, and that it can be given off by ground water entering workings, should be widely publicised throughout the civil engineering profession and incorporated in professional training".

Baker (1986) analysed the accident at Carsington Dam, where 4 young men died at the bottom of the reservoir toe drain, three of them while attempting a rescue. The consultant and the contractor were found to have failed in their duty to ensure the safety of the men who died. HSE in the 1970s produced a training film "Watch that space" which described how three men died in a drain in a construction site. Baker was struck by the uncanny resemblance of the circumstances depicted in the film to those of the Carsington accident. What does it take for the lessons to be learnt?

At Swan Hunter Shipyard in 1982 where an oxygen enriched environment created by the work activity resulted in an explosion which killed 8 men. The subcontractor had not been informed of the risk control measures and consequently the main contractor was prosecuted for failing to provide a safe system of work for subcontracted employees and for failing to provide information/ instruction so as to ensure their safety.

In three separate confined spaces incidents in NI during 1995/96 there were seven deaths, accounting for almost 25% of the total deaths that resulted from accidents at work in that year. Of those seven deaths four of the victims were attempting an unapproved rescue. The sentiments of the individuals compelled to act as they come upon their colleagues in

[3] Sixteen people died and a further 28 were injured in that one incident

trouble is understandable, but had they followed approved safe working and rescue procedures they and the original victims might not have died.

Analysts and safety professionals tend to agree that for every death of a confined spaces worker at least one other person, often more, dies in a fateful rescue attempt. Ibbetson (1998) suggests that the ratio is two would-be rescuers for one victim. Human nature being what it is there will always be the 'have a go' hero who if successful will be praised for their bravery and if unsuccessful becomes another fatality statistic. It is necessary to be particularly hard on such behaviour, no matter how uncaring it may seem, since unsafe acts of this type endanger many lives.

An approved rescue procedure has to be an integral part of any safe working arrangement, since it is not always possible to accurately predict the outcome of a confined spaces work operation. Incidents will happen and have to be planned for in the normal course of events. The procedure could be as simple as an alarm and evacuation procedure or as complicated as a major incident plan. The nature and complexity of the emergency rescue arrangements will depend on the degree of risk involved. While there are many variations on the theme there is one fundamental principal that binds them, that is the safe exit of all workers from the space. Examples may include;

1. a standby worker outside the space, whose job it is to raise the alarm in the event of an incident occurring,
2. a dedicated rescue squad, fully equipped with self contained breathing apparatus, standing by with a full emergency rescue kit,

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3. mechanical ventilation set to activate whenever the atmosphere monitor detects an IDLH environment,

4. the public emergency rescue services standing by throughout the confined spaces work operation.

Many of these incidents, including their fatal consequences are destined to be repeated unless the management of safety in confined spaces working is developed to a high degree and practiced without favour by all interested parties. A management system is needed, incorporating transglobal best practice, which may be adopted to suit any jurisdiction.

Safety management

Legislation within the European Union (EU) is driven by directives. Member States are bound to comply with EU directives within a specified time frame. UK legislation has a clear requirement for employers to manage health and safety through the development of valid and effective risk assessments and associated risk control measures. In the USA safety management systems are identified as one of the key elements necessary to meet the goals of the Occupational Safety and Health Act of 1970. OSHA's strategy is to pursue the following four strands;

1. Voluntary Protection Program (safety management system),
2. Consultation survey,
3. Full-service area offices, and
4. Effective enforcement.

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So while transglobal terminology may differ, the message and the spirit of enforcement remains the same. This is true for any aspect of workplace safety, however it is particularly poignant where confined spaces entry is concerned. The US Code of Federal Regulations (29 CFR 1910.146) and the UK Confined Spaces Regulations demand proper and effective management of confined spaces working.

The best solution is to avoid 'confined spaces entry' work operations, if at all possible, however this is frequently not an option. Therefore what is needed is an effective safe working procedure developed on the sound principle of risk assessment. Remember that risk assessment need not be complex and that there are no fixed rules about how it should be done. What is important is that the level of detail it addresses is broadly proportionate to the degree of risk. There are probably as many different types of confined spaces as there have been fatalities in them and it would be implausible to expect a risk assessment to cover each and every one of them. For the more dynamic activities in UK and NI, where the detail of the work activity changes frequently, it is deemed to be acceptable practice to concentrate risk assessment on the broad range of risks that might arise (Health and Safety Agency NI 1992). Remembering that in the resulting safe working procedure (SWP) it is necessary to address the safety issues associated with entering individual confined spaces.

The safe working in confined spaces working will only truly be achieved when there is direct involvement, commitment and leadership from line management in the development of and administration of an effective SWP (Singleton 1998). The SWP must be written in a clear, concise and unambiguous manner and operated with a high degree of

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competence from managers and workers alike. The factors which will ensure success, discussed in more detail below, include;

- Confined spaces entry workers to be medically and physically fit,
- confined spaces training and assessment for worker and managers,
- management system, based on risk assessment principles, featuring pre-entry checks, permits to work (if required) and emergency rescue arrangements,
- regular safety inspections and audits with any violations dealt with swiftly and effectively,
- accidents to be investigated and lessons learnt to be shared both internally and externally within the industry, and
- risk assessments to be reviewed as part of any accident investigations.

Competence and supervision - The degree of supervision of confined spaces workers should be in direct proportion to their level of competence, therefore it is vital to have a system to determine, at the outset and at regular intervals, that the worker is both able and competent. Managers should be aware that an individuals level of medical and physical fitness can vary in between medical examinations. Any deterioration could adversely affect the safety of the workers and his colleagues while in the confined space. Competence is not determined simply by attending a training course, rather it something which needs to be assessed after training and at regular intervals beyond. It is also about knowing your limits so that, should the exceptional arise, you know what you can deal with as result of your own experience or expertise and when to call for additional assistance. If this is the case then the exceptional violations (HSE 1995) can be avoided.

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The need to regularly check competence in the use of breathing apparatus, safe entry techniques and emergency evacuation arrangements is essential since there are people who only occasionally effect a confined spaces entry. When the time comes they need to be able to do so confident in the knowledge that they can deal with any foreseeable event.

association meetings and very effectively on the internet. It is only through learning the lessons from accidents and incidents that we will truly be on the road to zero fatalities.

Costs of safety management

Traditionally the costs associated with safety have been linked to the identification of workplace accidents and the incidental costs (McAleenan and McAleenan 1998a) . Confined spaces accidents like any other workplace accidents have considerable human costs, affecting the workers' immediate family, wider family circle and work colleagues. For instance the death toll of 87 confined spaces fatalities across the USA in 1997 has the potential to impact dramatically and permanently on the lives of upwards of 2000 relatives. The numbers, although small, relative to the USA working population, are totally unacceptable since with effective management such deaths are avoidable.

Work related fatalities, injuries and ill health continue to cost the world economy billions every year[4]. The HSE estimates that businesses in the UK lose upwards on £9bn, annually, through lost production, insurance and compensation. The Trade Unions Congress (TUC) has further estimated that this figure could be doubled if consideration is given to the true loss of income suffered by the victims of workplace accidents (Tolley 1997) coupled with the additional costs passed onto consumers through higher prices. The Eurostat figures rank the UK as having the third lowest accident rate in Europe (IRN/ HRM 1998). The US National Safety Council has estimated that in 1997 work related death and injury cost the country $127.7bn (Karr 1999). The major western economies, it

[4] Injuries at work cost the equivalent of £21 a week for each British family.

seems, are expending more on accidents or compliance failures than the GDP of the majority of countries in the world (Economist 1998)[5].

Whilst strict comparisons cannot be made between the US and UK on these figures alone, it is abundantly clear that safety management failure is a very costly business.

Many of the intangible costs will never be measured but there are more obvious associated costs facing an organisation in this predicament such as, accident investigations, lost time, recruitment, worker retraining and legal penalties. These negative costs have the effect of associating safety with the measurement of failure. It is not surprising, therefore, that it is difficult to associate the company's safety department with improving its profitability. However measuring safety performance much earlier in the process will deliver significant cost savings by detecting non-conformance sooner. In the longer term the failure costs will reduce as proactive safety performance becomes the company norm. It is widely acknowledged in the quality field that for every £1 spend on quality improvement can net up to £7 in saving. If we apply this to the safety business on the macro level then NSSB spending on improving enforcement could significantly reduce the cost burden on the economy. In the UK for example, it would take an investment of £2.3bn to eliminate the £16bn cost of accidents (Davies and Teasdale 1994). Just imagine the effect a £2.3bn cash injection would have on safety enforcement.

The number of fatal and near-fatal confined spaces accidents is a reminder that every act has a consequence and often the consequence has too high a price to pay. McAleenan and McAleenan (1998b) argue that the objectives of any good safety management system is to reduce accidents or injuries in a cost effective manner through;

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[5] In 1998 only 30 countries had a GDP greater than $130bn.

- Senior management commitment,
- High quality risk assessment based safety management systems,
- Worker participation in safety improvements, and
- Training programmes designed to increase manager and worker competencies.

There are clear operational and financial benefits for companies who operate their business within structured and workable safety management systems. However for companies failing to address these issues properly there are legal consequences and considerable financial penalties to be faced. In the high risk area of confined spaces working it is imperative that companies take full cognisance of all the requirements of their own NSSB and put in place a comprehensive yet workable confined spaces safety management system. Such proactive measures will serve to reduce the number of confined spaces accidents and should eradicate the fatalities.

Conclusion

Violations that occur across all industry sectors are the product of a number of factors including; employee behaviour (the result of inadequate training and supervision), and avoidance of safety procedures by companies in the pursuit of increased productivity or the retention of market positions. Thus in all regards, violations are the responsibility of the company, the corollary of which is that compliance and compliance management is a corporate function. Safety and quality are not irreconcilable concepts. Poor quality procedures could causes safety failures and poor safety procedures will reflect negatively on quality. In partnership, safety professionals and the managers of quality procedures

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can and should be designing safe systems that are commensurate with the work to be done. Compliance with safety requirements can be forced, but when led from the top with executive direction, competent line management and skilled worker input, safety becomes a natural and accepted practice in the workplace. There should be no need for aggressive enforcement.

It is this approach that should be encouraged by the enforcement agencies. Aggressive enforcement can and often does create a culture of "enforcement shadowing", with systems being put in place simply to avoid being caught out, and being dropped when the attention of the enforcer turns elsewhere. If we are promoting the integration of safety and quality procedures within the workplace, then contiguous with this is the national management of compliance by the enforcement agencies via a similar integration of national safety and quality standards.

Resource limitations mean that enforcement agencies are obliged to target those areas with the apparent highest accident rates. There is an analogy with the plate juggler in the circus who manages dozens of plates spinning on top of poles. He does not wait until a plate crashes to the floor before tuning his attention to it but rather continually keeps his attention on all of them. He moves between them supporting each with a nudge as required. Similarly in industry and at national levels, safety can be managed by paying attention to all parts and supporting those areas that show signs of wobbling. When the plates begin to fall the time taken to clear the damage and start a new plate spinning is time away from managing the other plates so they in turn fall. Time repairing the damage of major compliance failures is time away from managing safety elsewhere. If safety is not being properly managed more failures occur. Proper resource management coupled with

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judicious short term investments will net long term benefits with employers and NSSBs able to meet their safety obligations.

Aggressive enforcement is required when there are deliberate and malfeasant violations of safety standards in order to meet the demands of production, efficiency savings, or when negligent management causes or has the potential to cause serious injury, fatality or destruction. This is not a negation of the argument that good management flows from the willingness and acceptance, by all, of the need for quality procedures, but is the warning behind the system that failure carries with it severe consequences.

If we are going to achieve zero fatalities and zero major injuries in confined spaces then we need to put a stop to violations, learn the lessons from past accidents and improve our safety management.

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