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Management Commitment to Safety & Risk of Workplace Injury: A Workers’ Compensation Insurance Perspective

Katherine E. Schofield, Bruce H. Alexander, Susan Goodwin Gerberich and Andrew Ryan

Abstract

Management commitment to safety has been identified as a factor in employee injury prevention, but has not been evaluated solely from an outside entity perspective to predict injury risk. We evaluated workers’ compensation claims from construction companies to explore the association between OSH professional evaluations of management safety commitment and different types of injury rates. Employee hours and claim data were used to calculate injury rates. OSH professionals rated employer management commitment as good or poor; good was used as the comparison group. A Poisson model was used and generalized estimating equations accounted for correlated data. Rate ratios and 95% confidence intervals were estimated for injury rates. Models included covariates of company premium-size, union status, and trade. Results of total, lost-time and medical injuries revealed limited differences on an aggregate level between companies having a good or a poor management commitment. Significant elevation of risk was detected for some trade-specific rates. Employers were also at increased risk during the time prior to OSH professionals rating visits. Further investigation into data combinations providing predictive capabilities, or OSH professional guidance to improve management commitment may be warranted.

Keywords
workers’ compensation, insurance, injury, construction, occupational, Poisson, management commitment, safety culture, safety climate, safety professional

Introduction

Ongoing efforts to advance occupational safety and employee injury reduction have increased the focus of safety and health to include organizational factors. Two terms used to describe organizational factors related to safety are safety culture; an organization’s norms, beliefs, roles, attitudes, and practices concerned with minimizing exposure of employees to workplace hazards, and safety climate; a snapshot of the prevailing state of safety in the organization at a discrete point in time (Choudhry, Fang & Mohamed, 2007; Flin, Mearns, O’Connor, & Bryden, 2000; Gillen, Baltz, Gassel, Kirsch & Vaccaro, 2002; Huang, Ho, Gordon & Chen, 2006; Turner, 1991). Studies of climate, culture and perception have identified management commitment as one effective and important way to achieve a positive safety culture or safety climate. Management commitment, broadly defined, is management’s involvement, participation in, promotion, and enforcement of the safety culture and safety programs across all levels of an organization (Choudhry, et al., 2007; Flin, et al., 2000; Gillen, et al., 2002; Huang, et al., 2006; Lehtola, et al., 2008; Wirth & Sigurdsson, 2008; Zohar, 1980). The safety culture or climate of a company, and management commitment, are believed to play a role in risk of employee injury (Huang, et al., 2006). One study on management commitment showed a large reduction in lost-time injury rates (Garrett & Perry, 1996). Another hospital-based study indicated that management commitment was one of six management practices that, together, significantly predicted employee injury ($p < .1$), but was not by itself a significant predictor (Vredenburgh, 2002). Company culture is an influential and a powerful motivator, but may take time to change or modify as employees may resist change (Kletz, 1993, 1985). Statements and policies on management commitment are not enough; if supervisors do not convey commitment (Hofmann & Stetzer, 1996) or behaviors and activities do not adequately reflect commitment (Hofmann, Jacobs & Landy, 1995), employees may not think safety is important. Much of the research on management commitment has been centered on internal company factors and employee

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perceptions. Equally important, is insight if this relationship between management commitment to safety and effect on injury continues to hold true when based on an outside observer’s perception. This would be of interest for any outside occupational safety and health professional (OSHP) working with employers, but is particularly important for the insurance industry where the practice of evaluating management is common. Enormous amounts of data are compiled from OSHPs activities, and can be coupled with workers’ compensation claims data for a more complete picture of employers. These data are not standardized across insurance carriers, and are often proprietary information. Many insurance carriers employ OSHPs who are tasked with using their expert opinion to assess current or prospective policyholders on risk, programs and controls, and also on a perceived management commitment, attitude or willingness to partner. This subjective opinion on “commitment” can often be taken into consideration in the same respect as the more factual and objective measures of the OSHP assessment. It would be assumed that an employer with lack of commitment is at increased risk of employee injury and increased claim severity, both from a pre-injury hazard control and a post-injury claim management standpoint, whereas an employer with good commitment is at a decreased risk.

OSHP assessments often have major ramifications for both the employers and the insurance carriers from a financial and injury prevention standpoint. An insurance carrier may decline to insure a company if it feel the company is not committed to claim prevention, or the carrier may increase premiums and costs for the employer. Alternatively, an insurance carrier may give discounts in pricing to employers perceived as committed and possessing a good attitude. An insurance carrier may focus or direct OSHP efforts and resources based, in part, on the perception of an employer’s commitment to safety and what is believed to be subsequent risk of employee injury.

Research about management commitment and translation to employee safety in the construction industry has illustrated that management commitment was cited as an important factor in worksite safety (Choudhry, Fang & Lingard, 2009; McDonald, Lipscomb, Bondy & Glazner, 2009; Gillen, et al., 2002). However, construction may differ from other industries due to multiple, changing worksites and unique industry culture where risky behavior may be more normalized, emphasis on safety is put secondary to task completion, or employees are punished for injury (Barksy, 1997; Breslin, Polzer, MacEachen, Morongiello & Shannon, 2007; DeLeire & Levy, 2004; Grazier & Sloane, 2008; Gregory, 2006; Iacuone, 2005; Leigh, 1986; Lipscomb, Nolan, Patterson, Sicca & Myers, 2013; Paap, 2006; Savage, 1993; Smith, Huang, Ho & Chen, 2006; Thoms & Venkata, 2002; Veevers & Gee, 1986). Construction has a high rate of injuries and worker fatalities (BLS, 2013; NIOSH, 2009). Employment in construction has been associated with a higher probability of disability from injury (Stover, Wickizer, Zimmerman, Fulton-Kehoe & Franklin, 2007) and disproportionately higher direct and indirect cost of injury, almost double compared to other industries (Waehrer, Dong, Miller, Haile & Men, 2007).

Measuring a significant relationship between the OSHP’s perception of employer commitment and risk of injury can help both OSHPs and insurance carriers focus on more effective strategies to reduce human and financial loss from a workplace injury. The detection of a reliable relationship allows for more exploration of this measure and continued use to direct business and loss prevention decisions; the lack of a relationship acknowledges that the OSHP’s perception of management attitude, although perhaps accurate, does not translate into an accurate predictor of employee risk. This study aimed to explore if OSHP’s perception of poor, compared to good, commitment, is related to increased risk of employee injury and severity.

Materials & Methods

Population Data & Collection

Workers’ compensation claims were used to examine injuries in employees who obtain workers’ compensation insurance from a self-insured workers’ compensation fund that insures companies engaged in construction and construction-related businesses within the state of Minnesota. During the study period all companies in the study employed fewer than 200 employees, with the majority of companies having 50 employees or less. The study included all data from all companies insured by the fund during the time period 2004 to 2009.

Person-time at risk was established for all employees of each company through monthly payroll and analyzed as hours worked in each class code within the company. Class codes are a pricing component in workers’ compensation that classify risk or workplace exposure (e.g., clerical versus carpentry). Minnesota uses the classification system that is devised and maintained by National Council on Compensation Insurance (NCCI). A class that is more likely to experience loss due to risk of work being performed has a higher insurance cost. Some class codes in this study were combined to form trade groups with similar exposures for analysis. Companies were also classified by union status and premium bands of $1-$15K; $15,001 to $75K; and greater than $75,001K. Premium is a pricing mechanism that combines class code, rate and payroll and, thus, enables an estimation of risk of operations, company size and OSHP attention; larger premiums generally receive more OSHP attention.

Claims Data, Collection & Outcomes

Claims data captured all injuries and illnesses reported by employees and submitted to the insurance fund by policyholders for compensation. All claims are classified as medical or lost-time. Minnesota state statutes define a lost-time claim as claims that involve injuries or illnesses resulting in more than three consecutive calendar days of lost work time and include payment of medical and wage loss costs. Medical-only claims incurred only medical costs.
OSH Professionals & Management Commitment Rating

The insurance fund has a comprehensive loss control (LC) division that evaluates policyholder safety practices to identify modifiable factors to reduce injuries and compensation costs. The LC division is comprised of OSHPs with advanced degrees in their field. Comprehensive policyholder evaluations were conducted, in most cases, within 60 business days of commencement of workers’ compensation policy and, periodically, thereafter in 1- to 3-year intervals based upon company size. OSHPs meet with a policyholder representative and conduct a standardized evaluation interview. The evaluations ascertain the company’s operations, employment practices, major hazards and loss sources, safety efforts and programs, hazard controls and injury management process. A portion of the evaluation asks the OSHPs to consider their perception of management’s willingness to cooperate, to implement safety recommendations, abate hazards, accept assistance, partner with the insurance carrier to reduce risk and cost of injury, as well as the general tone and atmosphere of the meeting.

From these general guidelines, OSHPs formulate their qualitative rating of management commitment and select between the two choices of “good” or “poor” on the survey instrument. A third comparison group, “not yet rated,” was created for the hours at-risk during the time before a company received the initial LC visit and evaluation and had OSHP contact. A policyholder’s rating could change throughout the study period, based upon the results of additional evaluations. The hours at-risk of companies that transitioned to different rating categories over the study time period were changed at month of the switch to the new categorization. Ratings of management of commitment were categorized as: poor (n = 363 claims, n = 7,195,780 hours, 3,597 FTE) or not yet rated (n = 1,935 claims, n = 33,730,250 hours, 16,865 FTE) vs. good (n = 7,688 claims, 144,882,922 hours, 72,441 FTE). Groups were dummy coded and run against the good group as a comparison. No sampling was conducted for this study; all companies insured throughout the time of the study were included. Even so, only a small percentage of companies were rated as having “poor” commitment during the course of the study.

Analysis

The injury claims and hours at-risk data were used to determine injury rates. The effect of commitment ratings on injury were evaluated by estimating rate ratios (RR) and 95% confidence intervals (CI) as a function of injury rate. Time-dependent multivariate analysis was used to examine total, medical, and lost-time claim outcomes. A Poisson regression model was chosen due to the rate structure of the data and accounted for time-dependent factors (Haenszel, Loveland & Sirken, 1962). Robust standard errors were used for the parameter estimates to control for violation of distribution assumptions and over-dispersion and zero-inflation were taken into consideration. Generalized estimating equations (GEE) were used to account for correlated observations within companies over time (Liang & Zeger, 1986). An auto-regressive matrix was used for GEE, assuming observations closer together in time were more correlated than those further apart. The model included potentially confounding covariates of trade, union status and manual premium size, identified a priori. All analyses were done using SAS (2011).

Results

During the study period, 1,360 companies compiled 185,766,467 hours of employee time at risk, representing approximately 92,882 full-time equivalent employees (FTE) and 9,986 workers’ compensation claims for an average claim rate of 10.75 per 100 FTE. Medical claims comprised 7,693 of overall claims and 2,292 were lost-time injury claims. The total incurred cost of all injury claims during this period was $90,416,073. Rates varied among trade categories. Iron and steel workers had noticeably higher rates (82.8 per 100 FTE) than the second highest trade category of HVAC and plumbing workers (26.2 per 100 FTE). Union companies and companies of larger premium size had higher injury rates (Table 1, p. 189). The ratio of lost-time to medical claims in our population revealed the poorly rated group had a much higher ratio (0.385) than the good group (0.293) and the not-yet-rated group (0.302), thus they reported fewer medical claims per lost-time claim than the other groups; companies rated as good reported the most medical claims per lost-time claim.

Analysis did not reveal any significant differences in risk of injury between those companies that were perceived as having poor management commitment to safety and those rated as having good management commitment (Table 2, p. 190). This trend was true for total injury claims RR = 0.94 (CI = 0.74-1.19), as well as when analyzed by lost-time injury classification RR = 1.15 (CI = 0.85-1.55) and medical claim classification RR = 0.88 (CI = 0.67-1.15). However, during the period of before the evaluation by the OSHP there was an increased risk of injury for total claims RR = 1.11 (CI = 1.03-1.21) and medical claims RR = 1.11 (CI = 1.11-1.22) and lost-time RR = 1.13 (CI = 0.99-1.28). No significant differences were associated for management commitment ratings and risk of injury with respect to a company’s union status or manual premium size.

Analysis of risk by trade stratification revealed associations with rating of management commitment for total injury claims. Compared to a company with a good management rating, companies with a poor rating with trades of drywall RR = 1.82 (CI = 1.15-2.88), flooring installation and flatwork RR = 2.06 (CI = 1.28-3.29), and iron and steel RR = 5.75 (CI = 1.96-16.82), were at significantly increased risk of injury claims (Table 3, p. 191). However, three trades, supervisors, garbage and recycling, and equipment installation and assembly had decreased risks of injury when management was rated poorly. Significantly increased risk of injury for companies in the not-yet-rated group was present for: the trades interior carpentry; flooring and flatwork; iron and steel; and nursery and landscaping.

When examining risk lost-time injury, elevated risk was present when the management was rated poorly for drywall RR = 2.32 (CI = 1.02-5.26), flooring installation and flatwork
RR = 2.39 (CI = 1.12-5.12), electrical installation RR = 2.03 (CI = 1.04-3.95), and roadwork and equipment operators RR = 2.44 (CI = 1.23-4.84) (Table 4, p. 193). There were no trades that continued to exhibit reduced risk with a poor rating. The increased risk of injury for companies in the ‘not yet rated’ group was only illustrated in one trade, nursery and landscaping, when examining lost-time injuries.

Discussion

The utilization of workers’ compensation data, as well as internal OSHP data, allowed for the unique ability to follow a cohort of construction companies and track injury experience and rating of management commitment. The time period of this study itself was unique in that it included both the peak of the housing boom, the time preceding the housing market crash, as well as its initial years of the recession. These widespread economic conditions may affect data in ways unknown.

Worker’s compensation data may be limited when injuries are underreported and evidence exists that underreporting does occur both at a systemic and industry level (Fan, et al., 2006; Lipscomb, et al., 2013; Shannon & Lowe, 2002). Underreporting, depending on the magnitude, can hinder precise ascertainment of injury rates. It can be particularly troublesome if one group non-randomly underreports more than another group. It could be assumed that medical injuries are easier to hide and underreport than more severe lost-time claims, and our data showed a much less liberal ratio of lost-time to medical reporting in the poor group versus the other groups. Employees in

<table>
<thead>
<tr>
<th>Exposed</th>
<th>Overall Claims (n)</th>
<th>Overall Rates</th>
<th>Lost-Time Claims (n)</th>
<th>Lost-Time Rates</th>
<th>Medical Claims (n)</th>
<th>Medical Rates</th>
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</thead>
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<tr>
<td><strong>Total Population</strong></td>
<td>9,986</td>
<td>10.75</td>
<td>2,292</td>
<td>2.46</td>
<td>7,693</td>
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<td>Rough Carpentry</td>
<td>1,835</td>
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<td>452</td>
<td>6.0</td>
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<td>77</td>
<td>4.79</td>
<td>259</td>
<td>15.92</td>
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<td>Supervisors</td>
<td>259</td>
<td>5.31</td>
<td>60</td>
<td>1.24</td>
<td>199</td>
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<td>Crane Operators</td>
<td>33</td>
<td>9.75</td>
<td>11</td>
<td>3.26</td>
<td>22</td>
<td>6.50</td>
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<td>158</td>
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<td>22</td>
<td>0.08</td>
<td>136</td>
<td>0.47</td>
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<td>1,240</td>
<td>7.56</td>
<td>238</td>
<td>1.46</td>
<td>1,002</td>
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<td>Drywall</td>
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<td>16.71</td>
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<td>4.81</td>
<td>428</td>
<td>11.90</td>
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<td>259</td>
<td>5.21</td>
<td>1,045</td>
<td>21.02</td>
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<td>2.97</td>
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<td>10.52</td>
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<td>27</td>
<td>8.95</td>
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<td>22.21</td>
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<td>Manufacturing</td>
<td>606</td>
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<td>85</td>
<td>2.67</td>
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<td>16.35</td>
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<td>Flooring Installation and Flatwork</td>
<td>441</td>
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<td>123</td>
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<td>89</td>
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<td>9.79</td>
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<td>54</td>
<td>4.53</td>
<td>233</td>
<td>19.46</td>
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<td>21.11</td>
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<td>3.66</td>
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<td>940</td>
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<td>&gt;$75,001</td>
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<td>12.76</td>
<td>1,154</td>
<td>3.02</td>
<td>3,818</td>
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Note. † Rate per 100 FTE (200,000 hours)
workplaces where they do not perceive management support or fear retaliation may be inclined to underreport (Gillen, et al., 2002; Lipscomb, et al., 2013; McDonald, et al., 2009). In a survey of union carpenters, reporting of injuries was fifty percent less prevalent when there was a negative consequence for injury and about one-third of the population said that injuries were almost never or rarely reported (Lipscomb, et al., 2013). Employers who lack insurance reporting knowledge and proper procedures, or who are willing to misrepresent their injury experience, may also underreport injuries (McDonald, et al., 2009). Either of these scenarios could reduce the effect of a poor management commitment rating if those companies underreport at greater rates than companies with good ratings. Interestingly, the total claims data showed that supervisors were at reduced risk of injury when their employer was rated as having a poor commitment; this relationship ceased for supervisors, and all trades, when examining just the more severe, lost-time claims. This was perhaps as a result of underreporting less severe medical claims versus a true reduction in risk of injury, due to effects of unsupportive management. Insurance companies and OSHPs can more closely examine whether a company is not reporting the number of claims that would be expected and focus attention on management education and employee reporting.

There was limited difference on an aggregate level between companies perceived as having a good or a poor management commitment. A review of other safety culture assessment surveys found similar results, with their conclusions noting there was great likelihood for non-random measurement error (O’Conner, et al., 2011). However, when Smith et al. (2006), examined the relation between safety climate and injury rates, they found that when they adjusted for the hazard levels of different industries, it significantly altered their results. This could possibly explain the results that showed significant risk for some trades; their inherent risk may be greater than others. This also lends itself to the numerous studies on the more risk tolerant culture and workers of the construction industry (Barksy, 1997; Breslin, et al., 2007; DeLeire & Levy, 2004; Grazier & Sloane, 2008; Gregory, 2006; Iacuone, 2005; Leigh, 1986; Paap, 2006; Savage, 1993; Smith, et al., 2006; Thoms & Venkata, 2002; Veveers & Gee, 1986). Coupled with widespread job sites, this culture may make management commitment to safety harder to consistently establish and demonstrate and, thus, more difficult to accurately measure compared to other industries. Even sincere management commitment without adequate translation to work sites may make employees think safety is not important (Hofmann & Stetzer, 1996; Hofmann, et al., 1995). An OSHP may correctly assess management commitment, but the actual implementation of it in the field may be imperfect, leading to the non-difference in injury rates between good and poorly rated companies. OSHPs could focus attention and provide resources to promote more consistent displays of management commitment, such as supervisory training, site safety visits, enforcement of safety rules or emphasis on injury reporting.

A small percentage of employers were rated as poor in this study, which led to sparse data in some areas of analysis. OSHPs may have been hesitant to give a poor rating in some circumstances, especially if they were trying to form a consultative relationship with the employer. Or, an employer could have had a high baseline injury risk, yet have been open and committed to OSHP assistance and injury reduction, thus, avoiding a poor rating. A higher degree of standardization could be necessary. Other areas that were not examined in this study, but are utilized by the OSHP during assessment, such as injury history, safety training, hazard controls and written programs, when coupled with the management rating, provide a more complete picture of a company’s injury risk. Similarly, Vredenburgh (2002) noted that management commitment was only predictive in reduction of injury risk when combined with other management measures, not when examined alone. Further research may be warranted into what combination(s) of company attributes, when combined with management commitment rating, can predict risk of injury.

An additional interesting outcome of the research was the result indicating that employers were at significantly increased risk in the time prior to meeting and being evaluated by the insurer’s OSHP. Other research seems to support related results looking at OSHA and OSHP contact (Baggs, Silverstein & Foley, 2003). The association of OSHP activity and injury risk reduction should be further explored. Utilizing these often low-cost or free services from workers’ compensation insurers could be an excellent resource and avenue for employers to reduce injuries in their workforce.

### Table 2 Management Commitment & Risk of Injury by Claim Type

<table>
<thead>
<tr>
<th>Claim Type</th>
<th>Management Commitment Rating</th>
<th>Claims</th>
<th>RR[^1]</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Not Yet Rated</td>
<td>1,935</td>
<td>1.11</td>
<td>1.03-1.21</td>
</tr>
<tr>
<td>Total</td>
<td>Good</td>
<td>7,688</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Poor</td>
<td>363</td>
<td>0.94</td>
<td>0.74-1.19</td>
</tr>
<tr>
<td>Lost-Time</td>
<td>Not Yet Rated</td>
<td>449</td>
<td>1.13</td>
<td>0.99-1.28</td>
</tr>
<tr>
<td>Lost-Time</td>
<td>Good</td>
<td>1,742</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Lost-Time</td>
<td>Poor</td>
<td>101</td>
<td>1.15</td>
<td>0.85-1.55</td>
</tr>
<tr>
<td>Medical</td>
<td>Not Yet Rated</td>
<td>1,485</td>
<td>1.11</td>
<td>1.01-1.22</td>
</tr>
<tr>
<td>Medical</td>
<td>Good</td>
<td>5,946</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>Poor</td>
<td>262</td>
<td>0.88</td>
<td>0.67-1.15</td>
</tr>
</tbody>
</table>

Note. †Controlling for trade, union status and manual premium size.
### Table 3  Management Commitment & Risk of Overall Injury By Trade

<table>
<thead>
<tr>
<th>Trade</th>
<th>Management Commitment Rating</th>
<th>Hours</th>
<th>Claims (n)</th>
<th>RR †</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough Carpentry</td>
<td>Not Yet Rated</td>
<td>3,558,937</td>
<td>477</td>
<td>1.07</td>
<td>0.89-1.27</td>
</tr>
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<td>Good</td>
<td>11,060,553</td>
<td>1,322</td>
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</tr>
<tr>
<td></td>
<td>Poor</td>
<td>456,830</td>
<td>36</td>
<td>0.77</td>
<td>0.51-1.16</td>
</tr>
<tr>
<td>Interior Carpentry</td>
<td>Not Yet Rated</td>
<td>484,361</td>
<td>73</td>
<td>1.54</td>
<td>1.05-2.27</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>2,685,508</td>
<td>262</td>
<td>1.00</td>
<td>.</td>
</tr>
<tr>
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<td>Poor</td>
<td>43,067</td>
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<td>0.25</td>
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<tr>
<td>Supervisors</td>
<td>Not Yet Rated</td>
<td>2,057,294</td>
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<td>0.56</td>
<td>0.37-0.83</td>
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<td>Good</td>
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<tr>
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<td>Poor</td>
<td>276,048</td>
<td>6</td>
<td>0.83</td>
<td>0.30-2.28</td>
</tr>
<tr>
<td>†Crane Operators</td>
<td>Not Yet Rated</td>
<td>258,309</td>
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<td>.</td>
</tr>
<tr>
<td></td>
<td>Good</td>
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<td>0</td>
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</tr>
<tr>
<td>Sales and Retail</td>
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</tr>
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<td>45,022,025</td>
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<td>.</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>2,469,555</td>
<td>5</td>
<td>0.83</td>
<td>0.30-2.28</td>
</tr>
<tr>
<td>Shopyard and Deliveries</td>
<td>Not Yet Rated</td>
<td>6,367,580</td>
<td>246</td>
<td>1.06</td>
<td>0.82-1.37</td>
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<tr>
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<td>Poor</td>
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<td>1.01</td>
<td>0.52-1.94</td>
</tr>
<tr>
<td>Drywall</td>
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<td>0.99</td>
<td>0.69-1.40</td>
</tr>
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<td>Poor</td>
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<td>56</td>
<td>1.82</td>
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</tr>
<tr>
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<td>Poor</td>
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<td>81</td>
<td>0.73</td>
<td>0.47-1.15</td>
</tr>
<tr>
<td>‡Auto Repair</td>
<td>Not Yet Rated</td>
<td>194,559</td>
<td>17</td>
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<td>Good</td>
<td>522,468</td>
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<td>Poor</td>
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<tr>
<td>‡Roofing</td>
<td>Not Yet Rated</td>
<td>47,570</td>
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<tr>
<td></td>
<td>Good</td>
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<td>Manufacturing</td>
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<td>5,287,659</td>
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<tr>
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<td>Poor</td>
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<td>0.28</td>
<td>0.08-1.03</td>
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<tr>
<td>Flooring Installation and Flatwork</td>
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<td>589,751</td>
<td>97</td>
<td>1.64</td>
<td>1.17-2.32</td>
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<tr>
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<td>59,439</td>
<td>14</td>
<td>2.06</td>
<td>1.28-3.29</td>
</tr>
<tr>
<td>‡Trucking</td>
<td>Not Yet Rated</td>
<td>49,035</td>
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</tr>
<tr>
<td></td>
<td>Good</td>
<td>437,361</td>
<td>18</td>
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</tr>
<tr>
<td></td>
<td>Poor</td>
<td>16</td>
<td>0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Electric Installation and Assembly</td>
<td>Not Yet Rated</td>
<td>444,783</td>
<td>31</td>
<td>0.84</td>
<td>0.56-1.27</td>
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<tr>
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<td>Good</td>
<td>3,040,217</td>
<td>226</td>
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<tr>
<td></td>
<td>Poor</td>
<td>323,109</td>
<td>14</td>
<td>0.61</td>
<td>0.33-1.11</td>
</tr>
<tr>
<td>Painting</td>
<td>Not Yet Rated</td>
<td>625,324</td>
<td>58</td>
<td>1.42</td>
<td>0.91-2.22</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>5,332,139</td>
<td>377</td>
<td>1.00</td>
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<tr>
<td></td>
<td>Poor</td>
<td>23,193</td>
<td>2</td>
<td>1.62</td>
<td>0.35-7.50</td>
</tr>
<tr>
<td>Concrete and Masonry</td>
<td>Not Yet Rated</td>
<td>2,935,000</td>
<td>231</td>
<td>1.07</td>
<td>0.84-1.37</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>11,540,199</td>
<td>831</td>
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<tr>
<td></td>
<td>Poor</td>
<td>768,975</td>
<td>45</td>
<td>0.81</td>
<td>0.41-1.58</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>Not Yet Rated</td>
<td>97,828</td>
<td>43</td>
<td>1.85</td>
<td>1.19-2.90</td>
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<td>557,839</td>
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<td>Poor</td>
<td>2,505</td>
<td>41</td>
<td>5.74</td>
<td>1.96-16.82</td>
</tr>
<tr>
<td>Roadwork and Equipment Operators</td>
<td>Not Yet Rated</td>
<td>732,059</td>
<td>42</td>
<td>1.19</td>
<td>0.75-1.89</td>
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<tr>
<td></td>
<td>Good</td>
<td>4,542,281</td>
<td>253</td>
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<td>.</td>
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<tr>
<td></td>
<td>Poor</td>
<td>224,101</td>
<td>15</td>
<td>1.48</td>
<td>0.75-2.90</td>
</tr>
<tr>
<td>Garbage and Recycling</td>
<td>Not Yet Rated</td>
<td>688,621</td>
<td>42</td>
<td>0.95</td>
<td>0.64-1.43</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>1,482,622</td>
<td>101</td>
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<tr>
<td></td>
<td>Poor</td>
<td>315,311</td>
<td>12</td>
<td>0.59</td>
<td>0.40-0.86</td>
</tr>
<tr>
<td>Nursery and Landscaping</td>
<td>Not Yet Rated</td>
<td>432,110</td>
<td>78</td>
<td>1.72</td>
<td>1.07-2.75</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>1,932,086</td>
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<tr>
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<td>Poor</td>
<td>21,670</td>
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<td>0.55</td>
<td>0.07-4.51</td>
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<tr>
<td>Equipment Installation and Assembly</td>
<td>Not Yet Rated</td>
<td>317,866</td>
<td>20</td>
<td>0.66</td>
<td>0.42-1.05</td>
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<td>Good</td>
<td>1,229,038</td>
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<td>Poor</td>
<td>38,724</td>
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<td>0.17</td>
<td>0.10-0.28</td>
</tr>
</tbody>
</table>

*Note. †Controlling for company premium size and union status. ‡Not enough data available for analysis.*
### Table 4  Management Commitment & Risk of Lost-Time Injury by Trade

<table>
<thead>
<tr>
<th>Trade</th>
<th>Management Commitment Rating</th>
<th>Hours</th>
<th>Claims (n)</th>
<th>RR†</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough Carpentry</td>
<td>Not Yet Rated</td>
<td>3,558,937</td>
<td>117</td>
<td>1.07</td>
<td>0.81-1.41</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>11,060,553</td>
<td>324</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>456,830</td>
<td>11</td>
<td>0.91</td>
<td>0.48-1.70</td>
</tr>
<tr>
<td>Interior Carpentry</td>
<td>Not Yet Rated</td>
<td>484,361</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>2,685,508</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>43,067</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisors</td>
<td>Not Yet Rated</td>
<td>2,057,294</td>
<td>10</td>
<td>0.76</td>
<td>0.36-1.60</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>7,356,793</td>
<td>47</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>276,048</td>
<td>3</td>
<td>1.92</td>
<td>0.48-7.62</td>
</tr>
<tr>
<td>Crane Operators</td>
<td>Not Yet Rated</td>
<td>258,309</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>417,587</td>
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<td></td>
</tr>
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<td></td>
<td>Poor</td>
<td>19</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales and Retail</td>
<td>Not Yet Rated</td>
<td>10,327,160</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
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<td>2,469,555</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shop, yard and Deliveries</td>
<td>Not Yet Rated</td>
<td>6,367,580</td>
<td>52</td>
<td>1.18</td>
<td>0.83-1.68</td>
</tr>
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<td>Good</td>
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</tr>
<tr>
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<td>Poor</td>
<td>798,580</td>
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<td>1.09</td>
<td>0.48-2.48</td>
</tr>
<tr>
<td>Drywall</td>
<td>Not Yet Rated</td>
<td>768,560</td>
<td>13</td>
<td>0.76</td>
<td>0.39-1.48</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>5,998,989</td>
<td>139</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>423,638</td>
<td>21</td>
<td>2.32</td>
<td>1.02-5.26</td>
</tr>
<tr>
<td>HVAC and Plumbing</td>
<td>Not Yet Rated</td>
<td>1,808,676</td>
<td>44</td>
<td>0.91</td>
<td>0.62-1.32</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>7,332,633</td>
<td>197</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>800,499</td>
<td>18</td>
<td>0.85</td>
<td>0.51-1.42</td>
</tr>
<tr>
<td>Auto Repair</td>
<td>Not Yet Rated</td>
<td>194,559</td>
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**Note.** †Controlling for company premium size and union status. ‡Not enough data for analysis.
An outside perception of management commitment does not appear to be wholly indicative of risk of injury within a company, but may be predictive for some construction trades or potentially in combination with other measures. Continued exploration of valuable workers’ compensation data sources may help refine this measure. More investigation can direct OSHPs as to how to provide resources and assist management in improving their commitment, and its visibility to employees, for injury prevention.

References


Acknowledgments

This work was supported by a traineeship from the National Institute of Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention, through the University of Minnesota (T42OH008434) and by the CPWR—The Center for Construction Research and Training through a NIOSH cooperative agreement OH009762. The authors acknowledge The Builders Group (TBG) for access and continued use of its data. The content of this work is solely the responsibilities of the authors and does not necessarily represent the official views of NIOSH, CPWR or TBG.


Workplace Respect & the Link to Safety in the Workplace

By Craig B. Clayton Sr.

Workplaces are becoming increasingly more diverse. These changes are creating opportunities for managers, leaders, and employees to interact in ways that can present challenges. This article presents two key points for consideration by OSH professionals. Each has a significant impact on all members of the organizational workforce, but there are specific implications for women, immigrants, and people of color.

1) Lockout/tagout: It is time to “lockout and tagout” inappropriate behaviors in the workplace, not just equipment.

2) Behavior-based safety (BBS) should include a focus on derailing behaviors. Such behaviors affect performance, productivity, profitability, and safety.

Lockout/Tagout

Many production environments have documented, discussed, and implemented procedures that empower employees to take control of equipment in their workplace that they see as potentially being unsafe. This empowerment has helped to greatly reduce the number of recordable incidents as well as safety-related mishaps, injuries, and production losses. One of the most impactful areas of need in many operational, production, and workplace settings today is the need to reduce and/or eliminate the inappropriate behaviors of many managers and co-workers. Derailing behaviors specifically manifest when employees interact, communicate, and conduct themselves in meetings and more.

Behavior-Based Safety

The OSH industry has helped most organizations embrace BBS models as part of their regular business practice. The wisdom of connecting ways to manage, regulate, and encourage employees to conduct the operational aspects of their job in ways that encourage and ensure their safety and that of their co-workers makes good business sense. Unfortunately, many times the approach to ensuring appropriate behavior is limited to ensuring that “work-related” activities are conducted in a way that repeats job-specific practices in a systemic and process-based manner with an emphasis on safety. Research shows the prevalence of derailing behaviors has created organizational cultures that encourage acts of incivility, broken dignity entitlements, micro-inequities, and workplace bullying. These behaviors negatively affect all employees; especially people of color.

Derailing behaviors are occurring at rampant levels and are costing organizations millions of dollars each year.

Respectful Workplace Policies

The key to eliminating derailing behaviors from the workplace is to establish a respectful workplace policy. This strategy includes creating minimal behavioral standards, workplace programs, and training that allow employees to be clear about how to respectfully interact with their managers, direct reports, and peers.

When organizations fail to clearly define workplace policies around the topic of respect, employees tend to treat each other in ways that are not always in violation of policies yet leave people feeling violated. Respect should not be something that happens on occasion; it should be a consistent, daily occurrence. How does this relate to the topic of OSH?

A study by the University of Houston’s C.T. Bauer College of Business has now linked the prevalence of derailing behaviors in the workplace to a fourfold increase in safety incidents.

Many people assume that respect in the workplace is something you have to earn. Many managers treat employees in ways that imply that they demand respect. Supervisors hold a hierarchical title providing them a position of authority, and many of them use that title as a way to “make” people respect them. This form of respect only has validity when the person with the title is in the room. The real goal should be to command respect. The key to being able to command respect is to treat people with dignity, this allows you to earn their respect.

How Many People in Your Organization Are Suffering From Too Much Respect At Work?

When employees are treated with dignity and respect, there is a significant link to increased effort, improved performance, and now increased safety in the workplace.
Intuitively, people have known for years that if people are distracted there is a chance that their behavior would lead to increased chances for them to have a safety-related incident in the workplace due to inattentiveness.

Derailing behaviors exist in all organizations. These behaviors manifest themselves in many ways. The first step in beginning to reduce them is to get some conceptual clarity about what derailing behaviors are, how prevalent they are and how they affect business metrics.

The four primary types of derailing behaviors are:

- broken dignity entitlements;
- micro-inequities;
- corporate bullying;
- acts of incivility

Link Between Derailing Behaviors & Women, Immigrants & People of Color

The University of Houston study demonstrated the prevalence of derailing behaviors in all organizations. The correlations were clear and compelling that these behaviors and numerous metrics have an impact on performance, productivity and profitability. Here are some statistical data points from the study:

- 71% of all employees have experienced derailing behaviors in the last 12 months.
- 25% of those reported having lost productive time at work worrying and/or avoiding the person who committed the behavior(s).
- Those observing these behaviors reported experiencing 3.9 incidents in the last 12 months.
- Those losing productive time report 7.8 hours of lost productivity per incident.

As significant as these number are, from the perspective of people of color another data point was even more significant:

- Employees of color who witness diversity-related acts of incivility (DRIs) report being up to three times more likely to leave if another job were available compared to caucasian employees.

The University of Houston study examined the impact of these derailing behaviors on all employees. Each of these terms were coined in other studies that began the process of identifying the impact of derailing behaviors. Let’s further explore the meanings of these behaviors:

Broken Dignity Entitlements

Dignity entitlements are not a part of an employee’s written contract, yet they are part of what employees expect and should receive in the workplace. When dignity entitlements have been fulfilled, it leads to the willingness of employees to give their best efforts on a regular basis.

Micro-Inequities

Micro-inequities are subtle forms of demeaning behaviors that rarely violate organizational policies, yet still make people feel violated. These terms were coined in a 2001 study by MIT’s Sloan School of Business.

Acts of Incivility

A study by Brookings Institute identified behaviors that were evidenced as disrespectful and/or demeaning, and that undermined the dignity and self-esteem of employees and created unnecessary suffering in the workplace. These behaviors go way beyond just being impolite.

Corporate Bullying

Corporate bullying includes interpersonal behaviors in the workplace that can manifest in several ways and in several forms, such as persistent and unjustified criticism or unfair allegations of incompetence.

How Prevalent Are These Derailing Behaviors

According to a study by University of Houston’s International Institute for Diversity, more than 71% of employees had witnessed on average four derailing behaviors per year. When asked about these acts in a follow-up study, two of three respondents stated they felt the acts of incivility they observed or were subjected to, were perceived to be diversity related.

These DRIs were believed by the respondents to be associated with primary dimensions of diversity—race, gender, age, religion and sexual orientation. The impact on employees who are on the receiving end of DRIs is devastating. The negative impact is not limited to the individual experiencing the act of incivility, it also influences those who observe it. It is reasonable to assume that some employee turnover is directly associated with acts of disrespect or discrimination in the workplace.

Corporate Bullying & Workplace Safety

The study found a significant link between the amount
of acts of incivility in the workplace and measurable business indicators that impact earnings and the bottom line. In general, here are some areas influenced:

- amount of discretionary effort given;
- sick days and company medical expenses;
- frequency of safety incidents;
- overall propensity to leave (turnover);
- impact on worker ideas and suggestions (creativity);
- lost revenue per full-time employee;
- effect on regrettable losses;
- impact on unexcused absences;
- quality of customer service given.

Examining Workplace Bullying

Corporate bullying falls into several categories. The most prevalent form is back-stabbing, defined as unfairly criticizing a person behind his/her back to gain personal advantage. Another prevalent form is psychological bullying—repeated rude, intentional disregard of a person’s opinion or presence, or selective, unwarranted exclusion of a person from particular activities that has the effect of embarrassing, devaluing or annoying certain people. According to the study, both forms of bullying have been observed by as many as one in three employees.

Other forms of bullying include:

- repeated, confrontational, in-your-face demeanor;
- verbal bullying—severe criticism designed to demoralize;
- excessive profane language used to intimidate or demean;
- physical bullying—offensive gesturing or moving close enough to intimidate.

It is important to note that not all negative behavior is bullying. Most bullying has three consistent threads:

1) deliberate;
2) disrespectful;
3) repeated over and over.

Diversity Link

When measuring the perceived reason for the disrespectful and/or demeaning behavior:

- 54% of the respondents perceived the behavior to be based on gender;
- 43% perceived the behavior to be based on race;
- 41% perceived the behavior to be based on age.

In many organizations, the issue of corporate and/or workplace bullying has become an epidemic. Many manufacturing and production environments have a high percentage of bullying incidents occurring. Managers who have great operational skills are often promoted into leadership based on their operational talents. This is important because studies have indicated that as much as 72% of bullying involves managers bullying their direct report.! Here are some additional statistics of interest:

- 37% of the workplace has been bullied (minimum two of five people);
- 57% of targets are female;
- bullying occurs four times more than illegal harassment;
- 62% of employees ignore the problem;
- 45% of targets report stress-related health problems;
- 40% of targets never tell anyone;
- 3% of targets file lawsuits.

There is a difference between tough management and workplace bullying. Appropriate tough management is direct, legitimate feedback and rightly addresses inad-
equate job performance; it is not workplace bullying. Inappropriate tough management (or bullying) wrongly attacks character, is personally demeaning, humiliating, psychologically damaging and severely hurts productivity.

Workplace bullying is devastating for all employees to experience, especially when the bully is your boss and has the ability to threaten a worker’s job and livelihood. The impact that this behavior has on the increasingly more diverse population in the U.S. workforce is made more significant because of the level of diversity and the impact these behaviors have on people of color. Studies have linked the effect of these behaviors on employees in measurable ways that have a detrimental impact on the individual’s health and well-being—and on the organization’s bottom line.

Employees
The effects of bullying are psychological and physical. According to the U.S. Hostile Workplace Survey, conducted by the Campaign Against Workplace Bullying, bullying leads to these symptoms:

**Psychological Impact**
- anxiety, insomnia and clinical depression;
- self-destructive habits, such as increased use of alcohol, drugs and food;
- suicidal thoughts and thoughts of violence to others;

**Physical Impact**
- panic attacks, heart palpitations and increased heart rate;
- exhaustion and chronic fatigue syndrome;
- weight loss or gain and skin changes;
- headaches and hypertension.

Having managers who understand the need to effectively manage the differences in the workplace is not an option, it is a business necessity. Some may call this just a matter of good management practices, and they would be correct.

However, one fact to keep in mind is that according to the U.S. Department of Labor, more than 75% of the people currently entering the workforce in the U.S. are women, immigrants or people of color. Good management practices involve understanding how to motivate, communicate with and manage an increasingly diverse workforce. After all, if your competition does it better than you do, they win. It’s that simple.

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**Message From the BISE Assistant Administrator**

As BISE Assistant Administrator, my role is to support Patricia Reed in her role as BISE Administrator. For those who know Patricia, you will know that I will be extremely busy.

I look forward to working with BISE under Patricia’s leadership because I know she will bring her energy, commitment and knowledge of ASSE to BISE. We have had strong and successful BISE leadership from past chairs Terry Wigfall and Joe Davis, and I have no doubt that BISE will reach new heights under Patricia’s leadership.
Cranes, derricks and hoists are essential equipment on construction projects. By carrying heavy, variable and often uniquely configured loads over congested workplaces, the potential for serious incident is present. That risk is exacerbated by the duration of projects and variables like wind speed, precipitation, temperature and operator experience. As a consequence, construction cranes are closely regulated.

Recently, the issue of what entities are authorized to enforce that regulation has been hotly debated—with different courts coming to varying conclusions. This article aims to spread awareness about how construction cranes are regulated, what the fight over regulation is all about and who appears to be winning.

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At the federal level, OSHA regulates worker safety through the Occupational Safety and Health (OSH) Act. The OSH Act does not aim to protect the general public and applies only to employers and employees in workplaces. OSHA (2010) has promulgated comprehensive regulations for cranes, derricks and hoisting equipment. Among other things, federal rules regulate ground conditions, procedures for the design, assembly, disassembly, operation, testing and maintenance of machinery, proximity to power lines, signaling, fall protection and operator qualification, certification and training.

If a state wishes to regulate an issue of worker safety for which a federal standard is in effect, its only option is to submit a “state plan” for approval by the Secretary of Labor. Although states are permitted to assume full responsibility for development and enforcement of their own programs, states are not permitted to selectively supplement or alter the federal standards. Some states and a number of cities (e.g., Chicago, New York and Philadelphia) have enacted laws—usually as part of their building codes—regulating cranes without the imprimatur of an approved state plan. It is these unapproved state plans and municipal regulations that industry groups have challenged, arguing that they are preempted by OSHA’s federal scheme. At the core of their protest is that worker safety will be compromised by subjecting job sites to layers of duplicative or conflicting standards.

The courts have split in their handling of these challenges.

**Florida & The Eleventh Circuit Go One Way**

Miami-Dade County, FL, adopted an ordinance containing regulations for tower cranes. A portion of the ordinance contained a wind load standard that required tower cranes to withstand hurricane force wind speeds exceeding 140 miles per hour, which was at variance with the OSHA regulation, which generally required only 93 miles per hour. Several trade groups filed a lawsuit arguing that the county ordinance violated the OSH Act because it was a non-approved state regulation of occupational safety and health issues.

The county asserted the wind load provisions were not occupational and health regulations because construction workers, crane operators and other construction site employees should not be present on construction sites during a hurricane. The county contended that the singular effect and purpose of the hurricane wind load standards was to protect the general public from a collapsing crane—not workers at a construction site.
The Federal Court for the Southern District of Florida disagreed. Citing the U.S. Supreme Court’s holding in *Gade v. National Solid Wastes Management Assn.*, the trial court dismissed the challenged portion of the Miami-Dade ordinance under the doctrine of federal preemption.

The Eleventh Circuit Court of Appeals affirmed the trial court saying, “the ordinance’s wind load standards regulate how workers use and erect tower cranes . . . thus directly affecting occupational safety.” The court explained that to the extent the ordinance provides a benefit to the general public, the regulation is a dual purpose law “which is still an occupational standard even if it serves the dual purposes of protecting both public and occupational safety.” Citing *Gade*, the court ruled the ordinance preempted by the federal regulation: “That such a law may also have a nonoccupational impact does not render it any less of an occupational standard for the purposes of preemption analysis.”

**New York & the Second Circuit Go a Different Direction**

Adopting the arguments posited in Miami-Dade County, the Steel Institute of New York challenged New York City’s regulations for cranes contained in the building code, arguing that they should be preempted by federal law. The Steel Institute pointed to direct conflicts (e.g., OSHA required no equipment or load come closer than 20 ft to a power line whereas the city required 15 ft).

In affirming the trial court, the Second Circuit Court of Appeals found that the “New York City crane regulations are unquestionably ‘dual impact’ regulations,” observing that for the most part, “they are intended to protect public safety and welfare” but also finding “In their effect, the regulations protect worker health and safety in a ‘direct, clear and substantial’ way.” Upon reaching that conclusion, the appellate court said “Under *Gade*, the city’s crane regulations are preempted unless they are saved from preemption as laws of general applicability.

Laws of general applicability regulate the conduct of workers and nonworkers alike (e.g., laws regarding traffic safety or fire safety). That is the direction that the New York Courts took to save New York City’s crane regulations from preemption.

Asserting that “New York’s crane regulations . . . apply all over the city, not just in workplaces or construction sites” and “the city’s crane regulations, like fire codes and traffic laws, are an exercise of the police power to protect the safety of the public in a crowded metropolis,” the Second Circuit concluded “they are laws of general applicability, not directed at the workplace, that regulate workers as members of the general public, and are therefore saved from preemption.” In upholding the New York Building Code, the appellate court took comfort in the fact that while the litigation was pending, the Department of Labor added a section on “Federalism” to its regulations noting: “The agency does not believe that this final rule preempts any non-conflicting local or municipal building code designed to protect the public from the hazards of cranes” (OSHA, 2010).

**The U.S. Supreme Court Takes a Pass**

The Steel Institute of New York, supported by the Specialized Carriers and Rigging Association, as amicus curiae, petitioned the U.S. Supreme Court to accept their case to more clearly articulate the distinction between occupational safety and health laws with a dual purpose (which are preempted) and laws of general applicability (which are not). Despite the split on this issue between the Eleventh and Second Circuits, the Supreme Court declined to hear the appeal.

**Crane Regulation Going Forward**

Notwithstanding the Supreme Court’s abstention, all parties agree that safety (of workers and the general public) is paramount. With that in mind, and noting the reluctance of the Department of Labor and the Second Circuit to upset regulatory schemes in local and municipal building codes, owners, users and operators of construction cranes will be well served to heed the requirements of both the federal and local regulations for any jurisdiction in which they operate. When specific and limited conflicts are identified (e.g., wind speed) court challenges on a case by case basis appear to be the most viable remedy to combat the type of duplicative and possibly counterproductive regulation that Congress sought to avoid when implementing the OSH Act.

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**Garry Boehlert** is a partner in the Washington, DC. offices of Saul Ewing LLP. His practice addresses the full life-cycle of issues presented on significant infrastructure projects. Boehlert has litigated cases in the courts of more than 20 states, has defended companies in some of the most highly publicized construction accidents in the country, and is knowledgeable about the federal, state and local regulation of cranes.

**Nick Fox** is an attorney in the Harrisburg, PA, offices of Saul Ewing LLP. Fox is a member of Saul Ewing’s Construction Practice Group, where he counsels clients on matters arising on construction projects—from writing contracts to resolving claims. Prior to joining Saul Ewing, Fox worked for a national general contractor on several substantial projects where he gained relevant field experience with cranes. His experience spans the selection and permitting of tower cranes through project service and demobilization.
All core business disciplines (i.e., production, marketing, sales, quality, safety) require some type of strategy to ensure that they perform in a manner that meets organizational expectations. This is generally accomplished through the use of some type of formal management system. The administration of any management system requires time, effort and a good deal of planning. All organizations, whether large and complex or small and simple, require some type of management system to oversee their safety efforts. The collective formal actions on the part of a company to manage safety activities are known as a safety management system (SMS).

**SAFETY MANAGEMENT SYSTEM OVERVIEW**

The concept of an SMS is not a new one and it tends to arise organi- continued on page 8
Safety Management Systems

continued from page 1

cally, over a long period of time. As companies evaluated safety-related activities and defined certain actions as having value and as something that needed to be measured and managed, metrics of success for these actions were developed and defined. Ever since safe work practices were first instituted, a need to identify trends, document results and ensure consistent actions for follow-up has been present. One common example involves the education of employees regarding safe work practices. The first-step taken by companies is to ensure that employees work in a consistent manner that meets expectations. This is done by training the new employees in the proscribed safe work practices. The tracking of employee, supervisor and manager safety training is one example of a metric that can be measured using an SMS. Having a training protocol is important. Ensuring that all employees receive the required safety training and ensuring that the training is effective is crucial. Tracking training results and trending them against outcomes such as injury rates and workers’ compensation expenditures is progressive and represents a high degree of achievement of the SMS.

Over the years, SMSs have become necessarily larger and more robust. The number and scope of items that are tracked and managed can eclipse the hundreds. Some of the more common elements in an SMS that are routinely measured and evaluated for performance include:

• audit findings;
• behavioral safety observations;
• business continuity protocols;
• countermeasure development and implementation;
• employee drug and alcohol testing;
• employee injury frequency and severity levels;
  • employee safety testing;
  • employee training levels;
  • ergonomic evaluations;
  • investigations;
  • job safety analysis;
  • PPE evaluations;
• policy and procedure development;
• preventative maintenance;
• risk assessment;
• safety committee activities;
• safety costing and fee allocation;
• safety cultural evaluations;
• safe work barrier removal.

The above list is not intended to be a comprehensive representation of items found in a modern SMS; rather, it is supposed to illustrate the diversity and complexity of measurements that could be considered of value. The management of all of these different activities and systems can be very challenging.

The idea for the modern SMS arose as managers and safety professionals attempted to evaluate the metrics of their safety process for effectiveness. Given the plethora of items that can be assessed to determine the effectiveness of workplace safety, it became important that only items with the most relevant bearing to actual safety performance be measured. This qualification of items that receive evaluation has led to numerous articles and discussions regarding the importance of leading versus lagging indicators. The essential points to consider about these concepts is that lagging indicators are those items which are the outcome measures of a process. They are generally considered downstream metrics and have the most direct effect on the organization. In safety, the routinely measured lagging indicators are injury frequency (OSHA rates), injury severity (lost work days), and incident costs. Leading indicators are process-related items that can be measured prior to the outcome event. Leading indicators are the antithesis to lagging indicators. These are upstream metrics and generally involve actions or activities on the part of the individual employee or the organization. Numbers of employees trained, behavioral safety observations completed, and levels of safety climate/culture expressed on an opinion survey are all examples of leading indicators.

Leading indicators are generally considered preferable metrics for inclusion in an SMS, as they represent items that an organization can control before an incident occurs. The key consideration for leading indicators is that they must be valid. Items measured by the SMS must have a direct correlation with outcome performance to be valid. For example, if employees do not have the knowledge to work safely, then the lack of information creates a high level of residual risk. If an organization trains and educates its employees to the level of fluency with respect to safe work practices, then the residual risk can be greatly reduced. The tracking of employee training levels and demonstrated skills, using an SMS, is an example of a valid leading indicator that is effectively managed.

Function, Integration & Optimization

Describing how an SMS functions, how it integrates with other management systems, and the way to optimize its use is the next critical topic to explore. In today’s
world, SMSs are sometimes disparate tools used to measure numerous different activities. They may include spreadsheets, proprietary databases, or internally developed and customized tracking systems. Other SMSs are well integrated, computer- or cloud-based systems, which allow the organization to centralize efforts at tracking meaningful metrics. The remainder of this article will explore what a well-designed SMS should look at, how it should be devised and what positive outcomes a company or organization can achieve when using a rigorous and robust SMS. The next several paragraphs of this article will describe, in detail, some of the activities and metrics that an SMS can measure, track and trend.

An efficient SMS is designed to capture information and provide a platform for the management of all safety aspects within an organization, using data that are easy to understand. As discussed earlier, using only lagging indicators as the metrics of safety performance can be a common pitfall in many safety processes. Despite this, these items remain important to measure within the SMS due to the inherent relevance of knowing how many injuries have occurred and how severe they have been. A thoughtful and well-designed SMS will measure injuries and relate these measurements to other process-related activities. An SMS provides a means for looking at the metrics of frequency, severity and financial implications of injuries. An efficient SMS will have a method for tracking injury trends and relating the trends to other demographic information such as most frequent time of day, day of week, or activity engaged in when the injury occurred.

In the past 10 years, SMSs have become technologically driven. Originally, most data was tracked in hard-copy format in journals and ledgers. With the advent of computerized data tracking many organizations resorted to spreadsheets and databases that were the norm for managing safety-related activity data. More recently, single source program or internet-based SMS have added a high degree of efficiency to the management efforts. A strong integrated SMS with a cloud or web-based software system allows instant data capture as well as linking the injury/incident to the necessary corrective actions. A comprehensive and integrated SMS facilitates and manages the incident investigation process, communicating through corrective actions and closing the loop from lagging to leading indicators.

Another important benefit that can be realized when using a robust SMS is its ability to provide a consistent foundation for managing exceptions and variances discovered through audit findings and safe-work barriers identified through behavioral observations. Within the SMS, it is important to identify potential improvement areas and track these with a corrective action program. Corrective actions are then tracked by the SMS to completion, ensuring that any identified unsafe work hazards have been removed before further injuries or incidents occur. This identification and removal of unsafe conditions through corrective action is the key component in any proactive approach to safety.

Within the SMS, job hazard analysis (JHA), risk assessments and PPE evaluations contribute immensely to improving workplace safety. Defining safe work practices within the context of a JHA greatly heightens the safety level in any workplace. The identification of risk and hazards when paired with a PPE program provides organizations the vehicle for a proactive approach to improved behaviors and employee engagement. As employees identify risks and hazards and see that the risks they find are remediated and documented, they will become more committed to the safety process. These increasing levels of employee ownership in safety will help to dramatically improve the organization’s safety culture.

Working with an SMS that allows an organization to report behavior based safety (BBS) observations will further assist in improving an organization’s safety culture. Trending those observations allows for a risk-based, not loss-based, approach to safety management. Some SMS behavioral safety applications allow organizations to gauge and track employee participation and frequency within the BBS process. A strong SMS helps organizations identify critical unsafe behaviors before an injury occurs, while facilitating the presentation of appreciative feedback and positive reinforcement when safe behaviors are identified. Identifying areas where an organization is successfully working safely can steer a traditional safety culture that focuses heavily on identifying and punishing failures to focus on a more positive approach. This inevitably leads to a safety culture based on accomplishment and achievement rather than avoidance and punishment.

Another critical component is the measurement and management of education and training of employees. Ensuring employee training and education not only involves regulatory requirements, but also has a meaningful, positive impact on behavior that has the potential for injury. Training is often effectively conducted when a true knowledge-gaps are identified, when processes or procedures change or when the environment develops a new risk profile. Consistent documentation of completed employee education strengthens incident investigation, safety culture, incident reporting and safety communication.

Managing preventive maintenance is another element of a strong SMS. Although preventive maintenance may not typically be considered a safety-related action, the linkage between maintenance and safety is undeniable. The corrective actions within maintenance are important to prevent environmental and physical site incidents relating to equipment failure. Having the ability to track and trend repairs, and near-miss/incident reporting, against unplanned fixes and the associated costs allows a company to analyze the effectiveness and consistency within their maintenance program.

Reviewing these elements provides a clear vision for what an effective SMS entails. Having a dashboard
available to organizations whether large or small allows them to easily provide content and store data. With various SMSs being utilized by many organizations, it is crucial to explore which format will be relevant and effective in the given environment where an organization resides.

Evaluations are critical when determining if the SMS in place is providing precise, accurate information and measurements. A general evaluation of the SMS provided by the Civil Aviation Authority presents an “SMS Evaluation Framework . . . ” for Complex and Non-Complex Organizations. According to the Civil Aviation Authority general self-assessment tool, the evaluation is extensive and broken down into the following categories:

- management commitment and responsibility;
- safety accountabilities;
- appointment of key safety staff members;
- emergency response planning;
- safety documentation;
- hazard identification;
- risk assessment and mitigation;
- safety performance monitoring;
- management of change;
- incident management;
- continuous improvement;
- safety auditing;
- safety training;
- communication;
- SMS implementation.

According to this document, “The purpose of evaluating the SMS is to ensure that the system is put in place across the whole organization. . . . As the system becomes more developed, further evaluations can be made to ensure that the SMS is operating as intended and that it is effective” (Air Safety Support International, 2006). Assessment of the SMS provides relevant information that allows the determination if an optimal system in place or not. Examples of an optimal system include measurements about the usability and relevance of reports generated by the SMS, efficiency of investigations, impact of training alerts, report trending, data storage and security, ease of access and general user-friendliness. Many elements within a SMS must be studied to determine if there are additional items requiring measurement. Ultimately, the outcomes of these efforts should be providing the company with savings in time and money, improving communication, enhancing the availability of information and increasing the performance in safety by facilitating significant reductions in the frequency and severity of injuries.

The items that must be fully considered when examining a SMS are:

1) About what leading indicators does the SMS provide information and are these leading indicators valid?
2) What percent of employees use the SMS or derive benefits from its presence?

3) Has the SMS made the organization more efficient and productive?
4) What efforts have been done to create a positive Safety Culture in relation to the SMS?
5) What communication gaps, if any, exist between employees, supervisors, and upper level management?
   a) If communication gaps exist, how will the organization aim to improve them?
   b) If communication gaps do not exist, how can the organization capitalize on this strength to improve other lacking areas?
6) What values can the employees gain from increasing use of the SMS and improving communication?
7) How will increasing the use of the SMS affect the organization both in the immediate and the long-term?
8) How effective are the applications in the SMS?
   a) Are they easy to use?
   b) Do they facilitate interest and curiosity?
   c) Do they provide information of interest to organizational management?
9) How does the SMS illustrate specific measurements and generate reports in which your organization can trend different models?
10) What are ways that your SMS is used as the centralized source for your organization’s various locations and/or departments?
11) Has the use of the SMS improved safety performance?
   a) Is the organization continually improving?
   b) Are there fewer injuries to employees?
   c) Are fewer dollars being spent to pay for injuries?
d) Is the overall business cycle including productivity and profitability increasing?

According to Air Safety Support International, “When evaluating a SMS it is important to keep in mind that the purpose of the SMS is to make continuous improvement in the overall level of safety” (2006). The authors have noted an increased use of SMSs in all industries and with many different organizations. Numerous entities are now focused on achieving safety excellence based on the use of the SMS. Both large and complex organizations as well as smaller more compact companies are noticing how an SMS is able manage employee trainings; track barriers and incident investigations; enter in, track, and close out corrective actions; maintain up-to-date SDS files; generate reports; and draw trending conclusions to improve an organization’s culture and productivity.

Workplace safety is being looked at more closely in the present day than in the past. A successful SMS will allow employees to personally better understand how they make a difference in the safety efforts, and enhance their engagement. Ultimately, by using well-selected and customized SMS, organizations around the world are improving every aspect of their operations. The only question that must be answered is not should an SMS be implemented, but how can it be done in a timely manner with sufficient planning to ensure the achievement of operational excellence? 

**References**


**Chris Goulart** has 20 years’ experience as an OSH professional and 15 years specializing in behavioral safety, organizational safety performance, risk assessment and systems safety. Goulart is versed in working with organizations to assist them in identifying and mitigating the systemic components of risk, and offering reasonable business solutions. These solutions typically employ a healthy balance of engineering improvements, knowledge gap reductions, and performance management elements. He is a published author on risk assessment, safety management systems, safety culture and behavior-based safety.

Joe Melton has 6 years’ experience practicing in safety-related fields and 3 years focusing primarily on behavioral safety, safety culture, safety management system analysis and auditing safety systems. He is a certified FEMA responder, certified grain bin entry and rescue confined space entry and received bachelor degrees in both political science and history.

Melton is well versed in working with organizations to identify physical property risk, and systemic safety improvements while offering a reasonable business solution. These solutions have included but limited to engineering improvements, knowledge gap reductions, and safety management system modification. Joe has experience primarily working with smaller to medium size organizations to install and ultimately to sustain a positive safety culture that emphasizes employee engagement and continuous improvement of a successful safety workplace.

**Bashir Zayid** comes from Argonne National Laboratory as a researcher, then project manager, and finally an environmental, safety and health coordinator assistant. Zayid and his team performed monthly inspections/audits across all areas of the Energy Systems Division. By gaining an in-depth knowledge of radiological hazards, process safety management and specific governmental regulations, he applies the principles of safety with practical experience. He holds a B.S. in Chemistry and minors in Biochemistry and Mathematics. Zayid has extensive knowledge and skill in behavioral safety and safety culture. He has 2 years of specialization in behavioral safety, safety culture and safety management system analysis. He has worked with management groups, facilitated cross-functional employee teams and analyzed organizations’ safety culture.

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Construction is one of the most dangerous industries (Toole & Gambatese, 2008), and falls are a frequent cause of fatal injury. Of the 4,693 fatal work injuries that occurred in 2011, 553 (12%) were the result of falls to a lower level. Fatal falls in construction accounted for 46% of all work-related fatal falls in 2011 (BLS, 2012). OSHA estimates that each fall from an elevated position in construction (both fatal and nonfatal) costs between $50,000 and $106,000 (OSHA, 2012). Workers are at risk of falling during initial construction, after completion during operation, maintenance, renovation, and demolition of buildings. Facility features associated with falls include floor and roof edges, elevated platforms, ledges, atria, skylights, machine rooms, and ladders and stairways. Falls can occur from temporary structures used in construction and maintenance such as scaffolds or ladders, or from permanent locations, such as roofs.

OSHA 29 CFR 1926.502 covers requirements for fall protection systems. One of the following is always needed to protect workers from falls:

- Job-built or commercially available guardrails that meet OSHA height and strength requirements [29 CFR 1926.502(b); Bobick, et al., 2010].
- Properly designed anchor points with appropriate personal fall arrest systems and lifelines (Bobick, et al., 2010).
- Other forms of fall protection such as safety netting [29 CFR 1926.502(c)]. ANSI Z359.0 through Z359.18 describe safety requirements for fall arrest systems. ANSI Z590.3 addresses prevention through design guidelines for hazards in the design and redesign processes.
**Prevention Through Design**

Prevention through design (PTD) addresses worker exposure to hazards during the design stages of a project. For example, when a building or other structure is designed or redesigned, risks of fall-related injuries and fatalities to construction workers or users of the completed facilities could be minimized by implementing a PTD approach. NIOSH recommends that facility designers, owners, constructors, and safety and health professionals collaborate to perform one or more safety design reviews to explore and address hazards likely to occur over the life cycle of the facility. This approach would incorporate safety features into the building’s design, address fall hazards in construction plans, establish safety criteria for buying equipment, and communicate risks to building owners and facilities personnel (Behm, 2005) rather than rely on other forms of protection such as PPE or administrative controls.

**Design Solutions**

Designers should consider the need for permanent fall protection features to protect construction workers, future occupants of facilities and repair workers from fall hazards. A safety design review can help evaluate tasks that expose workers to hazards.

Designers and safety and health professionals can then use the hierarchy of controls to select the most appropriate options to address the identified risks (Gambatese, et al., 2005). The hierarchy of controls for fall protection involves the following:

1) Eliminating or modifying the fall hazard itself is the preferred approach.
   a) Adopting a building design involving a single level at grade rather than multiple levels at elevations would be the best way to eliminate the fall hazard.
   b) Using parapet walls or permanent guardrails to separate workers from the fall hazards would be the next preferred approach.

2) The second option is to provide a fall restraint system that secures the worker via an anchor point, connector, lanyard and body harness to prevent the worker from reaching the fall hazard is the next option.

3) Installing a fall arrest system. This final option also uses an anchor point, connectors, lanyards and body harnesses, but allows exposure to the fall and is then designed to stop the fall after it has begun.

Installing permanent fall protection features, depending on when they are installed during the construction process, may also be used to provide fall protection to workers during the construction phase.

A common requirement for all fall protection is the provision of suitably designed and installed anchor and support locations, which include a “secure connecting point or a terminating component of a fall protection system or rescue system capable of safely supporting the impact forces applied by a fall protection system or anchorage subsystem” (ANSI/ASSE, 2011). For many types of commercial and institutional buildings, equipment could be permanently embedded into steel or concrete parts of a building and used to set up fall protection systems.

These embedded safety features could be used to prevent falls during construction and building maintenance after construction. Embedded features can include concrete straps, anchor points for use with appropriate personal fall arrest systems and lifelines, or guardrail support. [See NIOSH, 2013 for details, diagrams and photos of various design features.]

Temporary safety features are not part of the building when it is completed, while permanent features remain a part of the building following completion. Planning for installation of permanent features is the preferred approach and involves the architect and consulting engineers who design the building. The features provide protection for construction workers, operations and maintenance workers, and future construction workers doing renovation, refurbishment, disassembly, or modification. The decision to include temporary features is made by the construction company’s engineers and safety personnel. These provide benefits for the construction worker and are typically removed when construction is done. OSHA general construction regulations (29 CFR 1926 subpart M) state that fall protection is required at 6 ft for temporary or construction purposes. Different industries have other protective height requirements, and they can be found in the appropriate OSHA regulation.

**Embeds for Guardrail Support**

Steel embeds could be placed along concrete slabs so that guardrails could be installed at the edges of all floors during construction. Embeds provide a secure method of installing guardrails that is quicker to install compared with bolted guardrail systems. Embeds could be used for both temporary systems used during construction, or for permanent guardrail or parapet systems used for both construction, operations and maintenance, and other future life-cycle needs.

**Embedded Roof Anchor Points**

Anchor points are needed when a personal fall restraint or personal fall arrest system is selected for fall protection. Several embedded anchor points can be installed so that they provide tie off points for attaching horizontal or vertical lifelines used for these systems. These should be independent of anchorage used to support or suspend platforms and capable of supporting at least 5,000 lb [29 CFR 1926.502(d)(15)].
**Straps Embedded in Concrete**

Straps are installed before casting by attaching each strap to the reinforcement (e.g., steel rebar) that will be buried within a concrete column, beam or slab. The other end of the strap and its connecting D-ring are left hanging, allowing workers to attach their personal fall protection harnesses or other personal safety equipment to the strap. D-rings and snap hooks must be able to support a 5,000-lb load [29 CFR 1926.502(d)(3) and 29 CFR 1926.502(d)(9)]. Straps should meet requirements for ANSI/ASSE Z359.1.

The straps are typically removed after construction is finished, so this option is intended to provide temporary fall protection anchorage for construction workers.

The decision to add concrete embeds should be made during the conceptual design of a building. Only a minimal amount of additional design is required (NIOSH, 2013). Research is being conducted on the safety of new, environmentally friendly U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) certified buildings, and recommendations have been proposed to include PTD safety features in these new designs. Including provisions during building construction to prevent injuries, illnesses, and fatalities among construction workers is an essential component of sustainable design (Harte, 2009).

**Cost Savings/Advantages of Permanent Features**

According to OSHA regulations, employers are responsible for worker safety. Perhaps for this reason, architects and design engineers do not always consider hazards during the design phase of a construction project. It is also possible that building designers are wary of assuming responsibility for future safety incidents, though no research suggests that building designers who consider safety are more subject to lawsuits than those who do not. Designers may also perceive that safety features take more time and money to install; designs are meant to be completed on schedule and cost effective for the owner (Gambatese, et al., 1997; Gambatese, et al., 2005; Toole & Gambatese, 2008). But having the fall safety features in the original design and permanently embedded in concrete has been shown to save money. Fall protection can be set up more efficiently using permanently installed features rather than installing temporary fall protection each time there is a roof-related maintenance or renovation task (Gambatese, et al., 1997).

As noted by Rajendran and Gambatese (2013), roof anchor points are generally low cost.

**Case Study**

The NIOSH Fatality Assessment and Control Evaluation (FACE) program supports fatality investigation programs in several states. The following case from New Jersey illustrates the importance of correct installation and how embedded anchors might have prevented a fall.

A 51-year-old construction worker died after falling from the roof of an industrial warehouse under construction. He was wearing full protective equipment, including a harness and retractable lanyard connected to a temporary metal anchor installed as part of the construction fall protection system. The anchor was attached to the unsecured leading edge of the corrugated decking. When the anchor broke free, he fell 40 ft to the ground.

In addition to improper anchor plates and screws, another contributing factor to the fall was having the anchor plate mounted
on an unsecured edge. If the anchor plate had been an embedded feature that was part of a permanent fall protection system, the anchor might not have broken free and caused the victim to fall to the ground (NJ DOH, 2012).

**RECOMMENDATIONS**

Building owners and designers should take the following measures to prevent falls (NIOSH 2013, NJ DOH, 2012; NYC DOB, 2008):

- During retrofits, renovations, or new construction, perform a safety design review to identify and consider tasks that could involve fall hazards over the life cycle of the facility. Use PTD approaches to prevent fall hazards or to provide engineering features to provide fall protection.
- Consult with certified professional engineers to install new features or to retrofit older buildings with permanent embedded safety features.
- For new construction, an architect or structural engineer should prepare a drawing indicating the location of fall protection anchor points and their capacities for guiding construction and maintenance personnel.
- Ensure that a competent person [29 CFR 1926.32(f)] inspects the fall arrest system before and during installation. A competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them [29 CFR 1926.32(f)].
- Have any existing concrete-embedded fall arrest systems field tested by a qualified testing entity to ensure that they are capable of withstanding intended loads.
- Ensure that a competent person inspects and evaluates the fall arrest systems regularly for damage.
- Ensure that no one uses the system before compliance with the conditions listed above.

**ACKNOWLEDGMENTS**

This document was prepared by E. A. McKenzie, Jr., Division of Safety Research, Matt Gillen, Office of the Director, and Susan Afanuh, Education and Information Division, NIOSH.

**REFERENCES**


ISO 50001:2011 specifies requirements for establishing, implementing, maintaining and improving an energy management system, whose purpose is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy use and consumption. Organizations can identify the significant energy users and optimize energy consumption by developing an energy management system (ENMS) plan in line with the ISO 50001 Energy Management System standard. By developing an ENMS plan, an organization can:

- maximize fiscal resources through direct and indirect energy savings;
- comply with applicable in-house, national and international OSH regulations;

continued on page 10
• reduce the environmental impact of any operations;
• increase the comfort and safety of organization employees;
• improve the reliability of equipment and reduce maintenance;
• provide the guidance and leadership necessary for the adoption of a culture of sustainability.

**PURPOSE & SCOPE**

An ENMS plan can be developed to formalize any energy management programs in line with the organization’s procedures allowing for the proactive pursuit of optimal energy solutions that will lead to environmental, societal and economic benefits. This plan can be implemented over all operations, facilities and services.

**ENERGY MANAGEMENT SYSTEM FUNCTION MODEL**

The ENMS function model (Figure 1) describes the overall two-way (expectation and deliverable) process flow from energy champion to employees. It is specially designed to help any organization implement an effective ENMS plan.

**ORGANIZATION STRUCTURE FOR THE ENERGY MANAGEMENT SYSTEM**

Two committees work together to implement the ENMS Plan. The energy management committee, led by the organization’s top management team, including all departmental managers and the departmental OSH head, controls all approvals related to the energy management system plan. The energy council, a departmental committee made up of respective departmental manager and supervisors, controls all ENMS plan matters at departmental level (Figure 2).

**OUTLINES OF ENERGY MANAGEMENT SYSTEM PLAN**

Figure 3 (p. 12) shows the key steps involved in ENMS plan in-line ISO 50001 standard.

**KEY ROLES & RESPONSIBILITIES OF ENMS ORGANIZATION**

Organization leaders must establish the following roles and responsibilities:
1) energy champion;
2) management representative;
3) head of energy council;
4) energy council members;
5) employees.

**DETAILED ENERGY MANAGEMENT PLAN**

Upon management approval, the energy council can establish energy plans that addresses the following:

**Energy Profile**

The purpose of developing an energy profile is to understand the areas of significant energy consumption (i.e., the buildings, equipment and processes), which account for the greatest energy use or offer the most potential for energy savings and the drivers for this energy consumption. The drivers can include production volumes, weather, occupancy and/or floor area.

The identification of the energy profile is critical in understanding where energy is used within the organization and forms the basis for prioritizing the efforts to reduce energy consumption.

When establishing the energy profile in line with ISO 50001, organizations must analyze energy use based on measurements and other data, identify the areas of significant energy use and prioritize opportunities for improving energy performance, including use of renewable or alternative energy sources, where applicable.

More details on energy planning process and energy management system implementation plan are included in Figures 4 (p. 12) and 5 (p. 13).

**Energy Baseline**

Keeping in mind seasonal variation and operational dynamics, it is recommended to have at least one-year energy consumption data to generate the profile. The initial profile (energy baseline) serves as the starting point against which future improvements are measured.

**Energy Performance Indicators**

Based on the energy profile and baseline data gathered in the first year, organizations should establish energy performance indicators (ENPIs) for different departments. ENPIs are a quantitative index of energy performance as defined by the organization and should be reviewed regularly. ENPIs can be used to compare...
organizational performance at different points in time. They should be selected to facilitate monitoring of performance especially in the significant energy uses identified in energy profiling.

**Legal & Other Requirements**

The energy council should identify and maintain any applicable legal requirements and other requirements related to the organization’s energy use.

**Proposed Targets**

The energy council should establish, implement and maintain documented energy objectives and targets at the relevant functions, levels, processes or facilities within the department. The energy objectives and target(s) must be measurable and a time frame should be established for achievement. The objectives and targets must be consistent with the energy policy, including commitments to improvement in energy performance and to comply with applicable legal obligations and other applicable requirements.

**Energy Management System Awareness Program**

Management representative should develop and implement the awareness schedule for all departments. Subsequently all departments should develop the resources to provide continuous ENMS awareness sessions for effective implementation within the departments.

**Implementation of Energy Management System Plan**

**General**

As mentioned in Figure 5, all the phases of implementation must be carried out. It is mandatory to get prior approval from the energy champion before making any changes or deviations from the original plan.

**Training & Awareness**

All the departments across the organization should prepare their human resources with necessary trainings or awareness for effective implementation and monitoring of the ENMS plan. All departments should have certified or trained energy auditors. The awareness sessions should contain the following elements:

- organization’s energy message;
- significant energy uses;
- roles and responsibilities;
- benefits of improved energy performance;
-
significant energy uses management program includes targets, control measures etc.

Documentation

The departmental OSH team should develop criteria for energy uses register (EUR) and the EUR management program in-line with existing OSH MS procedures and ISO-50001 standard. Upon approval, all departments should comply and develop their respective departmental energy uses register and EUR management program in coordination with the departmental OSH team.

Design

Departments should develop the mechanism for energy performance improvement opportunities to incorporate in the design of new, modified and renovated facilities, equipment, systems, process that can have a significant impact on energy performance.

Procurement of Energy Services, Products, Equipment & Energy

When procuring energy services, products and equipment that have or may have an impact on significant energy use, the energy council or superintendent of contract must inform suppliers that procurement is partly evaluated on the basis of energy performance.

The energy council or superintendent should define the criteria in coordination with departmental OSH team for assessing energy use over the planned or expected operating lifetime of energy using products, equipment and services which are expected to have a significant effect on the organization’s energy performance.

The departmental OSH team should then define energy purchasing/contract specifications as applicable for effective energy performance and upon energy champion approval; it shall be communicated to concern.

Checking Performance

Departments must update their ENPIs and energy significant users (ESU) management program periodi-

Figure 3 Outlines of Energy Management System Plan

Figure 4 Energy Planning Process Concept Diagram
Department OSH team should then compile this information for further review process.

Department OSH team shall develop assessments/audit criteria to access the compliance level and also compile all audit findings and status for department level to review with management.

**Management Review**

All the inputs from checking performance section (i.e., ENPIs, ESU management programs updates and audits status and other relevant programs) should be periodically reviewed in management forum.

Outcome of management review should be required to update or modify the energy management system plan or its relevant documents for effective implementation purpose.

**Records Retention**

All records generated by this plan should comply with applicable procedural requirements.

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CH. Rama Krushna Chary has 14 years of experience in various industries including oil and gas, refinery, and consulting. His experience involved in the field of waste and air quality management, encompassing compliance, permit applications and establishment and implementation of energy management systems. He is a lead auditor for ISO 14001:2004 and a certified H2S Awareness train the trainer. Chary is the executive secretary of the Environmental Practice Specialty, and a member of ASSE’s Kuwait Chapter.

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### Figure 5 Sample Energy Management System Implementation Plan

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Walsh Construction Co. is a Chicago-based general contracting, construction management and design-build firm. The firm has experience with a wide variety of building, civil and transportation sectors. Maintaining regional offices across North America, Walsh Construction operates using union labor and union subcontractors.

Walsh’s Northeast Region is comprised of regional offices in Pittsburgh, PA and Boston, MA. Both offices focus primarily on heavy civil construction projects in the transportation and water/wastewater industries. In 2013, this region was working on nine separate, significant bridge projects contributing to the Walsh Group’s Engineering News-Record’s ranking of number one among the largest bridge builders in the U.S. In the Northeast Region, heavy civil, we self-perform approximately 90% of the work in the highway and bridge sectors. This equates to more than 2.2 million work-hours annually by more than 750 Walsh employees. This work includes deep foundations, pile driving, excavation, reinforcing steel installation, concrete formwork, concrete placement, underground pipe and steel erection.

Walsh employees work year round through some of the toughest conditions encountered in the U.S. Its greatest concern is the safety of our workforce. Our mission is to set the highest standards of quality and safety. The Walsh Group performs approximately 13-14 million work hours annually, spread over approximately 30 different states. Creating the right safety culture at our jobsites continues to be one of our highest corporate goals. We are continually instilling the responsibility in all our employees that they have the right to have and the duty to prevent an unsafe work place. We are fully committed to our goal of, “No one gets hurt.”

Some readers may wonder why ergonomics and construction are a nontraditional pairing. Here are a few industry-wide known reasons as to why ergonomics is not typically a focus in construction:

- Ergonomics is a relatively new science that has been applied to offices and manufacturing for some years.
- Although buildings and bridges can be built in the blink of an eye; construction can be a slow industry to change.
- Ergonomics has a feel-good nature, which is foreign to most people in the construction industry. The ideal of hard, physically demanding work still precipitates throughout the industry. This physically demanding work is almost a rite of passage, and the ‘old school’ hardened construction workers may not always be excited to see an easier way to do a task they toiled through in their past.
- Ergonomics costs money. The construction industry can be near-sighted. The return on investment (ROI) is hard to demonstrate in a field that has not much history in construction.
- ROI is particularly difficult to prove in construction because most construction workers are not long-term employees for any certain company. Most workers are employed by a company in the geographical region where the work is taking place or where they call home. Once the contractor’s work is complete, s/he hires on with another outfit doing work in the area. This leads to difficulty proving an ROI for any training, as employees are not retained.

The Walsh Group has practiced general building construction since its foundation in 1898. Currently in its fourth generation of leadership, the firm has always been a family business. To facilitate national expansion efforts, Walsh Construction was incorporated in 1949, and Archer Western was incorporated in 1983. Each company has experience with a wide variety of building, civil and transportation sectors including: wastewater and water treatment plants; rapid transit highway and bridgework; educational facilities; warehouse/distribution facilities; athletic facilities; correctional facilities; office; and design-build.
for many years. Also, an injury to one company is challenging to manage and contain cost with employees coming and going so quickly between companies.

- OSHA requires safety training and the elimination of known hazards and immediate danger to life and health. According to the Bureau of Labor Statistics (BLS), the construction industry has the highest occurrence of fatal occupational injuries in goods-producing private industries. Ergonomic hazards are not an immediate danger to life and health conditions and currently not required by law to be abated.

- Physical wear on the worker is culturally accepted as part of the job.

- Construction never takes place in the same environment. Each site is different, each job is different, and the weather changes continuously. Traditional ergonomic principles are hard to apply with so much variation.

- As a stereotype, construction workers are usually focused on completing the task in the fastest manner possible.

- Ergonomics is something else they would have to do. Safety used to be this way, and it has taken more than 20 years to become ingrained into the construction lexicon.

Ergonomics is not known or preached as a focus in construction; however, ergonomics has somewhat been embedded in construction without necessarily calling it ergonomics. Workstation design and workflow have changed, work setup and staging have changed, and tools and handling aides have also evolved, all with ergonomic benefits included in the new designs. However, what has not changed much is behavior, workforce fitness and risk factor reduction.

**Why Ergonomics for Walsh**

In early 2012, Walsh Co. was in the process of trending its 2011 workplace injuries. It found that 40% of the recordable injuries fell into two categories: power tool use and musculoskeletal disorders (MSDs). A decision was made to focus on these two categories as an opportunity for improvement. A stretching program already existed and, although most thought this was helpful it was only one piece of the puzzle. The goal was to determine why MSD injuries occurred and how to prevent them.

Ergonomics is not known or preached as a focus in construction; however, ergonomics has somewhat been embedded in construction without necessarily calling it ergonomics. Workstation design and workflow have changed, work setup and staging have changed, and tools and handling aides have also evolved, all with ergonomic benefits included in the new designs. However, what has not changed much is behavior, workforce fitness and risk factor reduction.

**Where Do We Start?**

As with any program, it is important to have a 6-month, 12-month and a 2-year outlook. Walsh started with objectives for each month for the first 6 months and the goal of each activity. From there, larger intervals of 6 months, 1 year and the second year were set up, each with activities and goals. Some activities were as simple as writing an ergonomic perception survey; others were much more involved, such as training more than 800 regional employees in multiple ergonomics awareness class. Walsh proudly reports that for the most part it stayed on schedule and hit all but a couple of goals in the past 16 months.

The difficult part of the process was to set up realistic measures of success for the program. How do you measure success over the first year? Walsh’s program has been completely customized and does not reflect a traditional safety program or a traditional ergonomics program. Walsh fully expected the number of MSD injuries to initially increase simply because it was talking more about them. Given this expectation, injury reduction alone could not be used as a measure of success. The following metrics were determined:
Figure 2 Walsh Lifting Guidelines

- percentage of employees trained in ergonomic awareness;
- comparing the results of the initial perception survey versus 1 year later;
- incorporation of ergonomics into Walsh’s behavior observation program, review;
- employee’s actions and performance (REAP);
- number of field improvements implemented.

Walsh’s Ergonomic Program

As previously stated, it is difficult to deploy a traditional program approach to ergonomics in the construction industry. Typical ergonomic programs will involve risk assessments and, to date, Walsh has not used a quantitative nor qualitative risk assessment. At the onset of the program, authors Crawford and Steve Thomas scripted an ergonomic program plan for the first year of the program.

The first month’s goals included reviewing injury history, becoming involved with the new office move, and developing and deploying an ergonomic perception survey. The following months’ goals included: deploying an ergonomics perception survey, conducting ergonomic training classes, updating the Stretch & Flex routine, and documenting and sharing innovative solutions through “Cool Tools.” These goals are all outlined in the following sections.

Ergonomics Perception Survey

Before employees were informed about the new intent to focus on ergonomics, Walsh wanted to ensure that it had a comprehensive understanding of employees’ ergonomics knowledge or lack thereof. Employees were asked to complete an ergonomic perception survey. This was a one page document, as time is of the essence in construction, and it consisted of 14 questions: seven questions required a yes/no response, five were multiple choice and two asked for written responses.

Overall survey responses were very high, as 72% of employees in the region completed the survey; a total of 542 people. Survey results were analyzed, and the most notable results were:

- 40% of employees know what ergonomics is.
- 30% of the workforce does not feel free to report injuries.
- 31% of the workforce reports ergonomic injuries too late.
- 56% of employees appear exhausted at the end of the day.
- 23% of employees stated lifting was the most difficult task.
- 51% of employees are not familiar with Walsh’s lifting guideline.

Survey results were compiled for the region in its entirety; this was used as the standard. Each individual jobsite was compared to the regional average and each region was compared to this standard (regions were broken into: Pennsylvania, Connecticut and Boston). Ultimately, the survey served as an employee morale survey, ranking jobsites high or low. The survey’s intent was also to provide a base point to compare to after 1 year of concentrated effort on ergonomics.

After a year of a focused approach on ergonomics, the survey was sent again in early 2014. Walsh is currently awaiting responses to be analyzed and compared to the previous results.

Ergonomics Training Classes

One main focus area for the initial program year was to educate employees about ergonomics. Survey results reported that 60% of the workforce was not familiar with the concept of ergonomics. This is not alarming, as ergonomics is rarely a focus in construction.

The ergonomics training class needed to be short, as many other training initiatives were concurrently being completed. The class needed to be 1 hour and the message needed to be simple. Lucas also notes that for a successful program Walsh needed to “be able to spend time and train our workforce on what it means to move within our industry, not using potentially any other equipment or any other devices, but just be educated on how to move properly. That comes down to just training people and giving them the opportunity to be educated on how to protect their body on a day to day basis.”

The goal for 2013 was to train every employee in the region. Because of the nature of construction, the amount of employees is continuously fluctuating. The northeast region for heavy civil at Walsh typically has between 500 and 1,000 employees at any given time. Because of the nature of this class and the nature of construction employees, it was determined that the ideal class size was 10 to 15 people. Anything beyond 15 participants and some could get lost in the back of the class or the class could get out of hand.

Another challenge of planning the training class was that there was one instructor on a part-time schedule, and we needed to reach a fairly large geographic location. We had projects in Cleveland, OH; Pittsburgh, PA; Philadelphia, PA (x2); New Haven, CT (x2); Boston, MA (x4); Portsmouth, NH; Lowell, MA; Amesbury, MA.

The training class’s message was simple, with simple slides that were mostly visual. Many construction photos were used, but they were all
photographs taken from only Walsh jobsites and by the instructor. For example, when discussing and defining what ergonomics truly is, two pictures were used (Figure 1, p. 29). Before we gave our definition of ergonomics, we asked our employees to comment on these pictures.

Also, our message was to educate our employees that ergonomics is personal and is also, many times, a personal choice. Specifically, we want them to focus on their posture while doing their work. As in the photos in Figure 1 (p. 29), sometimes it is a choice to choose the correct working posture. The employee on the right took the time to set up the workstation so that he could be in an upright position while working.

Walsh also wanted to make the classes personable and memorable. Part of the message is that when you injure your back at work, it is much more difficult to pick up your grandchildren or children at home. Participants were given a handout that summarized the training class, as well as touched on some personal notes. It encourages employees to find ergonomic issues and fix them, instead of just continuing to do what they do. Participants were also given a hard-hat sticker, something to take with them to remind them about ergonomics. The sticker was based off the logo Walsh created for ergonomics, and also based off feedback from evaluations forms. Some employees provided written feedback on evaluations that the most positive aspect of the training class was “that Walsh cares.”

In 12 months, 817 people were trained in 63 classes. Evaluations were collected at the end of every training class and scores continuously improved throughout the 12 months. The biggest opportunity for improvement from the feedback was that the training class was too short.

One critical component to the success of the training class and the program as a whole, is that the training class was merely educational. Its main purpose is to help employees save their backs. Some employees have also questioned us and assumed we were getting a big insurance break by offering this class. On the contrary, our program has absolutely no relation to insurance rates and this region has voluntarily decided to focus on ergonomics because they care and because people were getting injured. Injury costs for MSDs were not calculated until after the ergonomist was hired and after the program commenced. One of the biggest sources of program success is that no extra work is required on behalf of the attendees. The training class is purely educational. As of today, there are no requirements from any Walsh employee to contribute to the ergonomics program—everything is voluntary.

Creating the right safety culture at our jobsites continues to be one of our highest corporate goals. We are continually instilling the responsibility in all our employees that they have the right to have and the duty to prevent an unsafe work place.

Stretch & Flex: Updating the Routine

While preaching ergonomics throughout the region, Walsh employees realized its own stretching routine was inconsistent and ineffective. Sparked by feedback, the routine underwent a makeover. Before any drastic changes were
made, Walsh sent out its Stretch & Flex survey, which was structured similarly to the ergonomic perception survey. Survey results showed that 87% of employees wanted to continue doing the stretching program and that 85% of employees feel better after they stretch. The program received positive feedback and Walsh received great ideas on how to improve it, as well.

Most employees wanted some new stretches, a warm-up included, and a longer stretch session—some jobsites stretch for about 3 minutes—all of which were included in the new routine. In the past, some jobsites had been following different stretching routines from different sources, as well as some non-credible sources. A new routine was created and trialed with a few jobsites throughout the region. Feedback was collected and the routine was changed accordingly. The final Stretch & Flex version was created and booklets were given to each foreman. Additionally, a short 4-minute video was created to share with new hires to orientate them to the new program.

Cool Tools

As ergonomics has gained a foothold at Walsh, employees have shared ideas they have implemented or seen in the field. The challenge is being able to replicate these ideas and sharing them. When, 8 months from now, a laborer in Boston, MA, faces the same challenge as a laborer in Pittsburgh, PA, did, we do not want to make the same mistakes or reinvent the wheel.

In construction, every day is a new problem with new solutions yet to be discovered. And, what works for one man or one crew may not work for another. So, as solutions are shared, typically during the training sessions, we have been sharing them with the rest of the region. We are also documenting them on the Walsh server so that any Walsh employee throughout the nation, or even internationally, can view them.

The following is an example of existing solutions to ergonomic issues. Two carpenters had been experiencing some form of elbow tendonitis. Both of these carpenters had been seeing a doctor and physical therapists to help remedy the situation. However, after years of seeing the doctors and physical therapists the pain still existed. Both of these carpenters resolved to, on their own, purchase different hammers they had seen or heard about. Each carpenter bought a different hammer but both hammers were lightweight. One hammer was skeletonized and titanium and the other hammer was fiberglass and curved. After getting used to using very different hammers, the carpenter’s problem and pain had vanished. Sharing these cases with the rest of our employees is critical to spreading the word of the benefits of “Cool Tools” and good ergonomics.

Some products have been available off the shelf, while others have been homemade. One of the most beneficial homemade tools hangs whalers (whalers are installed to support bridge decks). A foreman made an extended handle to hold two 2 x 12s in place while
remaining somewhat upright, instead of bending or contorting to reach below the bridge deck (or below the standing surface). He made this to help employees save their backs; however, one of the most positive benefits, unknown to the foreman, was that they ended up installing more whalers in a day while using the tool versus when not using the tool.

As they have demonstrated, construction workers are very creative and do an excellent job at problem solving. In February 2014, about a year and a half after program inception, Walsh launched a Cool Tools competition to collect more examples of ingenuity in the field. The competition has brought us a myriad of innovative solutions to recognize, reward, and share with the rest of the company.

**Additional Methods & Best Practices**

Walsh has attempted to incorporate ergonomics into every facet available to it. Implementing ergonomics into various facets of a construction company is not easy, as sometimes these facets are difficult to come by.

**Lifting Guidelines**

Safety managers present a safety topic every week to the entire jobsite at the toolbox talk. One of the 49 safety topics is safe lifting. Lifting is one of the most commonly noted most difficult tasks in construction—and lifting is not going anywhere. Lifting will forever be a part of the construction worker’s daily tasks, thus we must do all that we can to make it the best situation possible. Walsh’s safety topic documents on lifting guidelines were out of date and rather difficult to read or understand. The document has been revised to be mainly visual and includes photographs from our own jobsite (Figure 2, p. 30). We also wanted to document and share the 50 lb. lifting limit.

**Root-Cause Analysis**

Ergonomic issues constantly arise in the construction environment and the key to solving the true problem is a comprehensive root cause analysis. This is an area that can be greatly improved. For instance, an injury occurred 2 years ago where a bridge was being built. The employee pulled a tag release line from a clamp that was holding an H-pile and injured his shoulder. The team at this project decided that the only way to prevent a similar occurrence would be to place more emphasis on the stretching routine. However, this particular situation was depicted to all participants in the ergonomic training class. Before showing the solution defined by the project team, the participants were asked to evaluate the task and come up with their own solutions. They were asked to identify ergonomic risk factors as well as the root cause of the problem. Since we had a mocked photo of the incident, every class determined that the employee was reaching to the tag line, so the root cause was that the tag line was too short. Every class immediately decided they needed a longer tag line. But that was not the only solution. Each class brainstormed five to eight different solutions for this particular situation. They came up with solutions that were actual physical changes to the working environment. They figured out solutions that addressed the root cause of the injury, instead of telling the employee to stretch more. Some time was spent discussing root-cause analysis in the training classes; however, this is an area where more time must be spent.

**Walsh’s Lifting Limit**

As a corporation, Walsh has a lifting limit defined, however not many people know of this guideline nor is it technically documented. Also, numerous Walsh employees have different stories of how and where the lifting guideline was derived. At times, our lifting limit resembles an urban legend.

Most companies have a not-to-exceed lifting limit in place. The Walsh limit is different. Our 1-person lifting limit is set at 50 lb. and is communicated as a recommendation and a guideline for lifting. It is not an absolute, not to exceed value, as construction workers may often lift more than 50 lb.

Most construction workers scoff at the mention of a 50 lb lifting limit. Most construction workers are also very easily capable of lifting much more than 50 lb. For instance, workers are routinely lifting concrete bags that weigh 94 lb. It is more difficult to get someone to help lift a bag rather than just lifting it by yourself. So, when sharing our limit we are conveying the fact that 50 lb is a recommendation and a guideline, not an absolute rule or law. Walsh workers will not get written up for lifting more than 50 lb., they should be offered a helping hand instead. Additionally sharing that this limit is purely in place to help them save their backs has helped the message sink in to our workforce, and will hopefully make them think twice next time they might twist with their back while lifting a concrete bag.

**Opportunities for Program Growth**

The Walsh ergonomics program is in its infancy and has been successful thus far. However, we must not lose the momentum we have gained. There are a few avenues we have yet to really pursue when it comes to creating a formal program (a documented standard) and still more avenues for proactively addressing ergonomics.

**Office Ergonomics**

Reactively, and slowly but steadily, we have ventured into office ergonomics. Prior to inception of the program, the office had no known ergonomic issues and definitely not any ergonomic injuries. No MSDs have occurred in the office within the region, however, once an ergonomist was on staff, small ergonomic issues have risen.

A few people have reported back pain and in each case, each person’s work area was individually assessed for ergonomic risk factors. Recommendations were made and in a few occasions, solutions were implemented. The Pittsburgh, PA, regional office recently acquired one sit/stand workstation for an individual with severe back pain, and we hope this will spark interest and bring others forward who are experiencing discomfort.
Potential Partnership With Auburn University

Auburn University has a progressive and innovative program called Studio Build. In this program, multidisciplinary students work together with manufacturers and craft workers to solve industry issues through product design. These industry issues are either focused on productivity or safety and ergonomics is typically and naturally considered in the design of the new product.

Partnering with this program would allow Walsh to be progressively and proactively involved with ergonomics—at the stage before products are introduced to the workforce. Walsh has been in communication with Auburn University and has visited their facilities, however, at this point no official partnership exists.

The Business Impact

Since Walsh’s ergonomics program has only been in place for 1.5 years, the results are truly too green to provide specific and measurable impacts on the business. However, as Dan Lucas says, “For that first 12 months, and possibly the first 16 months, it was an important task not only to make the ergonomic program as effective as possible, but it was also important to somehow track the accountability of it. Is this worth the investment and time?” Walsh has seen tangible and intangible results. In this section, general thoughts on our business impact will be discussed, as well as specifics of what affects this has had on our business.

Return on Investment

The focus on ROI is multilayered and includes many of the expected process elements when it comes to implementing any worthwhile ergonomics program, which includes significant impact on production, costs of injuries and risk, regulatory compliance, and other safety and health benefits.

Production

Ergonomics has an enhanced focus on work layout and overall project logistics, and it naturally impacts the overall production rates on projects. It is a potential goldmine with Walsh’s workforce, and easily translatable and transitional across all projects, as well as outside of the company. More focus on workstation design or workflow has absolutely changed over time with new and improved tools fit to the worker, more functional handling aids, and better work setup and staging.

Cost of Injuries & Risk

According to the National Occupational Research Agenda (2001), conservative estimates of the economic burden imposed by MSDs in the U.S. (as measured by compensation costs, lost wages and lost productivity) are between $45 and $54 billion annually. Some experts estimate an even higher economic burden reaching up to $210 billion for low back pain alone (Jones & Kumar, 2001). Specifically, Walsh’s Heavy Civil North East group has tracked MSD injuries for 2012 and 2013, and reported a surprising 27% reduction in MSDs among employees. Some may call this a fluke, as this is only 1 year’s worth of data, but it can be compared to counterparts within Walsh who do not have an ergonomics program in place, and whose rates have remained the same. This proves very valuable, as an ROI can begin to be calculated for this program.

Regulatory Compliance

No federal standards for ergonomics exist. However, some organizations can and will be cited for poor ergonomics. Typically, ergonomics falls under OSHA’s General Duty Clause, which states “every employer must provide a safe working environment for their employees.” California is the only state to have ergonomics standard, where if more than one employee, performing identical tasks, has been diagnosed with a repetitive motion injury, the employer must have completed an evaluation and have corrective actions to address the injury and work area.

Additionally, there is a voluntary standard for ergonomics in construction. Despite considerable opposition from industry groups, in 2008, ANSI adopted a voluntary consensus standard for musculoskeletal injuries in construction, which promotes ergonomic solutions. The voluntary standard, ANSI A10.40 Reduction in Musculoskeletal Problems in Construction and Demolition, has been very rarely used in our program since we have highly customized our program, albeit the standard has been a helpful reference.

Other Benefits

Walsh choose to do this program for its employees and its business; it makes sense and adds value to both. The company is willing to do something for its people above and beyond, and many of the employees have noted this. Many comments have been heard such as, “other companies I’ve worked for have never done something like this.”

1) Employee benefits: In a recent survey (Schneider, LHSFNA), 40% of construction workers said “working hurt” is a major problem. Working hurt reduces productivity, but continuing to work hurt can result in disabling injuries that end a career. Many laborers retire by age 55 because they just cannot do the work anymore. Walsh wants employees to be comfortable, which means finding ways to make work easier and more productive. Smarter, not harder, and with fewer injuries. Employee morale has also been improved since inception of this program. Morale is a difficult area to show tangible results; improvements in overall morale have been noted.

2) Business benefits: In addition to the intangible employee benefits, with an ergonomic program one gets a happier and more productive workforce; higher retention of good workers, quality and efficiencies built into work design, reduction in cost of risk, lower incident rates and workers’ compensation premiums, overall...
wellness and absenteeism reductions, and lower healthcare costs.

**Comparing Us to Others**

Published success stories of contractors with comprehensive ergonomic programs are rare. Many companies have taken the initial steps, just as Walsh has, into the Stretch & Flex program but not many have taken the next steps with sound root-cause analysis, formal training or any type of risk assessment. One will find a much more advanced ergonomic culture abroad. The EU has had some success with MSD directives and, hence, more success stories both with contractors and designers/suppliers of tools, handling aids and other engineering solutions.

**Next Steps & Challenges**

Next steps for Walsh include using a formal risk assessment, although implementation time is not set. The goal is to target individual employees to determine what specific job tasks each employee performs, and conduct an analysis of the work being performed to determine the frequency, likelihood and severity of the risks they are exposed to every day from both a qualitative and quantitative standpoint. This will help move us from good to great by involving employees in the risk assessment process, which will include risk reduction and integrated solutions. Outcome, process and progress measures will measure the effectiveness, achievements and setbacks along the way.

**References**


Heather Crawford, CPE, is the ergonomics manager at Walsh Construction assisting with assessments, training and overall program management. Crawford has more than 8 years’ experience in the ergonomics field. Prior to joining Walsh Construction, she was a senior consultant with Humantech Inc.

John Neil is the area safety manager for Walsh’s Heavy Civil division in Boston, MA. His career began 27 years ago with Liberty Mutual as a loss prevention professional. He currently oversees all environmental, health, safety and risk assessment functions for the Boston regional office.

Steve Thomas, CSP, CHST, is the senior safety manager for Walsh’s Heavy Civil Northeast region. He has been practicing safety in the construction industry for 16 years and currently covers a region of approximately 900 employees and manages 16 safety professionals.
The following guide assumes that the most you do related to natural gas piping and combustion equipment is turn the stove on at home to boil water. It is meant to be a basic reference document, and its goal is to teach you how to look for guidance related to the codes and standards that keep personnel and facilities safe. I have noticed three kinds of organizations that have combustion equipment. There are those that have very little equipment relatively small and not subject to great risk. The equipment is almost considered commercial. These organizations typically have no specialized in-house talent to operate or maintain this equipment. It has almost every imaginable safety device and operates almost automatically. The second kind of...
Gas Piping & Combustion Equipment
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organization includes those that have lots of very large, semicustom equipment. These organizations have recognized that they need skilled in-house people to keep this equipment safe and maintained properly. There has probably been an explosion and or fire in their history so they understand the kinds of problems that this equipment can create.

The other 50% of the organizations have just enough of this equipment to need specialized expertise. Their management may not have yet recognized the need for the special treatment of these systems. Their neglect takes the form of personnel who are not adequately trained for and the absence of adequate policies dealing with start-ups, shut downs or preventive maintenance. This equipment does not likely have the latest safety advances. It most likely has antiquated flame safety systems. If this is your situation, I hope that you find the information presented in this article to be helpful. It contains the codes and standards that you need to help guide you through the compliance maze in today’s world.

You may be wondering, “Where do I go from here?” As I say in my book, Fuels & Combustion Equipment Safety: What You Don’t Know Can Kill You, it is all about people, policies and equipment, a new kind of safety-related PPE. People must be trained on safe operations and maintenance. Policies must be created for procedures such as checking safety devices and properly servicing and commissioning flammable gas piping systems. Equipment must be assessed to determine if it was designed properly, meets the latest codes and standards, and if it is being properly maintained. One must understand what codes and standards apply to the equipment and systems. The following is a short primer on the most applicable codes and standards related to fuel and process piping systems and combustion systems in the large commercial and industrial worlds. It is meant to provide a place to start the journey.

**Codes, Standards & Other Sources of Information Regarding the Rules**

Codes and standards form the basis of the rules that one must comply with. Standards are a collection of the best thoughts from a group of experts who followed a specific process on how to do something safely. Consensus standards refer to part of processes where a consensus of these experts has to agree on the components of these documents. Codes are standards that have been adopted into law in a particular jurisdiction. Recommended practices (RPs) are usually excerpts that are compiled from a number of standards. Although not always the result of a consensus process, RPs reflect someone’s or some group’s best practices.

When OSHA and attorneys investigate an incident, they typically seek to understand the code or consensus national standard that should have been known but was not complied with. It is important to remember that codes and standards usually apply from the date that something is built and are typically not retroactive. But, some codes and standards, such as NFPA 56, do have retroactive provisions. However, the retroactive issue does not let anyone off the hook. There were codes and standards in place for whatever year the equipment was installed. The mission should not be about seeing what you can get away with. Codes and standard changes typically occur every 3 years or sooner. These changes are all intended to enhance safety and are a response to horrible disasters. Systems and equipment should be reviewed with the latest codes and standards to identify any deficiencies. This is called a gap analysis.

Before starting on the codes/standards journey, it is important to remember that complying with every detail in every code or standard does not guarantee safety. Each document has many pages that cover the requirements for safe design, installation, operations and maintenance of the respective equipment. Nevertheless, sound engineering judgment is still needed why applying this information. Remember that these codes and standards are minimum requirements. Best practice organizations understand this and often try to do more than the necessary minimum.

The following sections are three of the most important U.S.-based sources [OSHA, NFPA and American Society of Mechanical Engineers (ASME)] for relevant codes and standards information related to fuel systems and combustion equipment. They are presented along with brief descriptions of what I believe to be the most relevant information from these sources for fuels and combustion systems safety.

**OSHA**

OSHA was established in 1971 with the passage of the OSH Act. OSHA and its state partners, coupled with the efforts of employers, safety and health professionals, unions and advocates, have had a dramatic effect on workplace safety. Fatality and injury rates have dropped markedly. Although accurate statistics were not kept at the time, it is estimated that in 1970 around 14,000 workers were killed on the job. That number fell to approximately 4,340 in 2009. At the same time, U.S. employment has almost doubled and now includes more than 130 million workers at more than 7.2 million work sites. Since the passage of the OSH Act, the rate of reported serious workplace injuries and illnesses has declined from 11 per 100 workers in 1972 to 3.6 per 100 workers in 2009. OSHA safety and health standards, including those for trenching, machine guarding, asbestos, benzene, lead and blood-
borne pathogens have prevented countless work-related injuries, illnesses and deaths.

Direct relevancy to fuel piping and combustion systems:

1) 29 CFR 1910.147 Lockout/Tagout—Zero Energy State. One of the most important OSHA provisions related to fuel systems and combustion equipment safety is 29 CFR 1910.147 regarding lockout/tagout and zero energy states. Hopefully, you are already well aware of this statute and what it requires. Proper isolation and lockout/tagout is fundamental to all safe fuel systems and combustion equipment work. I will not be spending much time on OSHA standards because besides the lockout/tagout standard, not a lot is available that is specific to fuel systems and combustion equipment.

NFPA

NFPA was formed by a group of sprinkler manufacturers, installers, insurance and enforcement officials in 1896. In that year, they also developed the first code for the installation of fire sprinklers. NFPA’s mission is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating consensus codes and standards, research, training and education. NFPA publishes more than 300 codes and standards. Among them are codes and standards regarding the safe design and installation of fuel train controls and combustion systems. These include specific codes and standards for boilers and devices other than boilers.

Direct relevancy to fuel piping and combustion systems:

1) NFPA 31, Standard for the Installation of Oil-Burning Equipment. NFPA 31 applies to the installation of stationary liquid fuel-burning appliances. It also covers the storage and supply piping for liquid fuels. Since many appliances (e.g., boilers and furnaces) can use liquid fuel as well as other fuels, the language for this standard is similar to that of NFPA 54, although NFPA 31 deals specifically with fuel oil.

2) NFPA 54, National Fuel Gas Code. This standard applies to the installation of fuel gas piping systems for up to 125 psig, fuel gas appliances and related accessories. Do not be fooled by the word appliances if you are an industrial user. This code is somewhat general and elements of it can be applied to many systems. It covers both natural gas piping systems from the point of the utility’s delivery to the appliance shutoff valve on individual appliances, and propane piping systems from the final stage pressure regulator to the appliance shutoff valve. In the case of most utility connections for natural gas, the point of service to a customer usually starts with the discharge flange of the natural gas meter or at the service shutoff valve where a meter is not installed. The document also covers gas-piping materials, pipe-joining methods, pressure testing, purging and the reintroduction of gas after a repair has been made.

3) NFPA 56, Standard for the Prevention of Fires and Explosions During Cleaning and Purging of Flammable Gas Systems. NFPA 56 is unique in that it covers all flammable gasses and not just natural gas. It is a relatively new standard (August 2011) created at the request of CSB after two tragic natural-gas-related incidents occurred within 8 months of each other (i.e., June 2009 ConAgra Garner Plant explosion and the February 2010 Kleen Energy power-plant explosion). It applies to the pneumatic cleaning of gas piping systems and to the commissioning and service of piping systems that contain flammable gases. It specifies the need to carefully isolate piping systems being serviced, stresses the creation of adequate planning considering dozens of possible safety issues for when gasses are released, and identifies required training for those doing this kind of work. This standard also covers natural gas systems operating at more than 125 psig, (remember NFPA 54 covered issues up to 125 psig).

4) NFPA 58, Liquefied Petroleum Gas Code (Propane). NFPA 58 covers the storage of LP-Gas, (liquefied petroleum). The LP-Gases included in NFPA 58 are propane and butane. Propane is a gas at normal temperature and pressure, but is compressed to be

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Table 1 Partial Summary of Applicable Codes & Standards for Natural Gas Piping Systems

<table>
<thead>
<tr>
<th>Piping section</th>
<th>Applicable code or standard*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to gas meter discharge (typically the utilities piping)</td>
<td>U.S. Federal Regulations 49 CFR Part 193</td>
</tr>
<tr>
<td>Meter to appliance shutoff valve (≤ 125 psig)</td>
<td>NFPA 54/56, ASME B31.1/3 NFPA 56</td>
</tr>
<tr>
<td>Appliance shutoff valve to appliance burner</td>
<td>Boiler, Furnace, NFPA 85, ASME CSD-1, NFPA 86</td>
</tr>
</tbody>
</table>

Note: Make sure to verify your projects’ requirements with the scopes of these documents.
outcries for action. It became clear that this technology needed to be made safer if it was to proliferate. ASME answered the call with groups of volunteer mechanical engineers coming together to create the first boiler code committee in 1911. The first ASME boiler code was then later published in 1914-1915. ASME now distributes more than 600 codes and standards all over the world. The code documents produced by ASME identify safe practices for the construction of boilers and pressure vessels and for pressure piping systems. These documents provided specifications for steels required, their thicknesses, welding practices, and many other fabrication and installation issues that enhance safety.

Direct relevancy to fuel piping and combustion systems:

1) ASME Boiler & Pressure Vessel Code. The heart and soul of what ASME produces is their famous, Boiler and Pressure Vessel Code, which originated in 1914. All 50 states, many municipalities and all the Canadian provinces have adopted it in whole or in part. It is organized into 12 sections that describe in detail important issues related to boiler design, fabrication and maintenance.

• Section I, Power Boilers
• Section II, Materials
• Section III, Rules for the construction of nuclear power plant components
• Section IV, Heating boilers
• Section V, Recommended guidelines for the care and operation of boilers
• Section VIII, Pressure vessels
• Section IX, Welding and brazing qualifications
• Section X, Fiber reinforced plastic pressure vessels
• Section XI, Rules for in-service inspection of nuclear power plant components

ASME

During the 1800s, boilers and steam engines became the heart and soul of the industrial revolution. At the same time, incidents related to boilers and pressure vessels became commonplace. From 1870 to 1910, there were more than 10,000 recorded boiler explosions in North America, (an average of 250 per year). By 1901, the rate had climbed to between 1,300 and 1,400 recorded boiler explosions per year. When these incidents occurred, they were often horrific and involved many people. There were public threats and other related controls that are essential to safe equipment operation. There is also a section regarding training that provides information on training needs for those that operate and maintain this equipment. This code is, however, limited to fuel and combustion issues and not to boiler or pressure vessel construction and integrity issues. These kinds of issues are covered in ASME codes.

7) NFPA 86, Standard for Ovens and Furnaces. NFPA 86 addresses the safe operation of the different types of ovens, furnaces and even thermal oxidizers. It contains extensive information about automatic safety shut off fuel valve requirements as well as other safety related devices like pressure switches and flame detectors. It describes minimum requirements for these components, their proper arrangement, and their maintenance and care. There is also a section regarding training that provides information on training needs for those that operate and maintain this equipment.

NFPA 70, National Electrical Code. This is not specific to combustion equipment but it does cover electrical panels, devices, wiring and installation issues that interface with combustion equipment. It also contains important information regarding special wiring requirements in hazardous locations. Locations can be classified as hazardous if flammable vapors or gasses exist in an area or can exist in an area.

6) NFPA 85, Boiler and Combustion Systems Hazards Code. NFPA 85 applies to single and multiple burner boilers, waste heat or heat recovery steam generators (HRSG’s), solid fueled stoker fed boilers, and atmospheric fluidized-bed boilers with a fuel input rating of 3.7 MW (12.5 million BTU/hr) or greater. NFPA 85 covers issues related to fuel systems, operation and maintenance procedures, combustion and draft control equipment, safety interlocks, alarms, trips and other related controls that are essential to safe equipment operation. There is also a section regarding training that provides information on training needs for those that operate and maintain this equipment. This code is, however, limited to fuel and combustion issues and not to boiler or pressure vessel construction and integrity issues. These kinds of issues are covered in ASME codes.

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• Section, XII, Rules for the construction and continued service of transport tanks.

2) ASME B31.1 Power Piping Code. This covers the design, materials, fabrication, erection, test, inspection, operation and maintenance of piping systems typically found in electric power generating stations, industrial plants, and other installations. The fuel gas piping requirements in NFPA 54 are consistent with the requirements of B31.1 for pressure under 125 psig.

3) ASME B31.3, Process Piping Code. ASME B31.3 focuses on piping systems that may be associated with refineries and petrochemical plants. In many cases, this piping could be related to fuel gas systems. The requirements provided for gas piping systems in both B31.1 and B31.3 are not dramatically different. There may be elements in both codes that might support the kinds of systems you need to know about.

4) ASME CSD-1, Controls & Safety Devices for Automatically Fired Boilers. ASME CSD-1 is a boiler safety code that applies to boilers that have a fuel input rating of less than 12.5 million BTU’s/hour. This code is applied and enforced in at least 26 states and some major municipalities. It is unique in that it is the only ASME code that actually covers the fire or combustion equipment safety side of smaller boilers.

In most cases where it is applicable, jurisdictional inspectors will ask to see evidence that annual testing of safety interlocks is taking place correctly. The rules of this standard include requirements for the assembly, installation, maintenance, and operation of controls and safety devices on automatically operated boilers directly fired with gas, oil, gas-oil, or electricity.

Other Recognized Codes & Standards-Related Organizations (North America)

There are numerous other organizations that play an important role in fuel and gas-fired equipment safety. A number of these and what they provide to the fuels and combustion system world are provided:

1) Factory Mutual (FM). FM is a well-known insurer because of its very high and rigorous standards, well-trained staff, and extensive risk management guidelines for just about every issue and kind of occupancy or process in existence. Many of FM’s data sheets and other materials are available on the web. FM’s loss prevention data sheets are well written, based on a great deal of experience, and full of very practical information.

FM also has a testing laboratory that approves components and devices. The approval guide is widely distributed and used throughout the industry. FM is a key agency to look for when codes require that components in a fuel train must be approved by a nationally recognized testing agency.

2) Underwriters Laboratories (UL). UL is a nationally recognized testing agency that has been in existence for more than 50 years. One of the most respected names in the history of electrical and fire protection safety, UL reviews and tests hundreds of components to certify them for safe use and applicability.

Note on “Listed” and “Approved” products. It can be very expensive for manufacturers to get product certifications, and it is a very rigorous process, so be careful when making changes to fuel trains and equipment. If you change something that is listed and labeled and there is a problem later, the insurer may deny coverage of the product because you altered it.

Other Standards Developers & Related Industry Organizations

In addition to the organizations listed above, other entities publish or enforce codes and standards for the safe operation of combustion devices. You may see tags on equipment that reference these groups:

1) American Gas Association (AGA).

2) National Board of Boiler & Pressure Vessel Inspectors (NBIC).

3) Canadian Standards Institute (CSI).

4) Industrial Risk Insurers (RI), although it no longer exists as it was purchased by GE Gaps).

5) ANSI. ANSI is the umbrella organization for all American national standards, and is the U.S. representative to the International Standards Organization (ISO). ANSI does not develop standards, but oversees the creation, promulgation and use of thousands of American national codes and standards.

6) Technical Safety Standards Authority (TSSA). TSSA is a not-for-profit, self-funded delegated administrative authority that administers and enforces public safety laws for pressure vessels, fuels, and other areas in the Province of Ontario, Canada. TSSA was established under Ontario’s Technical Standards and Safety Act. They do not develop standards, but provide guidance on complying with the government standards established in Ontario.

7) American Petroleum Institute (API).

8) U.S. Department of Transportation’s Pipeline and Hazardous Materials Safety Administration (PHMSA). DOT is a cabinet level branch of the U.S. government that was established by an act of Congress in October 1966. It ensures a fast, safe, efficient, accessible and convenient transportation system that meets the nation’s interests. DOT regulates air, rail, pipeline and road transportation in the U.S.
If your company has global operations, you must consider fuel and combustion system risks from a global perspective. This means considering differences in codes and standards, equipment and even cultures. The differences between fuel and combustion equipment safety issues and risks between developed countries and developing countries are vast. So far, our discussions have been confined mostly to the way that things are in the U.S. The following describes some of the relevant codes and standards making organizations outside of North America and their role in the world of fuels and combustion equipment safety.

**Highlights of the European Combustion World**

Outside of North America, the only other well-developed and well-known set of guidelines or rules for combustion equipment comes from Europe. The European Committee for Standardization or Comité Européen de Normalisation (CEN) developed the EN Standards to serve the common interests of countries within the continent (www.ENStandards.org).

CEN is a non-profit organization whose mission is to foster the European economy in global trading and to ensure the welfare of European citizens and the environment. CEN seeks to do this by providing an infrastructure for the development, maintenance, and distribution of standards and specifications.

CEN was founded in 1961. Its 30 member nations work together to develop European Standards (ENs) in various sectors to build a European internal market for goods and services and to position Europe in the global economy. Some of these standards are voluntary, whereas others have been made effectively mandatory under European Union (EU) law. More than 60,000 technical experts as well as business federations, consumers, and other societal interest organizations are involved in the CEN network, which reaches more than 460 million people.

**Popular EN Industrial Standards**

The following safety requirements parallel the NFPA codes and standards, (mainly NFPA 54, National Fuel Gas Code and NFPA 86, Standard for Ovens and Furnaces):

**Ovens & Furnaces**
- EN 746-1 Safety requirements for industrial thermo-processing equipment
- EN 746-2 Safety requirements for combustion and fuel handling systems
- EN 746-3 Safety requirements for the generation and use of atmosphere gases
- EN 746-4 Safety requirements for hot dip galvanizing thermo-processing equipment
- EN 746-5 Particular safety requirements for salt bath thermo-processing equipment
- EN 746-6 Safety requirements for material melting, re-melting and liquid phase maintaining thermo-processing equipment
- EN 746-7 Particular safety requirements for vacuum thermo-processing equipment
- EN 746-8 Particular safety requirements for quenching equipment
- EN 1539 Dryers and ovens in which flammable substances are released

**Boilers**

These standards are somewhat parallel to ASME CSD-1 and NFPA 85:
- EN 12952 Water-tube boilers and auxiliary installations
Other Important Fuel & Combustion Systems Standards Organizations Throughout the World

1) Canadian Standards Association (CSA). CSA is a not-for-profit, membership-based association serving business, industry, government, and consumers in Canada and the global marketplace. CSA develops standards for products and their installation, and is also a testing laboratory that lists products, similar to UL.

2) British Standards Institute (BSI). BSI Group is a leading business services provider to organizations worldwide, offering a range of services for management system certification, product testing and certification, and standardization.

3) TÜV. Headquartered in Cologne, Germany, TÜV is a global provider of technical, safety, and certification services. The TÜV Rheinland Group employs more than 12,000 people in 62 countries and generates annual revenues of $1.1 billion (40% outside of Germany). TÜV provides a listing service for many industrial products, including boilers and furnaces.

4) Bureau Veritas. This French organization is accredited in a vast number of areas to verify and give official acknowledgment that a system, product, person, or asset complies with a specified requirement for which certification is required. Certification usually includes on-site audits, standardized testing and inspections, and then surveillance audits during the certification period of validity. A design review phase may also be included where applicable.

5) GOST. Practically all goods exported to Russia are subject to some form of mandatory certification requirement such as GOST-R. Since 1993, GOST has been the Russian system of mandatory quality certification for all products produced in and imported to Russia. The purpose of the system is to protect the health and safety of Russia’s population by excluding potentially hazardous or unsafe products from entering Russia’s commercial space.

The registered GOST-R sign, a.k.a. Mark of Conformity, demonstrates a product’s compliance with Russian quality standards. The Russian state authorities establish the rules and regulations for product testing and compliance with the GOST requirements. The requirements include technical product testing and expert evaluation by an independent third-party testing facility accredited by the Federal Agency for Technical Regulation and Metrology. A violation of the certification terms is a violation of Russian laws.

Protect your fuel & combustion systems now, not after an incident: Remember Abraham Wald

Hopefully, you now at least understand where to find safety rules regarding fuels and combustion equipment safety. Since there is a lot of information here, take one concept at a time. Some of you will believe that this does not concern you because you have not had an incident or it’s has long been forgotten. When discussing this with management about trying to decide on priorities, you might want to remember the story of Abraham Wald, who was born in 1902 in Austria. Wald was a brilliant young man having received his Ph.D. in Mathematics in 1931. In 1938, as the Nazi’s invaded Austria and discrimination toward Jews increased, he was allowed to immigrate to the U.S. His expertise and capabilities were quickly recognized and he ended up in a position supporting the war effort. He was asked to statistically analyze where and how many bullet holes and pieces of shrapnel entered returning bombers so that decisions could be made on where to put more armor to enhance their survivability. To everyone’s surprise, he quickly made the assessment that where holes existed on returning bombers was not where more armor was needed because in fact, these were the planes that made it back. He suggested instead that all of the other areas be fortified.

This is the same kind of logic that will help you to avoid fuel and combustion systems tragedies. Statistics say that if you do nothing in this area for long enough you will have an incident. When incidents occur related to fuels and combustion system, they are usually significant and often times multiple people are badly injured or die. In some cases, businesses are wiped out forever. Take time to put some armor in this area before you have an incident. Hopefully you now understand where to access sources of information for what this armor looks like.

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Another year, another billion dollar increase in lost-time injury costs for healthcare. With few OSHA inspections and low penalties, 15.9 million healthcare workers continually record some of the highest injury rates in the U.S., costing the industry $14 billion, and at least 2 million lost workdays in 2012. Provider and patient populations continue to grow, and millions of healthcare-associated infections and fatalities each year demonstrate the link between worker and patient safety. Beginning in 2012 targeted inspections and regional and national emphasis programs aimed additional inspections at nursing and residential care facilities. Continuing losses in human and economic capital due to injuries make the case for building a safety culture in healthcare.

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Healthcare Workers

Healthcare workers represented approximately 12% (132 million) of the 2012 U.S. workforce and included 15.9 million professionals, technicians, support workers and others not directly providing patient care (i.e., maintenance and laundry). A steadily growing sector, the healthcare worker population already far exceeds that of the U.S. manufacturing sector (12 million) (BLS, 2013).

Bureau of Labor Statistics (BLS) identifies three healthcare subsectors within the healthcare and social assistance sector (NAICS 62):

1) ambulatory health (NAICS 621), with a 2012 worker population of 6.4 million divided across physician offices (2.4 million); home healthcare (1.2 million), outpatient and ambulatory surgery centers (0.7 million) and similar;
2) hospitals (NAICS 622) with 6 million workers;
3) nursing and residential care (NAICS 623) with 3.4 million (BLS, 2013).

OSHA Inspection Priorities

With only one compliance officer for every 59,000 covered employees across more than 8 million work sites (U.S. DOL, 2013) in the U.S., DC, Puerto Rico and the Virgin Islands, OSHA prioritizes inspections by 1) imminent danger situations; 2) fatalities and catastrophes; (3) complaints and referrals; and 4) programmed or planned investigations of high-hazard industries or those with high injury and illness rates (U.S. DOL, 2002). OSHA also develops national, regional and local emphasis programs, such as for overexertion injuries in nursing and residential care facilities (national) (U.S. DOL, 2012) to address newly recognized hazards or issues specific to a region or local jurisdiction, such as hazardous dairy farm activities in Wisconsin (local) (U.S. DOL, 2011).

OSHA Inspections of Healthcare

Hospitals

In FY2013, OSHA conducted 45,019 inspections (U.S. DOL, 2014), of which 204 (0.45%) were hospitals (U.S. DOL, 2014), while state OSHA programs conducted 53,892 inspections (U.S. DOL, 2014) of which 383 (0.71%) were hospitals (U.S. DOL, 2014). Figure 1 illustrates the annual numbers of hospital inspections by state and federal OSHA since 2004 (U.S. DOL, 2014).

Based strictly on worker population with no prioritization for high incidence rates, complaints or fatalities, with 4.5% of the U.S. workforce (from 2012) hospitals would have experienced 4,450 of the 98,911 inspections conducted in FY2013. They received only 587.

Nursing & Residential Care

From the same pool of FY2013 inspections, OSHA conducted 571 (1.3%) on nursing and residential care facilities (U.S. DOL, 2014), while state programs conducted 930 (1.7%) (U.S. Department of Labor 2014). Figure 2 (p. 5) illustrates the annual numbers of nursing and residential care inspections by state and federal OSHA since 2004 (U.S. DOL, 2014).

Based strictly on worker population with no prioritization for high incidence rates, complaints or fatalities, with 2.6% of the U.S. workforce (from 2012), nursing and residential care facilities would have experienced 2,572 of the 98,911 inspections conducted in FY2013. They received only 1,501.

Ambulatory Health

Of FY2013 inspections, OSHA conducted 444 (0.98%) on ambulatory health facilities (U.S. DOL, 2014), while state programs conducted 612 (1.1%) (U.S. Department of Labor 2014). Exhibit 3 illustrates the annual numbers of ambulatory health facilities inspections by state and federal OSHA since 2004 (U.S. DOL, 2014).

Based strictly on worker population, with 4.8% of the U.S. workforce (from 2012), ambulatory health would have experienced 4,748 of the 98,911 inspections conducted in FY2013. They received only 1,055, possibly in part due to below-average injury rates for this group.

Employee complaints drove 53% of hospital OSHA inspections in FY2013 (U.S. DOL, 2014)—the most of any...
healthcare subsector—a major issue in the context of potential whistleblower cases, as the win rate for OSHA increased to 32% in 2013 from a historical average of about 21% (U.S. DOL, 2014). This coincides with OSHA ramping up the program since 2012 through additional budget, personnel, visibility and, most recently, an online complaint form (U.S. DOL, 2013). Facilities with chronic high-injury rates and poor safety culture are at increased risk of complaints, inspections and adverse outcomes.

**Healthcare Safety Performance**

Healthcare and social assistance (BLS combines these for sector reporting) reported the highest number of nonfatal injuries and illnesses of any sector in FY2012 (BLS, 2013), the latest year for which these data currently are available. This is not a new development for the industry:

• General medical and surgical hospitals (NAICS 6221) reported more injuries and illnesses than any other industry in 2006—more than 264,300 cases (BLS, 2007).

• General medical and surgical hospitals (NAICS 6221) reported more injuries and illnesses than any other industry in 2007—more than 253,500 cases (BLS, 2008).

• While not significantly different from one another, manufacturing and healthcare and social assistance industry sectors reported more injury cases in 2008 than other industry sectors (BLS, 2009).

• Healthcare and social assistance reported more injury cases than any other private industry sector—623,900 cases—and accounted for 20.1% of all injury cases reported among private industry workplaces in 2009 (BLS, 2010).

• Healthcare and social assistance reported more cases than any other private industry sector in 2010 (BLS, 2011).

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Gross numbers of injuries and illnesses do not allow fair comparison of incident frequencies between industries/sectors. Numbers of cases are converted to incidence rates per 100 employees, defining the percentage of a given workforce injured or made ill. FY2012 healthcare rates (Figure 4, p. 8) reveal that safety performance across the sector is far from consistent (BLS, 2013). With the exception of ambulatory health, which reported a total case rate less than the FY2012 U.S. average for all sectors, all other healthcare components reported much higher than average rates, with state facilities the highest for both hospitals and nursing and residential care.

Based on the lowest end of the ranges reported by BLS, healthcare lost a combined minimum of 1,998,590 workdays in 2012 from days away from work injuries.
Most frequently injured healthcare employee

BLS compiles detailed information on the most costly injuries—those involving days away from work, also known as lost-time injuries. For private sector healthcare (the largest worker population), in FY2012 the most frequently injured hospital employee was a female, age 45 to 54, with five or more years on the job. For ambulatory health, she was age 45 to 54 with 1 to 5 years on the job. Within nursing and residential care, she was age 25 to 34 and on the job for 1 to 5 years (BLS, 2013).

Across all three groups (private) the most common days of injury for hospitals and nursing and residential care, with Thursday and Friday most common for ambulatory health (BLS, 2013).

Most frequent days-away-from-work healthcare injuries

In FY2012, healthcare reported the highest number of days away from work injuries of any sector (BLS, 2013). Within those 176,200 injuries, the most common were strains or sprains of the back due to overexertion from patient handling, followed by slips, trips and falls, and contact with floors (BLS, 2013).

Time lost from injuries

BLS data indicate that time lost from days away from work injuries is significant. Median time away from work in FY2012 ranged from 5 days (nursing and residential care) to 8 (ambulatory health) per lost-time injury, with 19% (nursing and residential care) to 25.5% (ambulatory health) of those injured out for 31 days or more. Based on the lowest end of the ranges reported by BLS, healthcare lost a combined minimum of 1,998,590 workdays in 2012 from days away from work injuries (BLS, 2013). The potential value is arguably double that (using midpoints or higher), for a conservative estimate of perhaps our million or more days lost that year.

Cost of injuries

Loading healthcare days away injuries into the OSHA “Safety Pays” calculator produces an estimate of the direct and indirect cost of those injuries to each group, along with the amount of additional sales needed (hypothetical 10% profit margin in this example) to recover those losses. For direct costs, the calculator uses the average cost of lost time workers’ compensation insurance claims derived from statistical reports submitted to National Council on Compensation Insurance Inc. (NCCI) for policy years 2007 and 2009. Indirect cost estimates are based on a study conducted by the Stanford University Department of Civil Engineering (U.S. DOL, n.d.).
For hospitals (Figure 5), the cost of FY2012 injuries was just under $7 billion, requiring additional sales (patient billing) of nearly $70 billion for recovery. Nursing and residential care (Figure 6, p. 10) spent $4.7 billion, equating to just under $47 billion in additional sales. Ambulatory health spent the least of the three on injuries at $2.2 billion, requiring nearly $22 billion in sales to recover (Figure 7, p. 10).

These direct and indirect losses equate to approximately $79,000 per injury and $874 per healthcare worker across the entire workforce ($2.39 per day per worker every day of the year). Hospitals fared the worst at $91,000 per lost-time injury. Operated at a hypothetical 10% profit, the industry collectively forfeited $139 billion in patient billing in FY2012 to cover $13.9 billion in lost-time injuries.

These large losses must be compared to the cost of OSHA compliance. The Joint Commission (TJC) standards were developed to minimize workplace injuries, but may not cover all occupational hazards. Hospitals have been found to violate OSHA standards more often than not. In 2013, OSHA received approximately 11,000 reports of workplace injuries and illnesses, identifying 15,000 violations.

Joint Commission Coverage of OSHA Requirements

An often-repeated myth within healthcare is that accreditation by The Joint Commission (TJC) satisfies applicable OSHA requirements found in 29 CFR Part 1910. TJC standards do overlap some OSHA requirements. For example, hospitals must label hazardous materials and waste under EC.02.02.01-12, which notes that the OSHA Bloodborne Pathogens and Hazard Communication Standards “provide details on labeling requirements.” EC.02.02.01-10 requires hospitals to monitor “levels of hazardous gases and vapors to determine that they are in safe ranges,” noting only that, “law and regulation determine the frequency of monitoring hazardous gases and vapors as well as acceptable ranges.” EC.04.01.01 requires that a hospital “establishes a process(es) for continually monitoring, internally reporting and investigating” a range of activities including “injuries to patients or others” and “occupational illnesses and staff injuries” (TJC, 2009).

Covered through incorporation by reference of comprehensive national codes are fire protection, exits and life safety (TJC, 2008).

As an example of gaps between the two programs, the most common FY2013 federal OSHA violations at general medical and surgical hospitals (bloodborne pathogens, electrical, hazard communication and lockout/tagout) (U.S. DOL, 2013) are only incidentally addressed, if at all, by TJC standards. The problem for hospitals is that to comply with OSHA standards, healthcare personnel largely are left to research requirements and identify and implement solutions separate from TJC responsibilities, which often is simply not practical given the resource constraints at many facilities.

The fundamental issue is a historical focus on patient safety ahead of worker safety, the logical result of an environment in which TJC accreditation is a continual, demanding process with dire consequences for failure (i.e., loss of eligibility for Medicare and Medicaid reimbursement), as opposed to an OSHA that rarely intervenes (i.e., few inspections) and imposes very low penalties when they do ($914 average per healthcare citation vs. $1,544 U.S. average) (U.S. DOL 2013). The lack of an OSHA ergonomics standard, which would bear directly on the sprains and strains plaguing the industry, exacerbates the problem. And so healthcare finds itself with a reasonably solid patient safety culture but struggling with a $13.9 billion annual employee injury problem, still tending to see OSHA compliance as a competing and minor technical issue. Recent efforts by OSHA clearly are designed to change that.

Healthcare Finally has OSHA’s Attention

Infection Control becomes an OSHA Issue

In the May 6, 2010, Federal Register, OSHA published a request for information (RFI) to collect data from the healthcare industry on “occupational exposure to infectious agents in settings where healthcare is provided.” This included hospitals, outpatient clinics, clinics in schools and correctional facilities and healthcare-related settings, ranging from laboratories that handle potentially infectious materials to medical examiner offices to
mortuaries. Specifically interested in current infection control strategies and practices, OSHA described healthcare as having “a weak culture of worker safety,” related to a lack of data on the prevalence of infections among healthcare workers, and “a lack of effort by healthcare employers” in tracking or documenting those infections, indicating it would use the information to “determine what action, if any, the agency may take to further limit the spread of occupationally-acquired infectious diseases in these settings” (U.S. DOL, 2010).

A sign of the emerging link between worker and patient safety, OSHA prominently observed in the RFI that infectious agents are transmitted between employees and patients, noting that healthcare-associated infections (HAIs) were “among the leading causes of death in the U.S., accounting for an estimated 1.7 million infections and 99,000 associated deaths in 2002” (U.S. DOL, 2010). Though the HAI issue historically relates to patients, OSHA clearly thinks too many healthcare workers are getting sick at work, and that voluntary standards are not working, largely due to poor safety programs and lack of regulatory oversight.

For perspective on the relative magnitude of 99,000 annual HAI fatalities, consider causes of death in the U.S. that generate many more headlines and much stronger public reaction:

- 33,561 from motor vehicles (National Highway Traffic Safety Administration, 2013);
- 22,134 from prescription drug overdose (CDC, 2014);
- 14,827 from murder (Federal Bureau of Investigation, 2013);
- 9,154 from melanomas of the skin (CDC, 2013);
- 8,369 from AIDS and HIV (CDC, 2013);
- 4,383 from workplace injuries (BLS, 2013);
- 3,000 from foodborne illness (CDC, 2014).

These sources nominally represent 95,428 fatalities per year. So, based on OSHA’s estimate (from CDC), HAIs, those infections one catches while being treated for something else, kill more people in the U.S. every year than motor vehicles, prescription drug overdoses, murder, melanoma, AIDS and HIV, workplace fatalities and foodborne illness combined. The U.S. spends billions annually on awareness, research, prevention, treatment, safety engineering, regulations, investigations, training, litigation and media coverage on these threats, yet HAIs remain largely unknown outside of the healthcare industry. That OSHA is so interested is a strong indicator of changing times.

**OSHA “Reaches Out”**

In March 2013, federal OSHA sent letters to 9,413 workplaces experiencing high rates of days away from work, restricted or transferred (DART) injuries and illnesses. Recipients of the letters had recorded FY2011 DART case rates higher than their respective sector averages. Employers were told to develop better safety and health plans, to seek expert advice if needed to do that, and that they might be targeted for inspection. Of the 1,218 received by healthcare, 97.5% (1,187) went to nursing and residential care facilities (U.S. DOL, 2013).

**Nursing Home NEP**

A 2012 nursing home national emphasis plan (NEP) will focus for 3 years on ergonomic hazards related to patient handling, exposures to blood borne pathogens and TB, and slips, trips and falls. Under the NEP, approximately 1,000 nursing homes with DART incidence rates greater than 5.3 are targeted for inspection over the next 3 years by specially trained teams. Enforcement for ergonomic hazards will be under the general duty clause (U.S. DOL, 2013).
Regional Emphasis Program

Citing more than 380,000 sharps-related injuries annually in hospital settings and 600,000 to 800,000 annually across healthcare, Region 4 OSHA implemented a regional emphasis program effective March 25, 2011, through Sept. 30, 2012, focused on bloodborne pathogen exposures and sharps/needlestick injuries at ambulatory surgical centers (ASCs), emergency care clinics, and primary care medical clinics (U.S. DOL, 2011). More than half of surgeries in the U.S. are performed in ASC facilities, and in the last 10 years, more than 130,000 patients served at ASCs were notified of potential hepatitis and/or HIV exposure due to “unsafe injection practices and lapses in infection control” (Infection Control Today, 2011).

Targeted Inspections

On Jan. 4, 2013, federal OSHA announced their Site-Specific Targeting 2012 (SST-12) inspection plan. The list is based on 2010 injury and illness data collected by the 2011 survey of establishments in historically high-rate industries, which included hospitals and nursing care. Healthcare facilities (except nursing and residential care) fall into the non-manufacturing group to be inspected if they reported a 2010 DART rate of 15 or greater. Nursing and residential care facilities will continue to be inspected under the 2012 NEP. A second group of 2250 establishments was randomly selected from the SST-11 list as part of a study of recidivism by previously inspected facilities (U.S. DOL, 2013).

Defining Safety Culture in the Healthcare Workplace

A safety culture is a common set of beliefs, assumptions, and behaviors that actively influence how participants think and act with regard to safety issues. A safety culture is not a policy, program or procedure nor is it distinct from the prevailing organizational culture. Instead, a safety culture is a reflection of the extent to which people take personal...
responsibility for their own safety and that of co-workers and patients into account, as well as their willingness to adopt behaviors that further improve safety and reduce risks. A healthcare safety culture cannot simply be mandated by organization leaders and implemented overnight. Instead, the development of an effective safety culture takes time and requires continuous attention and maintenance to remain effective.

Developing and sustaining a healthcare safety culture brings a number of benefits to healthcare institutions, workers and patients. An effective safety culture can:
- lower rates of worker injuries and illnesses;
- improve staff morale and worker retention;
- reduce transmission of diseases and transfer of pathogens and other infectious agents from workers to patients, protecting patients from infection-related complications;
- help initiate process changes that increase the quality of patient care, while improving operational efficiencies and driving down delivery costs.

**Sustaining a Safety Culture in Healthcare**

The goal of reducing safety and health risks for healthcare employees is inextricably linked with the goals of improved patient safety and quality of care. Individual safety improvement initiatives that separate worker safety and health issues from those experienced by patients often fail to address root causes that are common to both, squandering well-intentioned efforts and perpetuating the risks. For these reasons, healthcare organizations that are most successful in reducing worker safety and health risks focus their primary efforts on developing an organization-wide culture of safety that addresses all safety issues without regard to favorite programs.

Essential culture elements include:
- organization-wide commitment to safety;
- visibility and transparency;
- ongoing learning as a key prevention tool;
- a focus on leading indicators and early reporting of health and safety risks;
- continuous communication;
- recognition and rewards;
- eliminating fear of reprisal for reporting;
- commitment to continual improvement.

**Eliminating staff is not the answer, since most of these injuries came as a result of overexertion, often from staff shortages and/or lack of job expertise. Forcing even fewer staff to do more only exacerbates the issue.**

**CONCLUSION**

This is a wake-up call for healthcare. With 15.9 million employees across tens of thousands of work sites, incidence rates far higher than general industry norms, low OSHA inspection rates, and millions of HAI infections, and 99,000 fatalities per year, healthcare remains an attractive target. OSHA sees healthcare as poor safety performers, and targeted inspections and national and regional emphasis programs for nursing and residential care and ASCs/clinics are a major shift from the historically low amount of OSHA attention this sector receives. The industry is far under-inspected, considering its chronic poor safety performance. Based strictly on worker population, with no enhancements for poor performance, healthcare could have seen an additional 8,627 inspections in 2013. Does the industry really want to force OSHA into that position?

Although high, with rates below those of their nursing care brethren, hospitals avoid much OSHA attention. But, avoiding inspections is not the real issue. Those 176,200 lost-time injuries in 2012 collectively cost the industry $13.9 billion (direct and indirect) and likely more than 4 million lost work days, draining perhaps $139 billion in sales to cover the loss. Healthcare doesn’t sell in the traditional sense, and the need to replace billions in lost revenue through patient billing lands them in a quandary. Eliminating staff is not the answer, since most of these injuries came as a result of overexertion, often from staff shortages and/or lack of job expertise. Forcing even fewer staff to do more only exacerbates the issue. Is the answer simply to consider it a cost of doing business and raise fees?

A 2010 report from AHIP Center for Policy and Research found that the average patient charge for a 325-mg Tylenol tablet among 10 of the largest hospitals in California was $7.50, while CVS sold the same pill for about $0.08. With demands for healthcare reform making daily headlines and the average cost of a hospital stay in the U.S. now at $4,287 per day (Healthcare Finance News, 2013), the idea of a $139 billion cost increase to pay for injuries that largely shouldn’t happen seems untenable.

There are no healthcare exemptions to the OSHA requirements, and it is neither a TJC issue nor solution.
The industry pays dearly in human and economic capital for lack of safety culture, which brings the conversation to investing in safety. Millions of workdays lost from hundreds of thousands of injuries each year make a compelling $14 billion case for healthcare to pursue building safety culture.

The sustainable solution is building a culture of safety. It’s a lifestyle change for the organization that starts with an absolute commitment to safety. Then go after the data. Implement a formal incident management system that promotes early reporting and intervention based on meaningful indicators, such as observations and near misses. Investigate and understand them with the same resolve as if they were injuries, because these leading indicators are warning signs, and your best chance to stop the next injury or illness before it happens. At $79,000 per injury ($874 per healthcare worker) and climbing, the return on investment is obvious. It really is $79,000 per injury ($874 per healthcare worker) and an ounce of prevention, because no injury, illness, or fatality will ever be as tolerable (or affordable) as a case of an ounce of prevention, because no injury, illness, or fatality will ever be as tolerable (or affordable) as one that doesn’t happen.

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- Redefine the true role of public sector safety professionals to recognize their true scope of responsibility (safety, occupational health, fire prevention, hazardous wastes, tort claim investigation and administration, emergency preparedness and disaster planning).

Initiate, through Society leadership, dialogues between governmental leaders and division leadership to open lines of communication to demonstrate the true value of an effective program.

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Increasing Employee Participation in Wellness Programs
By Phyllis A. Simmons, M.A., CSP

When implementing or improving a wellness program, motivating and engaging participants is a constant challenge. Barriers may be personal, cultural, environmental or social in nature. Try to anticipate potential problems that could impact a program’s success. This article includes common motivational barriers and strategies that program developers can use to overcome these obstacles.

Personal Barriers: Intrinsic & Extrinsic

First, think about the intrinsic reasons why employees may not want to participate in your program. Maybe they are too busy. Perhaps they dislike exercise or find gym memberships too expensive. These are just a few examples.

Intrinsic reasons why employees may like to participate include:
• Being healthy is integral to their lifestyle.
• They enjoy activities that promote social interaction and support from others.
• The wellness activities offered matches their interest.
• Some will see the program as a means to help them manage a medical condition.

What’s your planning strategy? Identify the intrinsic values of your target population? Ask employees for their feedback?

Next, note any extrinsic factors (external influences) that could stimulate interest in initiatives, :
• Consider friendly competitions, e.g., a walking contest where all employees log individual miles, helping the company record 1 million miles total.
• Offer healthy food choices that appeal across cultures in your workplace.
• Sponsor various wellness activities throughout the year. Try to stagger the deployment time of each program to counteract participant boredom. For example, focus on healthy eating in the winter. In the spring launch a family wellness initiative. During the summer promote a “let’s get moving” campaign. Fall is a good time to encourage preventative exams, including biometric screenings such as blood pressure, cholesterol, triglycerides and glucose results.
• Offer meaningful participation incentives such as discount gym memberships.
• Include family members in a campaign. Family members can either represent a positive or negative support system for the employee. Including them can help reduce barriers stemming from home life.
• Offer reduced health insurance premiums in exchange for documented participation.
What’s your planning strategy? What are the some extrinsic strategies that could help motivate your target population? Ask some employees.

**Other Personal, Social & Environmental Barriers**

Many wellness practitioners have heard these common statements from the employees at their company;

**Barrier #1: “I’m too busy or tired to get involved.”**

- When implementing an exercise program, make it easy and convenient to participate. Ask employees to break up their exercise sessions into three 10- to 15-minute sessions throughout the day. Shorter time frames can be more realistic and achievable for employees with busy schedules. In addition, ask employees who have found ways to achieve their wellness goals to share their success stories.
- Consider including mobile app resources for the on the go and technology driven lifestyles.
- Ask yourself, how can you make the work environment more supportive? Provide exercise information that employees can do at home or on their breaks time such as walking, climbing stairs, computer stretch breaks and using an on-site gym if one is available.
- Ask the safety committee to sponsor stress buster activities (especially during the holidays) to help employees practice stress reduction techniques. Contact your employee assistance program for ideas if your company uses this resource.

**Barrier #2: “I have an injury or illness that limits my exercise abilities.”**

- Remember many employees may have a chronic illness or injury that could hinder participation (e.g., diabetes, asthma, back injuries). Learn more about the population you are trying to help and how many are being affected. This type of data could be obtained from workplace injury records and through an anonymous needs assessment.
- Encourage employees to consult with a physician before starting a diet or exercise program and to follow recommendations accordingly.
- For company sponsored fitness activities check with a corporate attorney for advice on liability waivers and any other legal documents that may be needed.
- Remind employees to start slow and do low risk/impact activities such as walking or water aerobics. Invite a fitness instructor or physical therapist to teach employees about injury prevention and body mechanics to lower risk of injury.
- Healthy eating initiatives can help if fitness activities need to be scaled down—plan at least one campaign for this category.
- Consider whether initiatives might exclude a segment of the employee population.

**Barrier #3: “Healthy foods are bland and unappetizing.”**

- Feature employee healthy cooking tips—swap recipes.
- Put healthy cooking magazines (including diabetic cooking) in the lunchroom.
- Sponsor healthy cooking taste testing by introducing a low-fat snack every month.
- Eliminate or reduce Friday donut days and give the vending machines a healthy makeover. Stock machines with dried fruit, pretzels, low fat popcorn, granola bars, baked chips, whole grain crackers, water and 100% fruit juice, if possible.

Developing motivational strategies and identifying potential barriers helps to increase the likelihood of employee involvement.

**Phyllis A. Simmons, M.A., CSP, is a safety consultant and president of Creative Safety Designs in San Leandro, CA.**
Industrial Hygienists commonly work in a wide variety of industries and applications. In order to perform optimally in the field, hygienists should have basic project management skills to effectively manage projects from inception to completion. This article is the first of two-part series that provides a high-level approach for managing industrial hygiene projects such as air or noise monitoring. The second part will provide additional details on project management basics.

**Scope & Preparation**

Establishing scope of work sets the tone for a project, the more detail established here will result in more clarity during preparation, execution and reporting. Managing a project starts with determining the scope and then selling the scope to appropriate parties (e.g., management, client, etc.).
Project Management Basics for the Industrial Hygienist
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An industrial hygienist should be prepared to determine a variety of scope details. These include the purpose of the monitoring (e.g., compliance with federal, state and/or corporate requirements, complaint based, or baseline/annual); how many samples are needed; whether similar exposure groups (SEGs) are accurately defined; what resources (e.g., budget, employees, equipment) are needed to perform the monitoring; and the timetable for sampling and reporting. Knowing the answers to these questions will help the hygienist accurately manage a monitoring project. Once the scope is set and approved, preparations can begin.

Modern technology means valuable preparation resources are plentiful. Numerous sampling videos for air or noise sampling are online. Laboratorios or equipment vendors are also great resources. Taking time to prepare before sampling will save frustrations and grief in the field. Hygienists may only get a single opportunity per day to perform the sampling.

While preparing for an upcoming sampling do not forget to inform relevant parties of the upcoming event. Ensure that employees and their supervisors are aware of the upcoming monitoring event and what is needed of them. They should know where to meet the hygienist (usually a break room is most convenient) and be prepared to wear sampling equipment (including the anticipated length of time required). If using equipment with rechargeable batteries, ensure to properly charge those beforehand and plan accordingly for needed recharge time. For noise sampling, ensure that the dosimeters are set up properly and understand the functionality prior to going into the field.

Overall, always ensure that all equipment is properly calibrated prior to use. A good project manager always retains copies of calibration records. With the scope established and preparations complete, the execution of the project brings everything together.

**Execution**

It is the big day or days of the sampling event—time for the hygienist to set up the pumps or dosimeters and kick back, right? Far from it! Sampling event days usually start an hour before workers’ scheduled workday and last an hour or longer after that. Observations and detailed note taking during sampling events are key for proper project management. A hygienist should be prepared to follow along and shadow the employee(s) being monitored as much as possible. Photographs and/or video (if permissible) should be included as part of the sampling event—they are invaluable when it comes time to review the data and report back findings.

There are many tricks and tips hygienists have developed over years of placing and keeping sampling trains on employees. As the old adage goes, practice makes perfect. Hygienists often find that people skills help make employees helpful and friendly. A special treat, like a dozen or two donuts, never hurts (check with management before, naturally). As the day progresses, take a moment to review notes and be sure enough detail is being captured. A preprinted sampling form often helps guide hygienists and ensures critical details are captured. Many examples of these forms are readily available on the Internet and many hygienists are willing to share examples if asked.

As the workday winds down, hygienists start to get busy. Collection of the sampling trains and maintaining a proper chain-of-custody is crucial. Air samples may need to be shipped overnight to a laboratory and equipment rentals may need to be returned. These tasks should have been planned for in the scope or preparation phases. Employees must know where to meet the hygienist so s/he can retrieve the equipment. If performing noise sampling, a data download will likely be needed, so ensure that appropriate computer cables and software are on hand. The end of workday also signals a shift of focus onto the reporting of findings.

**Reporting**

The importance of summarizing findings from a sampling event should not be overlooked. Many standards require reporting back to the employees who were monitored and employees who may potentially perform monitored task(s) within an established timeline. During the scope/preparation, a report template should have been identified and agreed upon with management. Additionally, report distribution should be established early on in the project. Reporting can be simple or detail oriented; the level of content is sometimes based on the outcome of the sampling results. Results below established limits may need no discussion. When reporting take into consideration what the reader will be able to take away and attempt to determine if someone else would be able to replicate the sampling effort.

**Conclusion**

Industrial hygienists commonly find themselves wearing more than one hat and being a project manager is perhaps one of the most significant. Following the basic project management skills outlined here will help an industrial hygienist successfully manage projects.
Budgeting, documentation and data review are critical components of project management for industrial hygienists. This follow-up article provides more in depth information of these components for industrial hygienists managing or starting to manage air and/or noise monitoring projects.

**Budgeting**

Preparing for industrial hygiene projects begins with budgeting and determining how much effort (including labor and expenses) will be necessary. The level of budgeting will vary, ranging from a single project to multiple projects over the course of a year (or longer). Defining your cost estimate before jumping in will assist you over the course of the project. Many hygienists use cost estimating spreadsheets to develop the budget. These spreadsheets can be setup to calculate and breakdown the cost.
Project Management Basics for the Industrial Hygienist continued from page 1

... estimate in a number of different ways. Having this breakdown in the cost estimate usually provides useful information to those making the monetary decisions.

With experience and time, you can refine your cost estimating spreadsheets but a few components should always be included: labor (if applicable), analytical cost per sample (do not forget field blanks as some laboratories will charge for this), equipment fees, shipping charges and other miscellaneous items (e.g., batteries and cleaning/decontamination supplies). If travel is necessary costs could include: airfare (consider baggage fees), car rental (including fuel), airport parking, hotel and meals. While it may appear that some of these items are insignificant, accounting for everything will provide a more accurate cost estimate. The more accurate the cost estimate the easier it is to determine a true cost of collecting air and/or noise samples. With this true cost estimate, justification for the sampling can be made more easily when company financials are of concern.

Tracking and trending cost estimates should be done throughout the life of the project. As the project progresses, keep track of invoices and expenses within your budgeting spreadsheet so you have a running total readily available. Being able to show accurate cost estimates will give you reassurance and likely help provide support for future projects. Additionally, tracking and trending cost can help you gauge whether or not it is time to acquire or upgrade in-house equipment. There comes a point when owning is more cost effective than renting equipment. Knowing when this point will come or if it already has will make your case for acquiring equipment easier.

When collecting personal air and/or noise samples you will need to collect some critical information. It all starts with having a strong template. Using a prepared sampling form and ensuring that all fields are completed will lead to successful reporting and data review. Any format is acceptable, but recording sampling details electronically (i.e., on a tablet or other electronic device) can help minimize time and effort during reporting.

There are a number of items that must be included on sample forms, including: employee name, employee identification number, job title, date of sampling along with start/stop times, sample number, calibration information, equipment serial numbers, PPE and applicable weather information. Beyond that, you will tailor your sampling forms to better support reporting and tracking of samples. Keep in mind that documentation should be thorough enough so that another hygienist could pick up your sampling forms and replicate the sampling. Replication is key; leaving blanks on sampling forms will lead to confusion during reporting or in the future when sampling is repeated.

Documentation

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Data Review

Many statistical evaluation tools exist, and there are a number of ways to evaluate data after receiving the lab results. Perhaps one of the most important things you can do is return the results to the employees sampled with comparison to applicable occupational exposure limits (OELs) and whether action is needed. Summaries should be sent to employees working in similar exposure groups (SEGs). Beyond that it is your choice on how else to review and maintain data. However, there should be consideration given to specific regulatory and corporate requirements on data review and reporting. Many companies offer software that simplifies database management, while some hygienists develop and build their own database. Data review also serves as PPE determination or verification of current PPE. Industrial hygienists can make determinations such as respiratory protection and cartridge change out schedule or what type of hearing protection is needed based on the data received.

Conclusion

These three elements of project management for air and/or noise monitoring are important components for industrial hygienists. Consider evaluating your work annually and look for those areas where improvement can be made. Look to your colleagues as another source of information; reach out to them and share spreadsheets, documentation forms and data review processes. Building on these components and becoming more experienced with these will lead to successful air and/or noise monitoring projects.

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Responsible Care

A Sustainability Initiative by Chemical Industry & Its Implementation Status in Asia

The Canadian Chemicals Producers Association [now the Chemistry Industry Association of Canada (CIAC)] conceived the Responsible Care (RC) initiative in 1984. RC was first launched in 1985 to address public concerns about the manufacture, distribution and use of chemicals. It focused on new and important challenges facing the chemical industry and global society, including growing public dialogue over sustainable development, public health issues related to the use of chemical products, the need for greater industry transparency, and the opportunity to achieve greater harmonization and consistency among national Responsible Care programs.

It was adopted by American Chemistry Council (ACC) in 1988.

Beyond North America

At the global level, the International Council of Chemical Associations (ICCA) adopted RC in 1996. ICCA used the program to represent RC as commitment of Chemical Industry to Sustainable Development at Johannesburg World Summit on Sustainable Development (WSSD) in 2002. As part of its initiatives in this direction, it included RC global charter in United Nations’ strategic approach to international chemicals management in 2006 in Dubai.

The global charter was revised in May 2014. Today, it acts as the “guardian” of RC. Per the latest ICCA reports, RC is practiced by chemical industries in more than 60 countries. ICCA monitors implementation and ensures that it evolves to address current concerns and issues. Each association runs its own national program with its own member companies. Two goals of ICCA for 2015 are:

1) expanding RC regions to include new areas of Eastern Europe, Africa, Latin America and Asia;
2) significantly increasing the number of chemicals in commerce listed on the global product strategy (GPS) portal.

Asia

In line with the overarching goals, there has already been a great deal of RC acceptance in Asian countries. For the first time ICCA had a global conference on May 29, 2014, in Japan. China’s China Petroleum and Chemical Industry Federation (CPCIF) was accepted as a full member of the association’s RC leadership group (RCLG), the working group steering RC Initiatives of ICCA. Gulf Petrochemical and Chemical Association (GPCA) has also been driving its membership to adopt RC 14001 and many companies like Saudi Basic Industries Corp. (SABIC) have already achieved implemented RC management system and received RC 14001 certification.
India

While individual Indian companies like Tata Chemicals, Nagarjuna Fertilizers and Chemicals, and Reliance have taken a lead in implementing RC initiatives in their organizations and have been among global leaders in pursuing third-party verification of their management systems per RC 14001, its response as a nation needs to drive open and transparent stakeholder communication and global product strategy, two key drivers that distinguish the initiative from the rest of OSH initiatives need substantial improvement.

Indian Chemical Council is a full member of ICCA and promotes its members to sign RC. It is not an obligation for members to commit to RC Program for becoming or retaining their membership. It has a manual to guide its members to implement six codes of practice. It carries out peer group assessments to grant the RC logo. The logo is also available provisionally if organizations are certified to ISO 14001 and OHSAS 18001 and commit to undertake RC logo assessment within a year.

Contents of RC Programs

RC Charter

The RC global charter—first released in 2006 as part of the United Nations’ Strategic Approach to International Chemicals Management in Dubai—was revised in May 2014. As part of this latest charter, signatories commit to actively strengthen RC worldwide by dedicating their company, people, technologies and business practices to the charter’s six elements:

1) a corporate leadership culture that proactively supports safe chemicals management through the global RC initiative;
2) safeguarding people and the environment by continuously improving the environmental, health and safety performance and security of facilities, processes and technologies and by driving continuous improvement in chemical product safety and stewardship throughout the supply chain;
3) strengthening chemicals management systems by participating in the development and implementation of lifecycle-oriented, science-and risk-based chemical safety legislation and best practices;
4) influencing business partners to promote the safe management of chemicals within their own operations;
5) engaging stakeholders, understanding and responding to their concerns and expectations for safer operations and products and communicating openly on performance and products;
6) contributing to sustainability through improved performance, expanded economic opportunities and the development of innovative technologies and other solutions to societal challenges.

Guiding Principles

The 2010 version contains 12 guiding RC principles that companies commit to follow:

1) to lead companies in ethical ways that increasingly benefit society, the economy and the environment;
2) to design and develop products that can be manufactured, transported, used and disposed of or recycled safely;
3) to work with customers, carriers, suppliers, distributors and contractors to foster the safe and secure use, transport and disposal of chemicals and provide hazard and risk information that can be accessed and applied in their operations and products;
4) to design and operate facilities in a safe, secure and environmentally sound manner;
5) to instill a culture throughout all levels of organizations to continually identify, reduce and manage process safety risks;
6) to promote pollution prevention, minimization of waste and conservation of energy and other critical resources at every stage of the life cycle of products;
7) to cooperate with governments at all levels and organizations in the development of effective and efficient safety, health, environmental and security laws, regulations and standards;
8) to support education and research on the health, safety, environmental effects and security of products and processes;
9) to communicate product, service and process risks to stakeholders and listen to and consider their perspectives;
10) to make continual progress towards the goal of no accidents, injuries or harm to human health and the environment from products and operations and openly report health, safety, environmental and security performance;

11) to seek continual improvement in integrated RC management system to address environmental, health, safety and security performance;

12) to promote RC by encouraging and assisting others to adhere to these guiding principles RC codes of practice.

Many national associations including ICC in India have adopted six codes of practice:

• pollution prevention;
• employee health and safety;
• process safety;
• product stewardship;
• distribution code;
• community awareness and emergency response.

However, ACC has adopted a seventh code, namely, the security code.

**Verification Processes**

In June 1993, ACC’s board of directors approved development of management systems verification (MSV) process similar to the Canadian initiative. This was intended to assist companies in improving their environmental, health and safety performance and contribute to the building of trust between chemical facilities and their neighboring communities. Following 3 years of development and testing, the board approved a management systems verification process for use by its member companies in April 1996. It is a system to ensure that member companies have adequate systems in place to implement RC’s management practices. Reviewers include peer group with no vested interest in the organization or any competitive interest or members of the plant’s public advisory panel or local emergency response personnel, such as firefighters.

However, in 2002, there was a major shift in the verification process toward third-party certification, to increase the public trust and two alternate approaches developed for verification process.

**RC 14001:2013 Certification Process**

ACC published the RC 14001 standard for the first time in 2002 based on Deming’s plan-do-check-act cycle. It brought together elements of RC program (RC global charter, RC guiding principles and RC codes of practice) and requirements of internationally accepted requirements for environmental management system ISO 14001. RC 14001 has since been revised to incorporate changes in ISO 14001:2004, adoption of security code and recent changes in ACC’s product safety code and process safety code in Nov. 2012. The latest version of this specification is called RC 14001:2013 technical specification.

This is available for assessment by audit service provider for assessment and certification to ACC members, its associates and those organizations, who are not a member of ACC.

RC 14001:2013 is a super-set of ISO 14001:2004. It includes environment, occupational health and safety and security and RC requirements. An organization with RC 14001:2013 certification is deemed to be meeting the requirements of ISO 14001:2004 and gets that certificate as well. Therefore, there is no need for a separate ISO 14001:2004 certification for the organization. All RC 14001:2013 certificates globally are accredited by ANSI national accreditation board that also approves ISO 14001:2004. In fact, it incorporates a majority of the requirements of OHSAS’s 18001:2007 as well.

**RCMS Certification Process**

RCMS:2013 technical specification is available for assessment only in U.S. and ACC members have the choice of selection of

**Peer Group Assessment Process**

ACC and the Synthetic Organic Chemicals Manufacturers Association are now required to implement a management system, a RC management system (RCMS) that meets either the RCMS or RC 14001 technical specifications. Both standards have their 2013 version currently in running and transition from their 2008 to 2013 version is still under progress.

**Certification Status**

Global

Different national associations are at different levels of implementation of the program, details of which are
available in ICCA’s RC progress report from 2012. Different national associations have adopted this program to different degree with some countries still implementing four codes, while most countries have adopted six codes. ACC has adopted six codes. Also, while in some countries national associations have made RC commitment mandatory for membership, others have left it to the discretion of their members to decide. Also, while a number of countries have gone in for third party assessment of their national RC programs, some countries like India still are sticking to the system of peer group assessments.

**Asia**

Indian companies led from the front in terms of voluntary adoption of RC 14001 certification process and Tata Chemicals Limited, Babrala, Uttar Pradesh and Indian Rayon, Veraval, Gujarat, a part of Aditya Birla Group were certified to this standard in 2008. After that fertilizer sector has taken a lead and Nagarjuna Fertilizers and Chemicals Limited, Kakinada, Andhra Pradesh got certified to RC 14001 technical specification. As in December 2014, per the information available with us, Reliance Industries Limited, Hazira is also certified to RC 14001 Technical Specification.

However, GPCA took a major lead in driving RC 14001 initiative since 2009, 16 companies were certified to RC 14001:

- Abu Dhabi Polymers Co. Ltd. (Borouge)
- Advanced Petrochemical Co.
- Alujain Corporation
- EQUATE Petrochemical Co.
- Farabi Petrochemicals Co.
- Gulf Petrochemical Industries Co. (GPIC)
- Kuwait Aromatics Co.
- National Petrochemical Industrial Co. (NATPET)
- Petrochemical Industries Co. (PIC)
- Qatar Chemical Co. Ltd. (Q-Chem)
- Qatar Fertilizer Co. (QAFCO)
- Qatar Vinyl Co. (QVC)
- Sahara Petrochemicals
- SABIC
- Saudi International Petrochemical Co. (Sipchem)
- S-Chem

**India**

There are three specific companies with valid RC 14001 certificates in India that are as per ACC RC 14001 Technical Specification:
- Tata Chemicals Limited, Babrala, Uttar Pradesh
- Nagarjuna Fertilizers & Chemicals Limited, Kakinada, Andhra Pradesh
- Reliance India Limited, Hazira, Gujarat

Also, there are about 118 signatories as of Jan. 1, 2015, to RC program and about 20 of them have been granted RC logo after peer group assessment.

ICC is the only organization authorized to grant this logo while implementation can be done either by the unit or applicant or with the support of any other organization deemed fit by the applicant unit.

Ajay Sachdeva is treasurer and secretary of the ASSE Maharashtra Chapter, a part of the organizing committee for Safety India 2015 and managing director of corporate governance advisory services.

Improve Your Online Experience

A SSE’s website is designed to improve your interaction with the Society. New features include:

- Updated homepage: Check out the latest feeds from ASSE’s blog, news, job board and all things ASSE.
- Shopping cart: Renewing your membership and purchasing technical books and standards from ASSE has never been easier. You can also save an order, create a wish list and more.
- Single sign-on: By changing the way you login to the website, Body of Knowledge users can login once and move seamlessly to the ASSE website while remaining logged in.

If you have any questions or feedback, contact ASSE Customer Service at Customerservice@asse.org or +1 (847) 699-2929.
Consider leadership in its broadest sense: business, functional business support and supervisors. Without continued leadership drive, at all levels, even strong safety processes and employee ownership will not yield the desired and sustained safety culture and performance.

The sustained drive and commitment of senior and middle management is continually identified as the most critical aspect of creating and maintaining a strong safety culture. It is challenging to achieve and sustain. This is reflected in circumstances where new leaders enter an organization as new hires or into new roles from internal restructurings, where complacency with high levels of performance are reached in mature organizations or where an organization struggles to make its first significant strides in incident reductions.

No one wants their employees injured or ill while at work, but some leaders may lack the understanding of exactly what to do and the fortitude to do it every day, throughout all the daily business challenges. How do the leaders fulfill this important role? Is it their fault when safety performance lapses or they do not consistently act as safety champions? I propose there is a dual responsibility here—a partnership of S&H professionals and leaders. As safety professionals, we have a key responsibility to become the leaders that we need to be, so that we can partner with our businesses leaders so that they may become the safety champions whom they need to be.

Many aspects make up superior safety leadership. All aspects and issues must be made clear, easy and desirable, even for our leaders. SH&E professionals, as teachers and coaches, step in at this point. Our role is to help our leaders, and every employee, to realize their roles and to successfully meet their responsibilities. Successful safety is a joint role—we are business partners.

We provide the leadership and offer help and clarity in the context of:

•What to do. What is the role of leadership to drive and champion safety, and why?

•How to do it. What are the specific actions leaders should take?

•Tools to help our leaders fulfill their responsibilities—make it clear, easy and desirable.

Let’s begin with the leaders. Do they have the clear understanding, easy processes, helpful tools and coaching to be successful safety leaders and champions? SH&E professionals can help leaders with the following:

•Set a mission, vision, goal and timeline. Discuss and define the organizations’ expectations for safety performance and culture; what are the safety goals; how do the safety expectations and goals align with the organization mission and values? What is the timeline for excellence? Is there a sense of urgency—union drives, employee grievances, OSHA attention or fines, customer requests, high workers’ compensation costs or a new senior leader with new safety expectations?

•Define a strategy. A successful strategy provides a balanced and simple framework, which guides actions and behaviors. A proven effective model is culture-(safety) process-(safety) talent. All three elements encompass safety prevention and value: pro-active, foundational processes and programs; supportive and leading resources and a culture which enables safety to become a value, integrated into all business processes, decisions and behaviors.

•Define culture and metrics. A culture must be clearly defined, so it may be worked and measured. An effective definition has four components: active leadership drive, employee engagement, safety integration with the business processes and system-based root cause analysis (Hansell, 2007; 2010). Together, these four components form a new culture—a new way of working and thinking, with safety as a core business value.

•Clarify expected roles and responsibilities for everyone, and how people will be held accountable. Target key actions and behaviors for all leaders, at all levels, and employees. Accountabilities are then set, communicated and tracked, and are integrated with performance reviews, recognition and reward, and discipline processes.

•Enable the organization to fulfill its roles and responsibilities. Provide specific education, tools and
processes in the organization, to enable it to fulfill its roles, embrace safety, actively get involved and drive it forward.

**Explain why** safety performance and culture are good for the organization’s people well-being, is aligned with company values, and facilitates business value and success. It enables a common, unifying vision for all people. It is well-established that superior safety results in increased productivity, quality, employee morale and teamwork. Safety culture also directly aligns with sustainability, and can actually accelerate sustainability progress (Hansell, 2011).

**How to do it- what are the specific actions that leaders should take.** Help leaders to identify specific actions that need to be taken, to fulfill the purpose and goals of a safety culture.

- **Define a roadmap.** Provide a simple tool, like a maturity path, to help the organization understand the characteristics of the desired end-state and to assess the current state, against that desired end-state. It provides a tool for self-assessment, identifying needed areas of improvement and a metric to track progress.
- **Business planning.** Include safety issues and culture in business and location planning.
- **Mechanisms to review status of goals and expectations.** Keep accountabilities visible and tracked, discussed in planning and business review meetings and performance reviews.
- **Review incidents.** Review and discuss incident trends, root causes and corrective action closures.
- **Assist troubled sites.** Target locations with safety culture or performance issues. Conduct leader and employee interviews, safety culture assessments, work task and equipment risk reviews, and functional process review for effective safety integration.
- **Role model behavior.** Leaders are actively and personally engaged.
- **Provide support** with time, resources, funds for safety improvement and involvement activities by employees and leaders, at all levels.
- **Safety ownership by everyone.** Safety professionals are not solely held responsible for safety performance. Instead, the entire organization owns safety. The roles and responsibilities of each function or level are understood and adopted.
- **Professional development.** Performance reviews are conducted and professional management plans are developed. Developmental assignments are identified, and succession planning done.
- **Helpful tools, provided by safety professionals.** Provide leaders with helpful tools to make it clear, easy and desirable to accomplish the needed tasks and purpose of the culture.
- **Safety leadership training.** Designed for each level or functional group, to provide core messages of organizational safety expectations and specific activities, pertinent for each group.

**Provide helpful, easy-to-use and practical tools** that make it clear and easy for leaders to fulfill their leadership roles. Tools and tips should cover the topics below:
- safety basics: understanding rates, costs, incident reporting, system-based root causes;
- roles, responsibilities and accountabilities for all;
- reinforce the desired behaviors and results (positive with recognition);
- integrate safety with company vision, values, processes and decisions;
- visible commitment, participation and involvement;
- engagement-enable and empower everyone to be personally involved.

**Maturity path.** Guidance framework for desired end-state of safety culture.

**Templates.** Business planning, annual operating plans, scorecards, culture surveys, walk-around audits, safety skip level meetings, incident reviews, good root-cause analyses and safety Kaizen events.

**Safety integration points** with 24 business processes, owned by human resources, engineering, operations, product and process development, quality, maintenance, procurement, IT and communications.

**Role of S&H Professionals**

The degree to which safety culture succeeds in a company is due to the drive of the business and functional leaders, alignment with the businesses, engagement of all employees, and provision of clear strategies and tools to help the business succeed. The SH&E professional has a critical role to help the businesses to achieve these actions and the safety culture (Hansell, 2013).

The role and needed skill sets of the safety professional are now as a teacher, guide and motivating coach. Leaders and employees need the encouragement and guidance to try new tasks, and fulfill new roles. In addition to these skills, the safety professional needs an attribute of passion. A true passion, even love, of what you do is the ultimate motivator for yourself and others. With a commitment of the heart, you will make a stand, take a risk and do what it takes to change your world for the better. Your passion will generate energy and enthusiasm in others too, along with your new great ideas, noble principles, stretch goals, exciting challenges and a compelling vision for the future. Others will be motivated to step away from their comfort zones and old paradigms to take new steps and generate new ideas. It is also the hallmark of companies with superior safety performance, where the leaders and the employees are so engaged that they forge new ground together with the SH&E leaders as a coaches. If this sounds too risky or cliché, and if you’d prefer to do what you are told without confrontation with or challenge by your leadership, then resign yourself to mediocre performance and do not blame the leaders when they do not step up. We are directly in this game, and in fact, we have the playbook.
With the needed skills, passion and clear roles in place, the best way for SH&E professionals to help the leaders is to make it clear, easy and desirable to make safe choices and to follow the strategy.

• **Clear.** Clarify the vision, and specific actions, behaviors and results that are mandatory,

• **Easy.** Identify straightforward and efficient ways to accomplish the desired actions, behaviors and results; strive to integrate safety into existing business processes.

• **Desirable.** Desired safety behaviors, actions and results are positively recognized and rewarded, included in personal and business performance reviews. Unacceptable actions, behaviors and results are subject to discipline, as appropriate.

**CONCLUSION**

Leaders want their people safe and healthy. To fulfill their role as safety champions, they may need assistance in better understanding what to do and how to do it, along with helpful tools that make the needed actions clear, easy and desirable. As safety professionals, we have a critical role as business partners to provide this guidance, coaching, teaching and tools. If our leaders are not the vibrant safety champions we would like, we need to ensure that we are being the most motivating, business partners we can be. Our role is to help our leaders, and all employees, to successfully meet their roles and responsibilities, and to achieve the desired safety culture results.

**REFERENCES**


**Cathy A. Hansell, CCSR, MS, JD** is the president of Breakthrough Results, a firm that specializes in leading companies to achieve superior, sustainable safety cultures and business value results. Cathy received a JD in Law, a MS in Environmental Toxicology (NYU Institute of Environmental Medicine) and a BS in Environmental Science & Engineering. She holds eight certifi-
cations in Safety, Six Sigma, Quality and CSR. She was awarded the 2010-2011 NAPW’s Woman of the Year Award in Safety & Wellness, and One of the Top 100 Women in Safety from ASSE.
Managing Safety for Temporary Workers

By Carrie Sypowicz, PHR, ASHM

Safety and health concerns for temporary workers are not new. The fact that 5.7 million temporary workers makes up the workforce, according to Bureau of Labor and Statistics, gives pause to HR managers who must navigate the growing trend of temporary workers and safety training. In addition, National Safety Council states that “11 million people are hired every year as temporary or contracted workers.” Arguably, injury rates among temporary workers have increased whether from the growing size of this workforce or poor training. Regardless, OSHA logs documenting the number of injured temporary workers prompted the agency’s enforcement initiative. The following information is intended to help HR managers navigate the enforcement policy, provide training guidelines and identify organizational approaches to improve safety among the temporary workforce.

Enforcement Policy

OSHA’s enforcement policy defines a temporary worker as a worker supplied to a host employer and who is paid by a staffing agency regardless of whether the job is actually temporary. The safety of the temporary employee is a shared responsibility between the staffing agency and the host employer. The bottom line is that all workers have a right to a safe and healthy work environment. Open communication and documenting between the staffing agency and the host employer is key to the success of a temporary employee’s health and safety in the workplace. The agency has also issued recommended practices to ensure temporary worker safety.

Who is responsible for the workers safety? According to the OSH Act, both the host employer and the staffing agency are responsible. The joint employment contract should address this responsibility as it requires each party to perform due diligence such as identifying hazards. Furthermore, the contract should specify which party will provide general safety and health training, and which will provide site- and task-specific training.

The written contract should be clear and concise. A staffing agency should determine any hazardous conditions that an employee may encounter and work with the host employer to determine what training an employee will receive. The agency should assess working conditions before sending an employee to a work site. In general, host employers will be better suited to train employees with regard to hazardous materials being used at a facility, with appropriate PPE and other equipment, for example.

HR and OSH professionals should partner to support employees in potentially stressful situations to help keep them focused on the safety aspects of the job. Generally, diversity programs are managed by HR. HR also plays a key role in the employee hiring and training, and must implement best practices in the onboarding and job assignment processes. HR professionals understand the balance between issues of joint employment and OSHA’s expectations regarding temporary worker safety. Safety professionals provide information and training that will enable any employee to work safely. Safety programs must be effective for everyone in the workplace. HR and safety professionals should work together to incorporate diversity principles in workplace safety programs, build effective communication strategies for multicultural and multigenerational workforces, and create and sustain an effective safety culture in a diverse workplace.

Wishing everyone a happy, safe and healthy 2015.
Employee Training
Training can be costly, especially for small and medium-sized employers. Utilizing a third-party is advantageous, not only because of cost-effectiveness and efficiency, but also because it is another set of eyes reviewing work conditions. Often, insurance companies offer free consultation to employers. After all, they want their clients to have a good safety record as that helps reduce insurance premiums. In addition, OSHA and state labor and industry agencies offer free consultations.

Temporary employees should receive the same training as permanent employees. More importantly, training should be delivered in a way the temporary employee can interpret and understand. For example, if employees speak a different language, deliver the training in their native language. If the company does not have a bilingual trainer, a local or state agency may be a good resource. Utilize pictures and other visual aids to train employees. Asking an employee to explain safety procedures after training will indicate how much the employee understood and the amount of knowledge transfer that occurred. The goal is to fill any learning gaps.

Organizational Culture
Another consideration is an organization’s culture with respect to temporary employees. HR managers should revisit their companies’ mission, vision and value statement. Does it indicate that all workers are a valued asset? Does management acknowledge the value of temporary employees? Are temporary workers included in new employee orientation training? Does the organization strive to make temporary employees feel that their work is valued, and that they are valued as an important part of meeting organizational goals? Is there resistance among managers, supervisors and full-time employees that could negatively affect a temporary worker or workforce? Arguably, a temporary worker who does not feel supported may also feel like s/he does not belong or is not a part of a team. Any employee can experience job dissatisfaction and become disengaged. A disengaged employee may disregard safety concerns, potentially creating an unsafe work environment for everyone.

Carrie Sypowicz, PHR, ASHM, is a solution specialist with Pro Group Networks.

OSHA’s Policy Background
For the policy background on OSHA’s initiative, click here.

Human Resources Branch
Significant Contributor Award
Michelle Brady received the Significant Contributor Award for ASSE’s Human Resources Branch. She has been a member of the branch’s Advisory Committee since June 2011 and is responsible for the branch’s awards and honors program. Most recently, Brady played a key role in the branch’s strategic planning. Along with her proactive and innovative ideas to grow branch membership, she has taken a lead on the branch’s contributions to the ASSE Body of Knowledge, and she has played an important role in finding articles to include in the branch’s technical publications.
Managing Hazards Through the Hierarchy of Controls

By David Coble, M.S., CSP

It is summer and for many of us that means lawn-mowing season. Numerous hazards can be associated with mowing the lawn, including flying objects; chemical exposures; heat from the sun and exhaust pipes; vibration and noise; and being caught in rotating parts. To protect ourselves against these hazards we might first think to use safety glasses, protective foot-wear or hearing protection depending on the length of noise exposure.

PPE is often considered first because it is usually the easiest control to implement. However, PPE usually ranks last in any hierarchy of controls because it is the least effective, most expensive and most cumbersome way to protect people in most situations.

Hierarchy of Controls

There are a variety of hierarchies of controls, and most are prioritized in the following order:
1) eliminating the hazard;
2) substituting less hazardous chemicals, materials or processes;
3) installing engineering controls;
4) controlling the hazards through administrative techniques, such as rotation of those exposed, signs and warnings, and improved training;
5) PPE.

The U.S. tends to follow the NIOSH hierarchy. The NIOSH hierarchy of controls emphasizes controlling hazards by first attempting to eliminate the hazard. If that is not successful or is impractical, it is recommended to find a less hazardous substitute. If elimination or substitutions are not feasible, engineering controls or administrative techniques should be used to address hazards.

In the lawn-mowing example, a few alternatives would eliminate the hazards altogether, including replacing grass with artificial turf or simply letting the grass grow. However, if these options are not feasible or aesthetically pleasing, consider substituting the lawn for landscaping that requires less maintenance such as decorative stone. Substitution might also include using a herd of goats or cattle to maintain the grass.

If these options are not acceptable, engineering controls such as a climate-controlled cab on the lawn mower, blade guards, sunshades and canopies and noise suppression can be used. However, the cost of controls...
must also be considered. When engineering controls are not feasible or do not control hazards to an acceptable level of risk, administrative controls such as assigning more workers to the task to spread out the exposure, mowing during the cooler times of the day, increasing rest breaks and using state-of-the-art push/pull techniques can be used.

When all other options have been exhausted but the hazards are still not completely controlled, PPE becomes appropriate. PPE is appropriate when hazards cannot be controlled through engineering techniques due to feasibility and during the interim time that engineering controls are being developed.

**Worldwide Hierarchies**

Many countries follow slightly different hierarchies of controls, but all have similar key elements.

OSHA’s hierarchy of controls (Figure 1) states that engineering and administrative controls must be used to control hazards. If engineering and administrative controls are not feasible, then PPE is appropriate.

A broader OSHA hierarchy, found in OSHA’s Small Business Handbook (OSHA 2209-02R 2005), prioritizes controls in the following order:

1) eliminate the hazard;
2) limit or control exposure;
3) training and safe work procedures;
4) PPE.

Unlike OSHA’s hierarchy, which includes isolation in engineering, the **Australian hierarchy** of controls includes isolation of the hazard as a separate element:

1) elimination;
2) substitution;
3) isolation;
4) engineering;
5) administrative;
6) PPE.

The **Canadian hierarchy** has four elements and includes substitution as a type of hazard elimination:
1) elimination (including substitution);
2) engineering;
3) administrative (including work practices);
4) PPE.

The EU has a simple three-step hierarchy that, interestingly, does not specifically include PPE. This is primarily because the EU relies on risk assessment of all potential hazards. Part of the risk assessment would be to determine the best method of control, which might be PPE if that is the only feasible control.

1) **Elimination**: The best way to reduce the risks from dangerous substances is to remove the need to use them by changing the process or product in which the substance is used.

2) **Substitution**: Substitute the dangerous substance with a less hazardous one or change the process to reduce the risks if elimination is not possible.

3) **Control**: If a dangerous substance process cannot be eliminated or substituted then exposure must be prevented or controlled.

While all of these hierarchies have their differences, three elements remain the same:

1) Control the hazard through elimination or engineering practices.
2) Substitute materials, chemicals and processes with less hazardous materials, chemicals and processes where feasible.

3) PPE is appropriate where hazards cannot be controlled due to feasibility or during the interim period when controls are being developed and/or implemented, or during an emergency.

A different hierarchy of controls used primarily in chemical process safety is inherent safety design (ISD). Chemist Trevor Kletz has been credited with developing this hierarchy following a chemical explosion in Flixborough, U.K., on June 1, 1974, that killed 28 people and seriously injured 36 others. The ISD hierarchy is:

1) substitute a less hazardous chemical;
2) minimize the amount of hazardous materials;
3) moderate with cooler tempera-
tures and less pressure;
4) simplify by removing unnecessary complexity.

**Regulatory Hierarchy of Controls**

In addition to the OSHA Small Business Handbook, OSHA’s noise standard, air contaminants standards, and various other standards and consensus standards sometimes provide a hierarchy of controls. If the standard is regulatory, such as an OSHA requirement, there is a legal requirement to follow the hierarchy. Local codes and regulations may also have a required hierarchy.

Consensus standards developed by organizations such as ANSI, Compressed Gas Association and NFPA may also have a hierarchy. These codes would be voluntary unless OSHA or another legal body has adopted the consensus standard into law.

An example of a legally required hierarchy of controls is OSHA’s requirements for controlling live electrical parts 600 volts or less in general industry, found at 29 CFR 1910.303(g)(2).

That standard requires controlling live electrical parts in the following hierarchy from most effective to least effective:
1) located in an approved cabinet;
2) located in a vault or room accessible only to qualified personnel;
3) protected by permanent partitions or screens;
4) located on a balcony, gallery or platform;
5) by elevation of 8 ft or more above the working surface.

Notice, for example, the fluorescent lights above the inspection table in the plant in Photo 1: The bulbs are not protected by a diffuser or sleeves. This exposes live parts within 8 ft of the working surface (the floor). The best control practice would be to install an approved fixture that protects the bulbs. If that is not feasible, a diffuser or sleeves might be appropriate. The last alternative is to raise the bulbs at least 8 ft above the working surface.

Another example of a legally required hierarchy of controls is fall protection. OSHA’s fall protection rules are found in the construction standards at 29 CFR 1926.502. OSHA’s hierarchy for controlling falls is:
1) fall prevention including walls, guardrails, distance from the edge;
2) fall arrest including catch nets, rubber bladders, harnesses and lanyards and lifelines;
3) controlled access zones and warning line systems;
4) monitoring systems.

Photo 1: Uncovered fluorescent lights above an inspection table.

Photo 2: Employee without fall protection.

**Assessing Risk**

Before one can implement control measures for hazards, the risk should be assessed. A variety of techniques can be used to assess risk, including risk matrices. Table 1 (p. 4) helps to determine the priority of controlling an unwanted event that may occur based on potential severity of the event and probability of occurrence. A rating of 1 would be a small risk and might be considered acceptable. A rating of 3 or 4 would most likely be considered an unacceptable risk. The acceptability of a risk rated at 2 would likely vary among organizations. Keep in mind that there will always be risk and the goal is to control the risk to an acceptable level.

Qualitative techniques can be used to determine risk as well. These techniques are usually based on questions, which might include:
1) Would you allow your adult child to perform this task? If you would not want your adult child to perform the task because of the risk, that might be an indicator that the task is currently an unacceptable risk for everyone.
2) Is any risk keeping you awake at night? If a manager is having trouble sleeping due to worry about a risk, the risk must be addressed.
3) If someone gets hurt, would anything be changed? If someone is injured and no change would be made, then that might be an indication that the risk is ac-
ceptable. If someone gets hurt and you are reasonably confident that a change would be made to prevent recurrence, then the change should be made now. The risk is not acceptable. For example, if an employee trips over a hose that runs across the work floor, would a change be made after the trip such as running the hose overhead? If so, run the hose overhead before someone trips.

Managing the Hierarchy of Controls

There are several fundamentals of controlling hazards. The first is that controlling hazards is both a management and an employee responsibility. Management must choose and implement a hierarchy of controls for all hazards, teach employees the amount of risk that is acceptable and teach employees to use the chosen hierarchy of controls. Employees then have responsibility to identify the risk. When the risk is unacceptable, the employee must either control the risk or report the risk to someone who is qualified to control the risk.

The second fundamental of controlling hazards is that hazard control must be planned, organized, implemented and evaluated. Every job and every task must be properly planned so that an unwanted event is not likely to occur. Use the hierarchy of controls as part of the plan for every task.

The third fundamental of controlling hazards is that controls should not introduce new hazards. For example, the hierarchy of controlling machine hazards would specify engineering controls such as guarding the point of operation. The point of operation could be guarded properly, yet the guard could have sharp edges that introduce a new hazard.

The fourth fundamental of controlling hazards is that the control must not interfere with performance. Many employers have implemented controls where if the control is used, the work could not be performed. An example is the use of portable stepladders. Some employers require fall arrest and three points of contact anytime a stepladder is used. If there is no anchorage and both hands are needed to perform the task, such as changing a light bulb, a ladder would not be appropriate. Either the job cannot be done, or another method to access the lamp would be required.

The hierarchy of using portable stepladders safely might include:

1) Elimination: Design the task so that working at heights is not needed. An example is bulb replacement in lamps. Install lamps within reach from the floor such as a wall sconce or install lamps that can be lowered rather than requiring the employee to elevate to replace the bulb.

2) Substitution: Perform the task using an aerial lift or have a scaffold built instead of using the stepladder. (When evaluating risk, compare the risk of building a scaffold to the risk of one person using a stepladder for a short period to change a bulb.)

3) Engineering: Install and use fall arrest when using a ladder to change a light bulb.

4) Administrative: Use the three points of contact technique when using portable ladders and follow proper safety measures for stepladder use.

Using the Hierarchy of Controls

Let’s take a simple example to illustrate the use of the hierarchy of controls for a potential hazard. The example will be a piece of angle or channel iron adjacent to a stair rail that impedes safe use of the rail while walking up or down the steps. In other words, the impediment forces one to remove their hand from the rail to get around this piece of metal or risk cutting one’s hand on the sharp edge.

First, the risk must be assessed. Start with the legal
requirement. OSHA 29 CFR 1910.23(e)(6) requires 3 in. of clearance around all stair rails. This means that an object at least 3 in. away from the stair rail is an acceptable risk to OSHA. There still could be an unacceptable risk if the object is sharp or hot. The amount of risk would be assessed using probability of an unwanted event occurring and the severity of the outcome expected. After the risk assessment, assume meeting the OSHA standard would be an acceptable risk. (Note that OSHA STD 1-1.6 allows a clearance of 1.5 in.)

The conduit support is within 0.5 in. of the stair rail. Using the hierarchy of controls, we first should try to eliminate the risk. This might include moving the support so that 3 in. of clearance exists. If for some reason the support cannot be moved, consider a substitution stair rail. A second rail could be run 3 in. inside the original rail. To do this, one would need space to maintain a stair tread width of 28 in. if the stair is used for egress. If this control method is not feasible, then an engineering control might be to trim back the support that is within the 3 in. and smooth out any sharp edges. If this control is not feasible, an administrative control might be to install a warning sign, or require employees to use the other side of the stairs and to hold the other stair rail if one is installed. At the bottom of the hierarchy of controls would be PPE. In this case, PPE might include cut-resistant gloves when using the rail. The use of the other side of the stairs and the use of gloves would require management and accountability for employees to use the stairs according to company policy. That might be more trouble than it is worth and would be difficult to explain to a government (or maybe a corporate) auditor.

**Conclusion**

Every hazard in the workplace must be identified and evaluated to determine whether the risk is acceptable. Unacceptable risk must be controlled. Consider the hierarchy: can the risk be eliminated? If not, can something with less risk be substituted? If there is no feasible elimination or substitution, determine what engineering or administrative controls can be implemented. If no feasible controls exist, require the use of appropriate PPE until the proper controls can be developed and installed.

Production, quality, cost control and safety must all be managed at a manufacturing site. It is up to management to decide the amount of resources needed to conduct these risk assessments and install the proper control measures.

**References**


**Photo 3:** Improper use of a stepladder.

**Photo 4:** Angle/channel iron conduit support impedes use of stair rail.

**Photo 4:** Angle/channel iron conduit support impedes use of stair rail.

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Rural Roads & the Driving of Agricultural Equipment

By Brian Hammer

In the push to get as much work done as possible, many in agriculture are on the road before dawn and return home much after the sun has set. We know we have to share the road with others and it is important that we consider some well-respected rules on safe operation of our equipment to reduce the risk of having a motor vehicle collision while trying to move equipment to and from the fields.

The Basics

Most states allow us much leeway in operating our equipment by allowing the use of implements of husbandry on the public roadway. So regulations on size and type of equipment for the most part do not apply to farmers operating agricultural equipment. We need to be aware of embargos on bridges and roads so we do not cause damage to the roadway or our equipment.

The size of our equipment makes it almost certain that as we drive on most rural roads parts of the equipment will be left of center. While courts generally uphold our rights to drive the equipment on the road that does not protect us from liability should we have an incident where the size of the equipment forced us to violate regulations.

Time of day is critical to the safety of the equipment and the risk we face. In the morning, we may face traffic as people hurry to work or school and do not have the patience to follow a slow-moving piece of agricultural equipment. The same applies in the afternoon when school dismisses and the “5 o’clock” crowd heads home.

If we operate in darkness, do we have: lights, reflectors or conspicuity tape or an SMV sign. This applies to trailers as well as tractors. Often, we pull trailers and try and use the lights from the tractor to help warn; however, the lights are often obstructed as the roadway curves or because the load being pulled is big, such as a large round hay bale. In some cases, using an escort vehicle can solve problems if we do not have lights.

In addition, the equipment driver must understand the hazards of driving and sharing the road with others. Try not to use inexperienced drivers during busy times. Instead, train them first in the fields and slowly work up to letting them operate on the road under the direction of an experienced operator. Often, these inexperienced drivers are children and we must protect them from both injuries they could receive but the trauma they would face if they caused a serious accident while driving.

Driving Scenarios

The Left Turn Collision

The left turn collision is one of the most common incident types for a farm vehicle. The driver is pulling an articulated vehicle such as a tractor pulling a tool bar and nurse tank or a planter. In an effort to make a left without making it too sharp, the driver swings to the right to make a wide turn. Motorists behind the equipment sometimes look at the pull to the right as permission to pass, not knowing that the agricultural equipment will turn left. Remember, those trailing the equipment are probably tired of driving 25 mph on a higher speed road and are looking for that opportunity.

The equipment driver must use turn signals on the cab of the vehicle or arm signals if it is an older machine. The driver also needs to check mirrors or look over the shoulder before making the turn to ensure that motorists are not trying to pass. In addition, the driver must pay attention to the oncoming traffic before committing to the turn.

Bottom line: Make sure that safety warning devices on equipment are in good repair and working when using an agriculture vehicle. Make good judgments about the time of day of operation, and understand the common collision types and the steps to avoid those accidents.

Rural Bridges

Rural bridges are dangerous for several reasons. As noted, the driver must make sure that the vehicle’s weight will not damage the bridge, up to causing its collapse.
Rural bridges are also narrow. If encountering oncoming traffic, it is best to let that traffic cross the bridge, then cross the bridge alone; this reduces the weight and gives us more space to maneuver across the bridge. Tractors, combines, sprayers all have high wheels with tires that have large lugs to facilitate traction. If a driver pulls right to cross the bridge with oncoming traffic, those tires can easily come in to contact with the bridge’s guardrail and can cause the equipment to climb the rail and even tip off the bridge.

**Cars That Want to Pass**

As agricultural equipment makes its way down the road, it is inevitable that a line of vehicles will form behind the equipment, with most want to pass the slow-moving machine. A driver should never wave a driver to pass. Each driver must make that decision on his/her own.

The equipment driver also should not drive with half of the vehicle on the roadway and the other half on the shoulder. Many drivers do this to help vehicles pass, but it is not a recommended practice because it encourages motorists to pass even though they are unaware that the equipment has to get back on the road if the driver encounters an obstacle in the shoulder, such as a stalled car or even a mailbox or road sign. The passing vehicle may straddle the centerline and the equipment driver then sideswipes it while moving back on the road to avoid the obstacle.

It is best to attempt to drive with the left side of the agricultural equipment to the centerline. Given its width, some of the equipment may reach onto the shoulder. If a motorist wants to pass, s/he will have to make that decision based on the law and safe opportunity to do so without assistance.

**Rear-End Collisions**

On contoured rural roads, it is sometimes easy for a car that is moving at higher speeds to be surprised by a larger, slower-moving vehicle, especially around sharp bends in the road or after the crest of a hill. It is hard for small vehicle drivers to judge the speed of a larger piece of equipment plus they can close the distance gap quickly because of the speed difference between a vehicle going 55 mph and a farm vehicle traveling 15 to 25 mph.

It is hard for farm equipment drivers to prevent these types of collisions. However, we can take some preventive steps. 1) Make sure that warning devices such as SMV sign are clean, visible and not worn. 2) Monitor mirrors to check for fast-approaching vehicles. While not always practical, when driving agriculture equipment on heavily traveled paved roads, it might be best to use an escort vehicle that lags behind with warning devices to help reduce the chance of such collisions.

Bottom line: Make sure that safety warning devices on equipment are in good repair and working when using an agriculture vehicle. Make good judgments about the time of day of operation, and understand the common collision types and the steps to avoid those accidents.

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safety and health management systems (SHMSs) are nothing new in the world of safety and in mine safety outside the U.S. They have been discussed, studied and implemented in many industries and in numerous countries for more than 20 years. There is a growing consensus among global policymakers, researchers and safety and health experts that SHMSs offer one of the most effective strategies to minimize worker mortality and morbidity in any industry (HSE, 2004). Their potential is optimized in high-risk industries like mining where risk management-centered SHMSs form the basis of the mine safety regulatory schemes and code of practice in many prominent mining countries.

In the U.S., SHMSs are present in a variety of organizations that affect public health and welfare such as the Department of Defense, the Federal...
CORESafety & The Future of U.S. Mine Safety  
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Aviation Administration, hospitals, nuclear power generation, the chemical industry and heavy manufacturing. Management systems make complex activities more effective with greater reliability and provide a framework to systematically identify hazards and assess and control their associated risks.

Despite this evidence the majority of U.S. mines still exclude systematic risk management and the use of management systems. However, that trend is changing through growing understanding of management systems work and a catalyst for change: CORESafety.

Are Management Systems New to the U.S. Mining Industry?

It can be argued that the complex business of developing and operating a modern mine would not occur without management systems, whether formal or informal. So it is ironic that many of the same organizations use management systems to optimize performance in other functional areas of their businesses (including, but not limited to: operations, maintenance, preventative maintenance and reliability, procurement, human resources, information technology) but fail to incorporate SHMSs. The essence of an effective SHMS is applying the same principles that make a mine productive to the function of safety.

Are All Safety & Health Management Systems the Same?

There are a number of commercial and non-commercial SHMS options available today. OSHA has realized success from their Voluntary Protection Program (VPP)(OSHA, 2008). The ANSI Z10 committee on safety and health management recently published a revision of the 2005 standard: ANSI/AIHA Z10-2012 Occupational Health and Safety Management Systems. Globally, the most commonly implemented SHMS assessment system is OHSAS 18001, and, in 2014, it was announced that the new ISO 45001 standard for Occupational Health and Safety Management Systems will be published in 2016, matching existing ISO standards 14001 for Environment Management and 9001 for Quality. These and other SHMSs share a number of common elements and perspectives regarding the importance of applying management principles and practices to the systematic management of risk. This is also true of CORESafety; however, there is a difference.

CORESafety is based on the idea that no management system can be truly effective unless it is integrated into an organizational culture that treats the system as essential work. Developing such a culture requires effective leadership. In other words, in addition to codifying risk management principles and practices, CORESafety also integrates leadership development, culture enhancement and behavior optimization as elements within the system. This element is what makes CORESafety unique to all major, published SHMSs.

Management systems are neither a guarantee nor a panacea. They can be challenging to design and implement, as they must be customized to each company. Without care, SHMSs can devolve into a paperwork nightmare and add layers of bureaucracy that counterbalance many benefits. They should be integrated into other business management systems and it is essential that responsibility for making the system work be shared among multiple stakeholders (i.e., workers, management, safety and health staff, human resources staff, engineering).

The National Mining Association (NMA) has studied risk management and SHMSs for years. In a 2006 industry task force report following the Sego mine disaster, the organization concluded that the U.S. needed “a new paradigm for ensuring safety in underground coal mines, one that focuses on comprehensive and systematic risk management as the foundation” (NMA, 2007).

CORESafety was created in 2010 through another NMA taskforce. The group consisted of eight CEOs from various mining companies, including Bruce Watzman, NMA’s Senior Vice President of Regulatory Affairs, who was tasked with developing CORESafety. Using industry subject matter experts, the system was developed from the ground up over an 18-month period and formally launched in 2011 by vote of the NMA Board of Directors. While specific to the U.S. mining industry, CORESafety is based on the experience of other trade associations and initiatives such as the American Chemistry Council’s (ACC) Responsible Care; the UK surface mining initiative sponsored by the Quarries National Joint Advisory Committee (QNJAC); and the U.S. Society of Chemical Manufacturers and Affiliates (SOCMA) ChemSteward system. It is a voluntary process with a set of structured expectations for participating companies that includes a CEO pledge, a gap analysis, up to five years for system implementation, annual performance reports and a third party review to verify the structure of the system at each company. The participation among NMA’s producer members makes CORESafety the largest safety initiative in the history of the U.S. mine industry.

The underlying goal of CORESafety is to eliminate mining fatalities and realize a 50% reduction in other injuries in five years (referred to as 0:50:5) and is based on a framework that includes three organizational competencies: 1) leadership; 2) safety and health management; and 3) assurance. These competencies summarize 20 modules that are the tools of the systems.
Each module has a unique function and also shares a common purpose in supporting the heart of the management system: risk management. The management system is necessary to optimize risk management and it is the tool that most clearly represents the gap between the utility of the Federal Mine Safety and Health Act and best practice effectiveness approach that is found in risk-focused SHMSs and a common characteristic of the safety mining companies in the world.

For participating NMA companies there is a wide spectrum of approaches to implementing CORESafety. Some include treating it as a tune up and health check for their existing SHMSs while other companies with less SHMS experience are developing new systems from the ground up.

An interesting side effect of CORESafety has been an increase in transparency among participating companies regarding their unique approach to developing and improving their respective management systems. It has shifted some of the attention to benchmarking this common framework and away from the collective frustration associated with the inconsistencies in the interpretation and enforcement of the MSHA. Emblematic of this effect is the volume of industry management system practices available pro bono on the CORESafety website. In fact, the entire CORESafety suite of principles, practices, documentation, and facilitating tools is open pro bono to anyone with interest at coresafety.org. (NMA, 2014)

Interest in CORESafety has grown beyond the member companies of NMA. Inquiries from other trade associations and individual organizations both in and outside of mining have increased steadily since CORESafety was launched. “Companies outside of NMA are realizing that while CORESafety was designed for the U.S. mining industry, it is very suitable for any high risk business,” says NMA’s Watzman.

CORESafety is based on the idea that no management system can be truly effective unless it is integrated into an organizational culture that treats the system as essential work.

**Does CORESafety work?**

Many who develop, implement and optimize management systems acknowledge that there is minimal immediate gratification from these tools. It can take many months to years for a management system to show clear results. The speed of implementation and effectiveness depends on organizational culture. You can only go as fast as your culture will allow. That is, you can implement a SHMS in a short period of time, but are less likely to realize the same benefits as those who take the time to ensure the SHMS is fully integrated into the company and/or mine. This will be different for smaller mining companies than for larger, multinational companies.

It would be understandable to expect more years to pass before seeing a significant performance trend change in the industry. Despite this assumption, the early CORESafety results are promising. Companies adopting CORESafety have significantly better high-severity safety performance between 2011 and 2014 by a margin of 3:1 compared to those companies who manage safety primarily through MSHA compliance.

As CORESafety, or any functionally equivalent system, matures across the U.S. mining industry in the coming years, results are only expected to improve further. Will CORESafety achieve its stated goal of helping to eliminate fatalities among participating companies? Only time will tell, but there is clear reason and growing evidence to be optimistic. So with this in mind, what is MSHA’s response to risk management, SHMSs and CORESafety?

**MSHA & SHMSs**

So why haven’t SHMSs become part of U.S. mine safety regulation? Are MSHA regulation and risk-centered management systems mutually exclusive? While SHMSs are not currently part of MSHA’s regulatory agenda, the agency along with OSHA, have shown interest in risk management and management systems in recent years (Abrams, 2012). In 2010, MSHA announced a series of public meetings to gather public input on “safety and health management programs” (Federal Register, 2011). As stated in the notice: “MSHA is holding a public meeting, and plans to hold additional public meetings, to gather more information on effective safety and health management programs to
eliminate hazards and prevent injuries and illnesses at mines. Safety and health management programs are an important component of helping mine operators assure the safety and health of miners at their mines. MSHA encourages representatives from academia, safety and health professionals, industry organizations, worker organizations, government agencies, and industries other than mining, and international organizations to present information on their model programs. MSHA believes that effective safety and health management programs in mining will create a sustained industry-wide effort to eliminate hazards and will result in the prevention of injuries and illnesses.”

It was during these public hearings that the beneficial effects of management systems were widely expressed by numerous stakeholders and the limitations of the Federal Mine Safety and Health Act to achieve zero fatalities and to address modern mining risk that could not have been conceived when the Act was promulgated in 1978.

Mike Wright, director of health, safety and environment for the United Steel Workers testified that “Mostly we [the U.S.] regulate safety and health through a rulebook” said Wright, “Since 1980, we’ve been collecting data on all fatalities that happen in the union. We’ve had more than 1,000. Not just in mining, but in all industries in the U.S. and Canada. In 2006 we took a random sample of those cases and analyzed them and asked a couple of questions: ‘Was this fatality the direct result of a violation of an MSHA/OSHA or equivalent Canadian standard?’ Astoundingly, in just about half the cases, the answer was no.” (MSHA, 2010).

In 2012, MSHA published a request for proposal to develop a voluntary risk assessment model for mine operators to prevent major mine emergencies, to assess preparedness of mines for emergency response, to assess the readiness of mine rescue teams, responsible person, and of the government response to mine emergencies (MSHA, 2012). ABS Consulting was selected to perform the work and published a report in 2013 summarizing their findings and the risk assessment model: “The Development of Risk and Readiness Assessment Models for MSHA and Industry, Consolidated Final Report” (ABS Consulting, Inc., 2014). Their recommendations center on key risk management principles consistent with CORESafety. A year later it is not clear to what extent the model has been applied across industry or has been utilized internally by MSHA. Hopefully, there will be more disclosure from both the industry and the agency in 2015.

There is no doubt that the Federal Mine Safety and Health Act has had a significant impact on the lives and welfare of U.S. miners and mine operators. It has directly and indirectly driven change and improvement in mine safety practices and attitudes. This has not been a one-way street with industry simultaneously innovating and working hard both to comply and find ways to go beyond the regulations were it has been deemed necessary. However, the Act was originally designed for a mining industry that existed in the 1970s. There have been substantial changes to the administration of the Act (i.e., tightening enforcement) but as each decade passes, the Act appears less relevant for companies and an industry that is growing in its belief that achieving zero mining fatalities is both possible and essential. So is the Federal Mine Safety and Health Act becoming a hindrance to systematic mine risk management?

That question is being debated by many parties interested in evolving mine safety in the U.S., including NMA’s Bruce Watzman:

“We do think it is time that we have an open and honest discussion among industry stakeholders on whether or not the Federal Mine Safety and Health Act is structured properly to drive the continuous improvement that we all desire. The industry has made phenomenal strides. Forty years ago, the industry had 400 plus fatalities a year. We are down to 30 to 40 on any given year right now, so a tenfold reduction in the number of fatalities.

Risk-centered SHMSs aren’t a quick fix for U.S. mining, but these tools can have a profound impact on mine safety performance (and productivity) with deliberate development, serious leadership, and the time necessary to bed them down appropriately.
But I think that you also have to ask the question: after 40 years should not the level be better? And if the answer to that is yes then the question that follows is what needs to change? The Act is very strict, rigid and prescriptive. It does not encourage proactive actions. In fact, on occasion, proactive actions might conflict with regulatory requirements. So I am hopeful that we have reached a point where we can discuss this honestly.”

With all of this in mind, it might be an obvious suggestion that the U.S. mining industry would benefit from the current Act being supplemented with risk management and/or management systems standards. Miners would be safer if MSHA bolted on risk management and SHMS standards, right?

To the contrary, this author believes the evidence is clear: forcing a risk management and/or SHMS standard into the current version of the Act would have significant negative effects. That is, the Act (the current hazard-specific regulatory standards) should be built around the risk management and management system structures and not be a supplement to mandatory standards. The U.S. doesn’t need to tweak how we enforce mine safety regulation, we need to retool how we think about mine safety management and its enforcement.

This calls for a tripartite reassessment of how U.S. federal regulation can optimize miner safety performance in future before making any changes. How much better off would we be as a country if there was consensus among labor, government and industry regarding the best path forward for us to follow?

**CONCLUSION**

Risk-centered SHMSs aren’t a quick fix for U.S. mining, but these tools can have a profound impact on mine safety performance (and productivity) with deliberate development, serious leadership, and the time necessary to bed them down appropriately. CORESafety is gaining momentum and shows promising results. The U.S. Department of Labor recognizes their importance and is working to make them part of their mandate. The rest of the safety world has already reached the same conclusion and is moving on past the U.S. mining industry.

There have been few opportunities in U.S. history to make positive course corrections when it comes to how we think about, act upon, and enforce mine safety practices. Has that time arrived? 🍀

**REFERENCES**


Tom Hethmon is an associate professor, western presidential endowed chair in mine safety in the department of mining safety, and director of the Center for Mine Safety and Health Excellence at the University of Utah. He is also principal of Hethmon Associates LLC, a consultancy assisting clients in the optimization of culture, leadership and systems. Contact him at tom.hethmon@utah.edu.
The 4th Annual HSE Excellence Forum was conducted by Fleming Gulf Conferences at Kuala Lumpur from Aug. 19-21, 2014. The forum was supported by Ministry of Natural Resources & Environment, Malaysia and Ministry of Health, Malaysia. It was also endorsed by HSE professional associations’ viz. American Society of Safety Engineers, Malaysian Industrial Hygiene Association and World Safety Organization. The Forum was inaugurated by Hon. YB Dato’ Sri Dr. James Dawos Mamit, Deputy Minister, Ministry of Natural Resources and Environment, Malaysia.

In his inaugural address, he emphasized on worker safety and how environmental protection needs to be given by industries while focusing on productivity. He also assured of extending all necessary support to industries in this process and appreciated Fleming Gulf to host such conferences at Kuala Lumpur by inviting local, regional and international experts in HSE field.

**Forum Highlights**

Around 100 delegates participated in the forum from government, private and public sector oil, gas and petrochemical companies. About 16 top industry experts in the field of HSE representing academic, government, oil and gas industries, and professional associations delivered their technical presentations, case studies and best practices during the 2-day forum. The focus of forum discussions was on achieving HSE excellence in oil, gas and petrochemical industries. At the end of two days forum proceedings, an exclusive CASP dialogue session among all conference advisers, speakers and participants (delegates) was held to suggest various ways and means to achieve HSE excellence in oil, gas and petrochemical industries. Following are the compiled list of top suggestions provided during CASP session:

1. Exert efforts in engaging senior management and employee involvement in implementing HSE initiatives and programs from concept to execution stages.

2. Ensure and identify applicable HSE regulations for respective operations and identify international best practices/applicable standards wherever regulations are not in place.

3. Conduct hazard identification and risk management mapping process of all operations and evaluate control measures to mitigate risks.

4. Conduct a gap analysis of applicable regulations and current status of its compliance; develop programs to ensure the full compliance of regulations.

5. Establish HSE roles and responsibilities for senior management, line management and all key personnel and integrate these responsibilities through HSE KPIs into their operational KPIs.

6. Ensure empowerment of workforce to handle unsafe conditions, effective implementation of stop work authority, shortcuts to be avoided, involve all concerned workers in reviewing and development of relevant job safety analysis job hazard analysis, etc.

7. Establish a proper training and awareness mechanism to educate senior management, line management and workforce at all levels on applicable HSE issues.

8. Establish a mechanism within the organization to share best practices, learnings from incident investigation recommendations, state-of-art technologies of risk reduction processes along with similar organizations on local, regional and international levels.

9. Check and analyze the best practice applicable for the industry by reviewing them on technical, economi-
10) Provide detailed technical specifications in contract/tender documents and ensure its compliance by contractors, so that even lowest bidding contractor also complies with relevant technical specifications and ensure its compliance during the execution / operation for safe completion of any construction or maintenance and repair projects/operations. Educate management for their good understanding that it is more important to focus on mechanically safe completion and not pressure contractors to beat the schedule which could lead to short cuts with potentially unsafe sloppy completion of projects.

11) Carry out a bridging of contractor HSE documents/procedures with company HSE procedures and ensure their compliance during all phases of project including operational phases.

12) Avoid blame culture, encourage reinforcement of positive behavior among the workforce, and encourage reporting of unsafe conditions, near misses etc.

13) Provide reward and disciplinary process for positive HSE behaviors and at the same time for HSE violations of company/contractor HSE procedures respectively.

14) Ensure senior management of company and contractors are conducted periodic site visits, understand workforce HSE concerns, issues and provide directives and required resources in improving workplace safety.

15) Establish a mechanism to review the HSE performance of company and contractors with senior management.

16) Establish a networking mechanism among all HSE professionals within the company (between the company and contractor), engage respective government agencies in this process and also enlarge this networking to local, regional and international levels to have a benchmarking process in improving HSE performance.

17) Engage senior management and line management to participate in local, regional and international HSE conferences, symposiums, workshops etc. to learn, share and gain best practices/understand latest HSE standards/developments, etc.

18) Carry out a benchmarking of the HSE performance with piers and consider appropriate corrective actions to comply with piers/or further improvement.

19) Always adopt a concept of “Think Globally… Act Locally” in implementing new technologies for continuous improvement of HSE performance, provide an opportunity for local HSE professionals to have a local chapter/Forums/associations with international reputed HSE professional societies like ASSE, IOSH, AIHA etc.

Although, improvement in HSE performance across the world is trending positively, incidents world-wide suggest, much work still needs to be done. Currently, standards, policies and procedures are existing, but, lack of implementation and enforcement is seen. The culture still is based on production and profitability. “HSE is a lip service.” It is a challenge to educate the management, who once believed that “HSE is the HSE professionals’ responsibility.”

With effective communication, initiatives like corporate social responsibility, GRI reporting, etc., it has now turned into “HSE is the management responsibility.” Oil, gas and petrochemical industries efforts must continue to make “HSE Excellence.” It involves teamwork through engaging workers, supervisory line-management, policy making executive management and the HSE professionals, and one must remember that production, profits and HSE go hand in hand.” In the long run, this approach would be prudent socially, morally, legally and financially.

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Jitu C. Patel, CPEA, is an international HSE consultant who has a B.S. in Chemistry and an M.Phil in Fuel Science. For 21 years, Patel provided HSE services to Saudi Aramco. He also gave technical training while conducting research for 15 years on fires, explosions and HSE issues at a British chemical company. He is a founder of many international ASSE chapters in the Middle East, southeast Asia and India. He is the recipient of Howard Hiedeman Award and he is an ASSE Fellow, as well as an ASSE Global Ambassador.
Early on Aug. 24, 2014, an earthquake of moderate-to-severe intensity shook the Napa/American Canyon region, about 30 miles north of San Francisco, CA. The U.S. Geological Survey (USGS) estimated it to be about 6.0 in magnitude. One fatality was reported and about 200 people were injured, of which 13 were hospitalized. The earthquake caused extensive damage to many buildings in downtown Napa, some of which are listed on historical registers. Four homes in the Napa Valley Mobile Home Park were lost in a resulting fire attributed to a broken gas line compounded by a broken water main. The surrounding area, extending to Vallejo and nearby Mare Island, also sustained significant damage. Officials fixed early estimates of the damage at about $400 million.

A major area of concern was the Napa Valley wine region. Commercial banks reported a total loss of between $80 and 100 million to the wine industry, which is much lower than initially estimated. Napa Valley is a popular tourist attraction, dotted with quaint hotels and bed-and-breakfast establishments. Some people in the area had never before experienced an earthquake, or one of that magnitude. While many Californians learn to “roll with it”, the experience was quite unnerving for visitors. One visitor said that it sounded like a freight train rumbling outside the door, while another likened it to being tossed about on the ocean.

Since the earthquake struck at 3:20 a.m., many people were in bed when it happened; however, few were able to sleep through it, as it was quite the surprising awakening. Instinctively, some jumped up and ran outside, which became a source of many injuries due to the exposure of collapsing masonry structures, chimneys and other falling objects. While not a bad thing, the natural urge to take flight to safety was, in fact, not the safe thing to do. In addition to fleeing a building, several popular misconceptions or myths concerning earthquakes...
must be debunked. Some of these myths are propagated by the media that is fueled by sensationalism. Some of the more popular, incorrect thoughts are:

- All buildings will collapse and become death traps.
- All gas mains will break and cause major, devastating fires.
- When the shaking starts, take shelter in a doorway.

These thoughts certainly make for better entertainment than reality. The more entertaining the media, the better the ratings. First responders might already know that the above statements are the exceptions and not the rules. Take the second statement that “all gas mains will break and cause fires.” Certainly, some gas mains ruptured during the Napa earthquake, but not all of them broke. Let’s put that statement into perspective: Only one fire caused significant damage, and the firefighting effort was hampered by a broken water main that prohibited the fire department from fully doing its job.

This is where the role of an OSH professional becomes important, whether it be public education officers for public safety organizations, such as police and/or fire departments, or as safety officers for private companies. OSH professionals can be the voice of reason during these types of emergencies. OSH professionals have the opportunity to ensure that the correct information is being disseminated, since a lot of incorrect information and guidance is provided in movies, television, YouTube, Twitter, Instagram, etc.

Rather than spend time looking at what we do not want people to know, let us turn our attention to positive messages. The way messages are stated can be as important as the message itself. Studies have shown that when people hear messages, they listen for the action words (the verbs). For example, when explaining how workers should evacuate a site, one might be tempted to say “Don’t run.” While that is a good message, the first action word listeners hear is “run.” So while you do not want people to run, their instinct tells them to run. Reward simple instructions as a positive message to be more clear. For example “walk to the nearest exit” rather than “don’t run.” Let’s examine some positive messages that we want people to hear.

**Pre-Earthquake**

The Napa earthquake was significant in that it was one of the first where scientists were able to provide an alert before the earthquake occurred; they had 10 seconds to sound alarms. Even though 10 seconds does not sound like much time, it does provide some hope for future warning systems. Earthquake warning systems are in the infant stages of helping people prepare for earthquakes, so preplanning is essential to prevent injuries, illnesses and property damage during these events.

In safety speak, we must develop a written emergency action plan (OSHA 29 CFR 1910.38). The regulation requires employers to provide plans for the safety of their employees during reasonably anticipated emergencies, including earthquakes.

Unlike hurricanes, where you might have a day or two of warnings and preparation time, we do not have that luxury with an earthquake. If lucky, you might get that 10-second alert, but that is not helpful if you did not plan. The best time to prepare is before an emergency happens. So, how do we prepare for an earthquake?

**Be Cognizant**

Be cognizant of the surroundings, all six sides, right, left, in front, behind, up and down. People must know where the closest exit is and the most direct path to get there. People must be aware of the materials and substances in these areas to know what can cause harm, such as chemicals that could tip over and spill, falling objects or chairs that could roll into the pathway.

Identify the locations for the best place to drop, cover and hold. Remind employees who work remotely or travel, such as service technicians or construction workers, to always be on the lookout for evacuation routes. If they are unsure, they should ask the host employer about the site’s emergency plan.

One thing to remember about emergency action plans is that they are only as good as the information that is disseminated. Writing a plan and putting it on a shelf does not do any good. Employees must be trained on the plan and the plan must be reinforced with positive actions. Drills, exercises, table tops and active discussions are all methods to implant the safe behaviors employers want their staff to take and form good habits. The best employee is the one who knows his/her family is safe and can focus on the job.

Part of preplanning for an emergency at work is planning for an emergency at home since employees are at home approximately two-thirds of the time. Remind employees to preplan safe surroundings and other safe actions during an emergency at home. The workplace will be a better place when employees have safe families and friends.

**Establish a Communication System**

The first thing an employee will want to do is to find out if his/her family and close friends are okay. Establish a communication system before a disaster happens. Hard-wired, land-line phones may not be useful, as telephone poles may be down. Cell phones may be the way to successfully execute the communication system. Text messages, Twitter and Instagram are all immediate and simple communication tools that tend to work when other systems are unusable. Additionally, as the phone
system becomes clear for emergency calls, these tools also allow a message to broadcast to a wider audience. One only has to post once to get a message to many people, which saves time and energy. Employees working remotely may need to report to a main office after an emergency. It would be wise for companies and municipalities to have someone in the office monitor a Twitter feed, a Facebook post, or phone calls and text messages. Employers must ensure the safety of their staff, so checking in and accounting for all employees is important. If the phone lines are down, the same communication systems will be effective for employers and employees as work for family and friends.

Research will be required as part of preplanning for communication by cell phone. Find out if your emergency dispatch for police or fire has a direct dial number for cell-phone use. Many public agencies have this information on their websites. If you are a public information or education officer, provide this phone number to the public when possible. Not all 9-1-1 systems are answered by local public safety agencies. For example, if we were to report a building on fire by dialing 9-1-1 from a cell phone the call would be answered by the State Highway Patrol 40 miles away. Knowing the local direct number is valuable and saves time for both the dispatch call taker and the person requiring immediate assistance.

There is a good reason to hold fire and earthquake exercises at work and at home, with positive messages, so that people are prepared and ready for the actual emergency event.

Prepare Through Training
Preparing through training goes beyond having drills on the evacuation route. Encourage people to take CPR and first-aid training. Promote learning how to use a fire extinguisher and how to clean up small chemical spills. Encourage them to take these safety behaviors home and teach them to their families or hold a family safety day at work to provide this training for them.

During the Earthquake
During an earthquake, preparations practiced into memory become life-saving actions. Even with careful preplanning, there may be some variations to the practiced actions since no two earthquakes are the same. Some basic, immediate actions should be instinctive, stemming from human nature for self-preservation:
• Drop, cover and hold. We cannot say it enough. Drop, cover and hold until the shaking stops and then wait a few minutes to make sure objects that were put into motion when the ground started shaking stop their movement. Take a breath and look around before moving from the shelter. Make sure it is safe before you go anywhere. Be ready for aftershocks, which can be almost as strong as the earthquake and may cause further damage to already damaged buildings and surroundings.
• If you cannot get under something to protect yourself, then plan to turn and cover your head away from potentially breaking glass. If no shelter is available, instruct people to lean into a weight bearing wall, turning their head away from windows and into the wall to protect their head with their arms.
• Why don’t we stand in a doorway? We believe it did not take any protracted study to realize doors will swing when a building sways. Swinging doors could hurt someone standing in the doorway and doorways are not constructed to withstand a significant earthquake. A strong wall, hopefully with minimal items that could fall like pictures or books on shelves, is a better shelter.
• Why don’t we leave the building? It is safer inside of the building. This is another example of the media sending incorrect messages to the public. The media knows it will get our attention by showing a few crumbling buildings and collapses during an earthquake; showing the hundreds of buildings that withstood the shaking is not nearly as interesting.

Safety professionals as public educators have some work to do. Safety professionals need to alter the messages to let the public know buildings are safe. Using a positive message lets people know to stay where they are unless the building is crumbling, on fire or there is...
an unsafe condition, such as an imminent threat from a chemical release. During the Napa earthquake, many were injured from falling bricks, a common building material in the area for older businesses, residences and even in more contemporary chimneys. Buildings are shelter so, unless the building is unsafe, stay inside.

After the Earthquake
Numerous steps should be taken after an earthquake occurs to ensure your safety and the safety of others.

Don Your PPE
As previously mentioned, shoes should be included in first-aid and emergency kits. These shoes should be able to withstand walking on broken glass. If someone is going to assist with first-aid or cleanup spills, gloves will also be needed. If you can put on good shoes and gloves without leaving your shelter, do so.

Notify
Now that people have assured their own safety, they can make the necessary notifications to that circle of family and friends, employers and if necessary, emergency responders.

Watch for Hazards
There are many hazards that people should be aware of. Here are a few that may be controlled without emergency responders:

•Fires. Fires are one of the most common hazards after an earthquake, right after falling objects. Instruct people to extinguish small fires, as the fire department might be busy with the big fires. The shaking and fires in the 1906 San Francisco earthquake devastated the city.

•Small chemical spills. If the spill is small, and employees have been trained to provide cleanup, they should do so while taking all the precautions they normally would for any chemical spill.

•Injuries. People may have been cut from breaking glass, hit with falling objects or have fallen during the shaking. People can assist those that are hurt when they wear gloves to protect against blood. Remember that people will be shaken by the shaking. Treat for shock when appropriate.

We already discussed that gas lines may not erupt into flames after an earthquake. Instruct people to pay attention for the smell of gas, but not to automatically turn off their gas supply. Some people turn it off, fearing a leak when there is no leak. This should be done only if a leak can be detected by smell. Natural gas has a designed detection mechanism of a strong odor due to the added mercaptans. People need to know that if they smell of gas, to turn it off and then leave it to the commercial gas providers to turn it back on. Many people automatically turn their gas off, fearing a fire, only to cause the fire when they turn the gas back on by themselves.

Conclusion
Often in the wake of disasters, comes progress. We look for ways to learn from past experiences, both good and bad. The Napa Valley Earthquake provided a similar learning experience. We learned that many misconceptions are promoted through a ratings-driven media. Gas lines won’t always cause fires, fleeing a building following a quake is not always the best thing to do and doorways are not a good place to shelter when things are swaying. Positive messages, reinforced by actions (e.g., drills, table top scenarios, training) provide information that can save lives.

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Lessons Learned in Safety
By Major Chris Dotur

Over 15 years and multiple safety positions, I have repeatedly been somewhere at just the right (or perhaps wrong) place and time when significant events occurred. As a result, I have investigated all sorts of incidents, putting operations on a temporary pause to further Air Force, Department of Defense (DOD), Federal Aviation Administration (FAA), National Transportation Safety Board (NTSB) or foreign safety programs. While most have been US Air Force flight incidents, the events have had little rhyme or reason, involving a variety of types, scopes and players. Thankfully, I have always been on the investigation side, although I have assisted coworkers and units with incidents they have been involved in themselves.

On the advice of colleagues and as I get closer to the completion of my own Air Force career, I have put together a pamphlet of various safety tips, stories and personal techniques I learned over the years. Most of these tips focus on safety investigations and particular interviews, but also touch on other safety practices. Many focus upon tactical or hands-on activities, but I do include some discussion for the higher operational and strategic levels as well.

While some lessons might not be direct, I believe they contain principles worth reminding other disciplines and leaders throughout safety programs, command leadership, accident investigators and perhaps even organizations like law enforcement and emergency responders.

While this is intended to be a “lessons learned” reference for other safety personnel and to augment existing guidance and training, these suggestions are my own and are by no means a definitive source. Personnel may find that different practices work for them. Of course, anywhere that my own thoughts may unintentionally conflict with established organizational guidelines or current headquarter instruction, higher organizational regulation or guidance take precedence.
PART I—General Safety Program Practices

Safety is all about two words—mishap prevention. No matter how obvious this might seem, never forget that basic principle and fight mission creep and divergence from the safety program. Everything we do in safety is about preventing accidents. Remember the Air Force service-wide quality initiative of the 1990’s? Many units were unsure how to implement this, or who the responsible office should be and gave it to the closest safety office to handle as a secondary duty. This kind of practice, while a commander’s prerogative of course, dulls the direct focus and power of the safety program’s purpose. I have started every safety job by meeting with my team and giving standing instructions—safety members come see me if they see us getting off the clearly defined track of mishap prevention.

It is easy to get wrapped up in procedures, reports, paperwork, metrics, etc., but we cannot lose sight of the ultimate goal. A good safety officer, as a leader, will also periodically pull back from the weeds and consider how to make the program more effective overall. Safety does not exist for its own purpose, of course, but should always seek to improve operations and protect personnel through actions that are genuinely effective at preventing mishaps.

It is also important to remember that everything we do is about people and this becomes increasingly imperative the more senior we get, in roles of more responsibility and authority. It is perhaps even more important as we get away from daily front line operations, into unit leadership, or program management administered from a desk. We can go cross-eyed with things like mishap rate charts, but never forget that each little square on that chart is a person, possibly a person that is not with us anymore and certainly a person that does not need to be a part of that chart. That little square could be any of us. Could be you. Could be me. Every single one is important and we all have to do everything we can to make sure our people do not become that next square on some chart.

Do not make safety program a hammer. As it is, you will have to fight some perceptions that safety is “out to get” people and get them in trouble for doing things wrong. You will also occasionally hear people say something along the lines of “You filed a safety report on me.” Fight this at every turn. Safety is never about pointing fingers at people and there are separate legal and administrative processes for finding culpability and establishing accountability.

If the safety process is ever directly misused to get people in trouble, the program (and you as a leader or safety officer) will lose credibility and inhibit the fundamental purpose of mishap prevention. Even if an organization were to allow their safety program to pursue mishap prevention through punishment or other negative emphasis, it would have fairly limited effectiveness.

Never settle for the status quo. Now, a leader or safety officer should not constantly hound people on every little problem, of course. That is a quick way to wear out your welcome. Pick your battles, but do not give up on them. If you can improve operations and make life better and safer for your people, why would you not? Even when an organization is on a good streak with mishap rates, a lack of active engagement from leadership and safety staff will eventually make the unit fall apart.

Safety is truly all about leadership. Always look for ways to make things better, working towards that idealistic and practically unreachable (but essential) goal of zero incidents. If we as leaders settle for the status quo, our people will settle too. Remember, that small
defect that you allow to persist today, may be the exact thing that grows into a mishap next month. 

Certain aspects of a safety job are actually downright easy. A good part of making a difference in your organization as a safety officer, like leadership, can be accomplished just by being present. When there is a planning meeting for any activity, often all you have to do is have you or a member of your team quietly sit in the corner and listen.

Members noticing your presence will often be enough to prompt thoughts of scaling back “cowboy” operations and incorporating risk management. You will even hear playful comments of “Careful! Better watch yourself. Safety is here.” This is where the reputation you build and maintain pays off, that your presence is (maybe a bit reluctantly) viewed as a friendly reminder of building in safety principles to every area of operations, not resented or perceived as a roadblock.

Attending these meetings can also pay off for you to stay abreast of operations. It is much easier to keep things on the right track in a planning meeting with a quick reminder of safety principles (e.g. “let’s not plan on parking fighter jets armed with missiles pointing at the bomb dump”) than trying to undo things later because plans were put together without your input or knowledge.

Since safety is the commander’s program, safety officers by default should attend the meetings s/he leads. You will be there to take taskers and discover other ways you can assist the organization’s activities, enhancing mission effectiveness. I have found that these practices are especially important at the tactical and operational levels in contingency settings, where new and higher-risk operations are put together. They are less important in the sustainment of well-established home station administration functions.

I believe a safety role has similar functions to an instructor, using lessons to affect learning in coworkers, so they become more capable, more knowledgeable and more aware workers. One perspective I hold to is that if I am able to help my people become better at their job than I myself have ever been, that is not a loss for me or my pride. That is a win, for my people, the organization and me. Another view I hold is that the instruction or safety lesson I give today could end up being the exact piece of knowledge my troops need to prevent or survive a mishap tomorrow. When you really think about that one, it can keep you up at night.

I myself have been fortunate and never had an emergency we could not eventually overcome that became a mishap. But others have had different results and I have played a small role in every one of my best friends, squadron mates, co-workers, students, classmates, aircrew, supervisors and others under my leadership or command who have had a mishap. In some cases, that influence was positive and they were able to walk away from the mishap in the best possible circumstance. Others were not as fortunate. For the rest of my life, I will bear a small responsibility for every one of them that have lost their lives. There have been far too many.

We never know ahead of time exactly what situations someone will encounter and how they will respond. I may not be at fault, but as a safety officer, instructor and leader, who knows if I had imparted just a little more checklist discipline to the person, or lessons learned from all sorts of mishaps in my bag of experience, whether they may have avoided or overcome that mishap and still be here today.

Remember that in safety, whether in active mishap prevention or emergency response, no organization is really alone. The best safety meeting I have ever had, we brought in Capt. Al Haynes, the renowned captain of the United Airlines Flight 232 DC-10 that crash‐landed in Sioux City, Iowa, in 1989. We used the opportunity to have more than just USAF aircrew at the meeting. We brought in local FAA personnel, NTSB, firefighters, police, civil airport, civic leaders, etc. and everybody rubbed shoulders. When a big event happens, it will not be just blue suits involved. Just as hap-
pened in Sioux City, your team will need to be able to respond and interact with every local resource.

**Continually Learning From the Past**

We are all familiar with various axioms of the importance of learning from the past. It is rather obvious that one primary tenet of any safety program is to learn from past organizational and personal mistakes, to prevent future mishaps. In military strategy, we often talk about “fighting the last war,” where we learn from events of the previous conflict, but then misguided assume the next conflict will be like the previous one, with similar geopolitical conditions, conflict players, weaponry and strategies. This has proven to be a dangerous assumption.

Safety is somewhat different, as we have virtually run out of new ways to crash vehicles and aircraft, hurt people and mishandle weapons. The precise circumstances of the next accident may be different from the last one, but it will almost certainly duplicate exact causes and factors that have led to numerous other mishaps throughout history. Long after the first car, the first aircraft and gunpowder were created we are still crashing and exploding these things the same way people did years ago. Safety and occupational health practices have been developed because all across the world, people have the potential to get hurt in exactly the same ways.

Modern technology and repeatedly revised culture and practices have drastically reduced many mishap rates. Today, we have all the knowledge and lessons of the past more readily available than ever before, paired with the finest technology to date. Yet somehow, we still find ourselves crashing perfectly good aircraft and vehicles, things still manage to break and our people still have accidents. Even (or in some cases particularly) when we remove the human factor from activities and attempt to add automation, the same mishaps occur, or are replaced with new factors.

Not only must we learn from the past, we must do so perpetually. A particular lesson steadfastly ingrained in any organization will gradually fade from memory if not given a periodic reminder. With steady personnel turnover rates, it is amazing how some lessons are completely forgotten in 3 to 4 years, even in units with severe mishaps. Even though revisiting those mishaps a few years later may reopen some emotional wounds, I have found it can be very valuable to do so.

In general, properly trained safety personnel can quickly gain invaluable insight into mishap causes, historical cases and operational approaches to risk management and mishap prevention. There have been many occasions over the years, whether in the cockpit, out in the field, sitting behind a desk, or in a strategy planning meeting, where I have suddenly had a feeling things just did not feel right. In many cases, I recognized similarities to chains of events that had previously led to other mishaps I had either investigated or studied. By just pointing it out to the team, we were able to break our own chain of events and avoid a potentially impending mishap.

Of course, safety programs do not exist just for the knowledge of safety personnel, so it is vitally important that safety professionals repeatedly pass on insight and lessons learned to develop others’ intuitions as well. This can be through formal instruction, “there I was” type stories, or just small talk at the water cooler. Even safety members with no personal investigational experience often have learned invaluable lessons from accident case studies, which coworkers will never benefit from if not discussed. I will come back to the topic of teaching safety lessons later in the section of post-investigation actions.

Returning to the issue of automation, I urge great caution to any industry considering the topic, with the strongest of warnings to aviation. While ever-ubiquitous technology may provide new tools for users and increase safety in some areas, it is far from a panacea—quite the contrary. Continually incorporating more and more gizmos and technological features into any operation inherently brings with it additional new
risks. These dangers may be from the technology being misunderstood by the user, misused, distracting the user from higher priority tasks or potentially malfunctioning and causing a mishap where the user has no ability to override the technology. These risks must be realistically faced with eyes wide open and appropriately mitigated at every step.

I wince inside every time I hear an early adopter of some technology proclaim how it could not possibly malfunction so badly as to cause a mishap. In general, anyone who says “that could never happen” should immediately stop and check themselves. I could point out any number of incidents where the unthinkable of some sort has happened, despite all proud claims it never would—all sorts of natural disasters, United Flight 232 losing all hydraulics on a triple-redundant DC-10, Air France Flight 296 flying an Airbus 320 straight into trees at the end of the runway and exploding, B-2 systems overriding the pilot and forcing an unrecoverable stall on Guam, or even Asiana Flight 214 unable to perform a basic visual approach to San Francisco and crashing when the ILS was not available. We must learn from these as well, along with the humility of never putting ourselves beyond the possibility of mishap involvement.

**Contingency Operations**

As of this writing, the U.S. Air Force is in a time of cultural, operational and mission scope change. The vast majority of our people entered the service after Sept. 11, 2001. All they know is service at war, although actual combat has somehow become a segmented and disjointed part of the service. This has created a curiously skewed perception of contingency operations, which have been sustained in some cases for 13 years or more. Some of our people have no experience other than combat-related operations with waivers that have become standard and higher risks that are now assumed to be always acceptable because of how important the mission has been.

As we draw down and end various combat operations, those with combat experience need to capture and pass on this vital experience to the next generation. Hopefully this new generation will live at least temporarily in an era of peace, but must be prepared at every moment for any contingency. Modern reality is also proving that peace is increasingly elusive. Other personnel will remember the different service and life in the military before Sept. 11, how shocking those unexpected attacks were and how everything changed as we mobilized for war. This too must be captured for future generations and their ability to mobilize for contingencies.

In 2002 I wrote an article to capture some lessons learned from the start of Operation Enduring Freedom, as we deployed into austere environments far around the world, to start very new and different operations. One particular important principle I would like to repeat here is fighting the “we are at war, so anything goes” syndrome.

This phenomenon is huge and something that happens almost naturally when commencing contingency operations. It also occurs every time new personnel join an established contingency. It is a basic perception that the dire importance of the contingency overrides the need for established practices. Leaders at every level in every organization should address this problem to set unmistakable priorities and give clear guidance for mission execution.

New circumstances and challenges in contingencies often require creative thinking, problem solving and a hard-charging warrior spirit of domination. However, regulations (and, most importantly, the reasons for them) do not disappear when we deploy. Just because we are not at home, thinking “outside the box” does not give us latitude to do whatever we want.

We fight the way we train, adhering to standards, to keep damage focused upon the enemy, not ourselves, which hinders mission capability. The contingency commander will most likely decide he or she would rather accept a slight slowing of operations, instead of rushing things or taking a cavalier approach that could lead to a mishap.

**Safety Briefings/Meetings**

Unit/installation safety meetings should not be under-
estimated in value. Although they are just one small part of a safety officer's job, these meetings have a disproportionately large impact on the organization and the safety office’s influence. Air Force Wing Flight Safety meetings typically only happen four times a year. You could have the best safety office in the Air Force, with the best safety programs and investigations, be totally on top of every safety report, but if you screw up a safety meeting, the entire base/Wing (likely to include the commander) will perceive the safety office as a poor organization. The reverse is actually true as well—a struggling safety office, that buckles down and puts together a good safety meeting, will score big points and can help start down the road to organizational health. Do not forget how important credibility is for safety personnel and leaders alike.

While safety meetings are far from the most important thing in safety of course, I put a lot of stock in them. You may send out informational messages every other day, visit with people and work tirelessly behind the scenes with safety members and leadership to carry out programs. However, these meetings are your distinct, unique opportunity to directly interact face-to-face with every single member of your organization all at once.

A good safety meeting is approximately 40% content and 60% presentation. Just like any other public speech, if you have the best content in the world but present it poorly, you will fail hard. No matter how great your meeting content is, if your team does not present it in a way that is effective and interesting, the only thing you gain by having the meeting is checking the regulation requirement box.

Here are some other in-the-weeds pointers on building a safety meeting, which I include as I have seen so many problems with them:

- Put together a string of interesting videos maybe 20 minutes long and start the videos playing about 15 minutes before the start of the meeting. This will keep everyone entertained as they get seated and avoid silence if the commander is delayed past the scheduled start time. Remember to embed the videos inside the PowerPoint presentation to start automatically and store them in the root directory folder. This will make the PowerPoint file size huge, but it is worth it. Do not try to link the videos. Inevitably, on the meeting computer, they suddenly not work. Trying to switch between a presentation and separate videos only invites disaster, unless you have one important, dedicated video that really is worth it. (e.g., a 5-minute instructional video or mishap recreation)

- Meet your arranged audio/video/computer experts at the briefing location at least 45 minutes early; 60 minutes or more is even better (no matter how much they insist that 25 minutes is fine). Without fail, some briefing system component will need re-configuration and you do not want the stress of having your team scurrying to get the audio system properly running 10 minutes before the Wing Commander arrives, with hundreds of people watching you flounder. Bring three copies of the presentation, as at least one will inevitably not work. Then move all files to the briefing computer built-in hard drive and do not try to run from an exterior source. Check how every slide and video looks and sounds in the briefing room—slide formats can get adjusted on a new computer and things often look and sound differently in a new setting.

- Take every opportunity to get guest speakers for your meetings, on any number of subjects. As a safety officer, your unit will be seeing you more than enough in these meetings as it is and get bored with you. As I mentioned, reach out beyond your installation and bring in outsiders from the community and beyond. Often, these guest speakers will be thrilled with the opportunity to come brief a bunch of Air Force flyers. I will tell them, “This is a prime opportunity for your organization to reach every flyer on base all at once and influence operations.” That can be quite appealing, particularly to aviation partner organizations, such as the FAA.

- It is always a good idea to do a dry run a couple of days before the meeting, with every speaker. Only excuse someone with whom you are familiar and hold the highest of confidence in as a briefer. There are few things more painful than watching one of your briefers in your meeting flounder on stage in front of everybody, because they were nowhere near as prepared and eloquent as you assumed. Take the opportunity to ruthlessly scrub each other’s briefing slides for content and typos.
Always remember that safety is the commander’s program and meet with him or her to get their high-level guidance. Talk to others that have worked under your specific commander before and get a feel for what kind of meetings the commander likes to have. I have seen more than one hard-charging chief of safety put together a great briefing through enormous hard work that was very serious and professional, only to come away from the briefing red-faced because the commander afterwards said they did not like it because it was not funny. (This highlights the importance of always starting a project by understanding the boss’s intent) When allowed, I highly recommend going with funny meetings. Come up with a style that works for you though, so the presentation is not forced.

Personally, I like a group of subject presentations with funny videos between each subject. Although some people insist transitional videos and other associated pictures should be something that ties in to the briefing subjects, I gave up on that a long time ago. Off-the-wall, little 20-second clips are great for keeping the audience on their toes and paying attention. Playing a clip between each subject also allows each briefer to hand off the clicker/pointer to the next briefer and get settled in at the podium or other briefing point. This keeps up the briefing energy, without silence.

Of course, anytime a mishap is briefed, proper reverence should be observed and at the very least that portion of the meeting segmented from the rest, without humor. As safety officers, we should never forget that numbers, stats and reports truly are about real people, who have had real things happen to them. Some of these experiences are horribly bad.

Safety meetings should ideally be a total of 30 to 40 minutes long. Any shorter than that and attendees will not take it seriously, like it is just a quick requirement filler. When they are longer than that, naturally you will lose your audience to boredom, which you always have to fight anyway.

We always ask if there are any questions at the end of briefs, but the culture usually seems like nobody wants to have the guts to ask, or the offer for questions is insincere. If we are going to maximize effectiveness of safety meetings, the greatest learning comes from questions asked at the end, which can sometimes spawn some very heated multi-party discussion. Sometimes I will deliberately wait in long uncomfortable silence until somebody asks a question or adds their own input and try to get people to start throwing rocks and spark debate.

PART II—Safety Investigations
To tell a secret, most safety mishap investigations are fairly easy, when it comes to the first root purpose of figuring out what happened. Particularly in contemporary aircraft mishaps, with modern aviation technology including multiple data recording devices, an investigator can often determine the essential event information in the first few hours of an investigation. After that, challenges often arise in figuring out fine-print details that may or may not be important to a mishap’s root cause, answering questions of why it happened and, perhaps even more difficult, how to change the organization to prevent future mishaps. There are exceptions, of course.

Perhaps the greatest roadblock you will encounter as a safety investigator is a cultural attitude that can unfortunately be found in every area of the Air Force and even many levels of leadership. This concept can be summed up in seven words: “It is just one of those things.”
There is a human tendency to shrug the shoulders and resign ourselves that sometimes random and unexpected bad things just happen. You will encounter lots of people that think a safety investigation is way too uptight in getting down into the details and scoff at such scrutiny that they perceive as making more of something than is really there. Unfortunately for safety investigators, (but fortunate for the Air Force and all that benefit from investigations) we are not afforded the maligned luxury of throwing up our hands in surrender and writing off any mishap as unavoidable fate. Every activity carries with it a level of risk, which we tacitly accept and seek to manage when we engage in that activity. However, no mishap ever just spontaneously happens without some sort of root causal factor that had it not existed, would have prevented the situation from occurring in the first place. Every incident really is preventable.

I have seen cause problems in multiple investigations—regardless of your particular role in or related to an investigation, always remember who you and your people work for (More on wearing different hats, specifically in interviews, a bit later.)

Safety is the commander’s program and each safety investigation is clearly directed and owned by a specific commander as determined by the mishap’s particulars. Regulations clearly dictate that personnel assigned to an investigation work directly for that commander who is the “convening authority” and are temporarily relieved of all other duties. For impartiality and to prevent outside influence, other personnel must stay out of investigations. On paper, this seems clear, but this can be surreptitiously violated even sometimes with well-meaning intentions. For one reason or another, a commander responsible for convening an investigation may not realistically be able to use an investigator from outside the mishap organization, which can clutter chains of command and impartiality. Although that investigator theoretically works only for the convening commander during the investigation, their performance evaluations are likely still written by subordinate supervisors inside the organization and there are long-term conflicts of interest. Well-intentioned people in support roles may want to make sure investigators have everything they need, run interference, or help gather information, but must ensure that they do not overstep their bounds or interfere with the investigation. The installation and safety office who are hosting the investigation are particularly susceptible to this. Especially with high-interest mishaps, every single person wants to feed their bosses updates to keep them informed on the investigation status and prevent later surprises.

If the investigation chain of command is not clearly preserved, things can get very messy with clearly inappropriate involvement. Extra care must also be taken to protect the safety investigation as a completely insulated and contained process. You must not compromise the ongoing investigation and greater safety program with leaked safety information.

Immediately Capturing Mishap Information
Everyone is familiar with the standard practice following a mishap of having those involved immediately write down a statement of what happened. This is both effective and quite important, particularly since human memory naturally degrades and changes as time goes on. When a mishap occurs on a Friday evening, after gathering up immediate pictures and physical components of the mishap, complying with any particular requirements such as mishap notification, it is easy to decide with the best of intentions to pause the mishap response/investigation until Monday morning. For whatever reason, Friday evening mishaps seem to happen, or damage discovered, after several participants have already gone home for the weekend. Of course, we want to be understanding and allow people to have their deserved time off and may be hesitant to call someone back in when they have already left. I hate to be a Grinch, but highly encourage you to do so anyway.
By the time Monday morning rolls around, not only have people's memories degraded, but they likely were not thinking about work or the event at all over the weekend. If they did not know that a mishap occurred on Friday, their short-term memory may have completely dumped all recollection of Friday's activities.

Inevitably, on Monday some of your participants have gone on vacation or are off doing something else. You will go to maintenance supervisors on Monday only to find that due to changeovers, requests for records were not passed on, broken parts were already fixed or discarded, logbooks updated, etc.

It is not fun to see a blank stare from a person of interest that does not have a clue what you are talking about. This is not to say that you have to work the immediate investigation through Friday night or even over the weekend. But have all participants write out a statement before the weekend, capture important records and do important interviews right away. When you get to a good pausing place, only then you can break for the weekend.

**Steering the Investigation**

In an investigation, it can be counterproductive to theorize and develop preconceived notions before all the evidence comes in. However, follow your instincts on clues that you discover and track down trails that clues point to. Every investigation is comprehensive in one way or another and as you gather data and discover areas that are deficient or of interest in some way, keep peeling that onion apart to see what is inside those outer indicators.

Pay attention to the evidence you find, but just as importantly, pay attention to what is not there. One of the more interesting investigations I was a part of regarded an E-8 JSTARS aircraft in Southwest Asia that had a fuel system malfunction upon initial air refueling in combat and returned to base. The system and aircraft performance went further downhill during recovery, with problems compounding, but thankfully they got it on the ground with everyone safe. Post-flight inspection revealed multiple fuel tank ruptures in the wing, with many broken load-bearing structures. It was scary as we found more and more damage like buckling on the wing before we even got it off the runway and we are lucky we did not lose the entire airplane and large crew that night.

As we dove into the immediate investigation, though, we discovered a notable absence of any contributory information that was out of the ordinary. All fuel checked out normal, mechanical systems were working fine, aircrew procedures seemed within standards and appropriate, no problems with maintenance, weather, the tanker, etc. We could have spent an indescribable amount of time picking apart any number of possible factors, searching for a random golden BB that could have magically caused the mishap. Instead, both the Safety and Accident Investigation Boards carefully followed the clue trail and most likely causes for this particular event and eventually discovered that small plugs had been left in the fuel venting system during the last depot overhaul. The particular circumstances of this flight had caused the wings to over-pressurize internally and begin to rupture like a balloon. We came within minutes of having the wings fail catastrophically in flight and losing the entire jet.

In March 2014, Malaysian Airlines Flight 370, a heavy Boeing 777, went missing while crossing into Vietnamese airspace under strange circumstances. Cable television news programs were full of supposed aviation experts and even trained professional investigators confidently asserting to the fascinated world that any number of various things must obviously have happened.

Wild speculation became rampant, which literally included even a meteor collision, black hole and supernatural involvement. In an investigation, speculation gets you nowhere and jumping to a conclusion before gathering all the information can invalidate the entire process. Even in the most difficult of investigations, you must rely on the total package of evidentiary clues that will point you in the right direction. Careful and thoughtful analysis of the evidence that is present and what is not there, will prevent you from wasting time on false “leads” that are not supported by fact. Speculation is not the same as educated intuition!
The 5 Levels of Why

When determining a mishap’s root causes, the Air Force Safety Center teaches to use the “5 levels of why” methodology. Originally developed by Toyota, it is an incredibly valuable and appropriate approach to investigations. In practice, it is easy in investigations to stop at the first or second “why” and consider ourselves done. For example, “Why did the airplane crash? Because the pilot turned into the mountain, obviously.”

Of course there is much more to it than that and stopping prematurely shortchanges your responsibility to find the root cause. The real problem probably is not person X doing something wrong. Remember, that people really do not come to work with a goal of doing something wrong or having an accident that day. Your real problem likely lies in several more levels of “why”, which explores the reason that person X chose those actions, or that part Y stopped working correctly.

During an investigation, I recommend being as “ridiculous” as deliberately and systematically writing this methodology down on paper or a white board. This can be done in a few ways, but can be as simple as just numbering lines 1-5. On line 1, write down “Why did XXXXXX occur?” using the basic particulars of the mishap. Lines 2-5 can just say, “Why?” Each time you find the answer to a line, write down the answer right below it and move on to answering the next line. You may need to go to four or even seven levels for your particular mishap, but the final answer will be your root causal finding.

Investigations vs. Operations & Immediate Mishap Response

From there on, each night the team can decide which factors have been eliminated as possibilities, move them to a non-factor list and then focus on the remaining factors to investigate. (Consider Sherlock Holmes’ principle that when you eliminate the impossible, whatever remains, however improbable, must be the truth.) This keeps the investigation organized and systematically tracking on what still needs to be explored.

Finally, each night, I like to go around the room and ask each person what they are doing tomorrow. They know this is coming, so it is not a surprise. My purpose is not to put them on the spot, but rather keep each member focused and organized on what short-term tasks they need to accomplish, to further the overall investigation. This also eliminates duplicated efforts between members and helps them see which activities they need to coordinate or deconflict with others.
on and damaged vital Alaskan railroad tracks and there was immediate intense pressure to get the railroad reopened as well.

This is why U.S. Air Force mishap response doctrine designates the Ops Group commander as the Interim Safety Investigation Board President. This makes sense for no other reason, since they will also be so busy with other duties following a major mishap. The OG/CC can choose to balance these conflicting priorities.

When a major mishap/disaster happens, if you are anything like me, your instinct may be to go straight to the scene. Safety personnel, though, should immediately rally at the safety office. Quickly gather your team and get your heads on straight, then get right out to the mishap site. Systematically go through the site with a public affairs photographer, documenting everything. Make a journal note for every picture that you personally take, with a comparative object like your hat or a dollar bill in the shot to give scale reference. Otherwise, you will later be looking at several photographs that you do not have a clue of why you took the picture, what the things are in the picture and how big they are in real life. This is even more important when the person who took the picture is not the same person that later is trying to use the picture to analyze the mishap. Determine if anything is not needed for further critical analysis. These things can be released back to owning units if they need them, or at least removed from a mishap site that needs to be re-opened.

If there is ever conflict over assets involved in an investigation, naturally the investigation leadership should speak directly to the owning commander. If a conflict continues, it could be raised to the convening authority for resolution, but I have never needed to do that. After interviewing important personnel such as aircrew in an aircraft mishap, I will make a preliminary judgment call on whether it seems they could have been causal in a mishap. I then like to call up the mishap unit commander and let them know that either we will need to do further investigation with his or her people, or that we would like to still be able to contact them, but are continuing our focus elsewhere. This practice has generally been well received and appreciated. Of course, I never divulge mishap information, much less say whether the people contributed to the mishap, but commanders have to make the tough decision of whether to get their people back out to working the line, or sit them down because they may be a danger to others.

As a commander, getting your people back into work following a mishap can show you have confidence in them and help them recover to be a better person and worker than they ever were before. On a related note, if during an investigation I find major problems that cannot wait for the final report, I will go to the convening authority for something like a one-time maintenance inspection across a fleet of equipment.

Going back to the initial mishap site visit, I will also emphasize that this can be a horrific experience, even if there are not fatalities, just seeing the awesome power that kinetic accidents can impose on people and objects you are familiar with. If people have in fact died, seeing bodies and other effects is almost certainly trauma you will have to help your team deal with. You may walk through wreckage and have a victim’s cell phone start ringing next to your foot, as a family member hears about the mishap and frantically tries to contact their loved one. Ask for help dealing with unexpectedly terrible things like this.

Both begin and end the visit with a big picture look from 50 yards away from the site, looking for major clues that you will not be able to see when your head is down in the weeds. When you first show up to a crash site, you will be anxious to dive in. And when you leave, you will be tired and preoccupied with a million other things. But force yourself and your team to stop as you arrive and depart the site, to look over the area from a distance for at least several minutes. What is the site telling you? These bigger clues can particularly indicate events immediately preceding the final crash. Is there an angle cut through the tall trees on the far side of the area, which would indicate the approach impact angle of the crashed airplane? Is a streetlight several hundred yards away dented, where the mishap vehicle clipped it, before losing control and crashing down the street?
The Power of Safety Investigations

Safety investigators have an enormous amount of authority, but should almost never rest solely upon their power when interacting with others. For one thing, power-hungry people generally do not play well with others. The source of this power is the Secretary of the Air Force’s charter to the service for mishap prevention. Use it when facing rare roadblocks like an organization’s reluctance to give data. It is a good idea to use the investigation’s command authority like the board president, or, if needed, convening authority.

But what I emphasize to safety investigators is if at any point during a safety investigation they think of something that could be useful for them to figure out what happened and what needs fixing, all they have to do is ask. An incredible array of resources can be sourced for them, whether it is an equipment crane to lift wreckage, a Navy scuba dive team, technical experts, material analysis, or anything else they can think of. Investigators should not be limiting themselves based on what they perceive the feasibility or financial cost is of any resource or action. This also applies when making recommendations in the final safety report at the end of the investigation—do not fail to make a recommendation because you think it would be too hard or expensive to implement. Leave it up to the convening authority you work for, to decide whether a resource would be too prohibitively expensive to use in an investigation, or a corrective action would be too difficult to implement. As an investigator, that is not in your purview and that is the commander’s call, not yours. Your focus is to find out what happened and then recommend what would truly, effectively, prevent the mishap from happening again.

Keep in Touch With Commanders of Units Involved in The Investigation

Always let a commander know when you pop into their unit for any questions or to collect records. This may seem obvious, or it may seem trivial for shorter visits. After all, a safety investigation reports to the convening authority, not the unit commander. But just popping your head in their office as a courtesy to let them know you are around shows respect for the commander and their organization, heads off grumpy suspicions of your team prowling around their areas and keeps open a communication pathway that can facilitate better flow of information through the investigation.

Major Chris Dotur has served more than 21 years in the U.S. Air Force. He has been a safety officer for more than 14 years, holding every Air Force safety position from a unit additional duty, to Alaskan regional safety administrator. He has personally investigated 15 major Class A/B incidents of every scope and type around the globe, including as a Safety Investigation Board President. He has authored 18 articles or papers published in professional journals and magazines.
First of all, let me say that there is no silver bullet, no one size fits all, no easy road to success. If anything, my 30 plus years in the profession have shown me that each organization I have interacted with is unique to an extent and is comprised of personalities, interdependencies, motivations and structure that challenge our ability to prevent employees from getting injured. After all, that is what we are here for right?

**RISK MANAGEMENT & INVESTOR CONFIDENCE**

An Ernst & Young investor survey conducted in 2012 concluded that 4 of 5 investors would pay a premium for companies with a successful approach to risk management. We could have a discussion as to what constitutes a successful approach to risk management, but I wanted to capture the general idea that successful risk management continued.
Paradigm Shift
continued from page 1

ment is good business. As with any business metric, I would say that a successful risk management program is defined by superior numerical results (pick your category - general liability, workers compensation, etc.).

I remember a conversation with a prospective client several months ago where they asked me what percentage of companies have an excellent safety program? My response was 5% to 10%. Perhaps another 20% to 30% of companies have well-staffed, formal programs that are basically successful in doing the right things most of the time.

I’m not clairvoyant, and I haven’t conducted a research study to quantify results, but I do know that very few organizations have successfully established injury prevention as a core business value that is effectively deployed across the organization. Cultural integration is how I define an excellent safety program.

MAINSTREAM PARADIGM

You would think that after 40 years of OSHA, college degree programs, national and international standards, certifications galore, and a consulting market filled with “bright shiny objects” that we’d be farther ahead. Don’t get me wrong, we’ve made progress as a profession, but there is still a long way to go. Having said that, if you and your respective organization have been successful with behavioral observations, OHSAS 18001, ANSI Z10, ILO 2001, OSHA compliance, or other focus areas, good for you—and I do indeed mean that. After all, whatever gets you where you need to be is the reason we wake up each morning. I know that most organizations and safety professionals I come into contact with do not work for an organization where safety is an integral cultural value. Most of my peers seem to be focused on tactical projects instead of organizational development.

Merriam-Webster defines paradigm as a group of ideas about how something should be done; hence a paradigm shift is characterized as a change from one way of thinking to another. If you can step out of the traditional thought process of how we have been trained to prevent injuries, let me introduce a new concept as to how to influence organizational change to better integrate injury prevention into your organizations business preventing injuries, but their words do not create an integral value in their operating culture.

A DIFFERENT APPROACH

What if we could develop a model that is constructed to be consistent with all other business metrics or key performance indicators (KPIs)? Instead of trying to get business leaders to share our vision, what if we developed a safety improvement process that can be seamlessly integrated into their business strategy? What if we had a business model for preventing injuries?

Such a model is focused on a continuous improvement goal, supported by a formal strategy, operational accountability for risk reduction, a structure for employee empowerment and management involvement. Really, isn’t this a basic business model that’s been a foundation for business from the beginning regardless of the metric?

REGULATORY COMPLIANCE

Before I dive into developing a business strategy for loss prevention, I want to comment on regulatory compliance. Being involved in assessing injury prevention best practices in a global arena, I am committed to the concept that regulatory compliance is a necessary corporate responsibility. But the real question is “how do we get to the next level?” Is regulatory compliance the output or the input? Are regulatory standards consistent with other business metrics? I’ve never had a member of senior management tell me that they refuse to comply with safety regulations, but I have seen many organizations subordinate compliance to other business metrics.

When businesses integrate continuous reductions in operating risk as a foundation for preventing injuries, compliance activity is embraced instead of it being considered a business distraction. This is similar to the discussion of whether injury prevention is a priority or value. It is the difference between idea vs. execution. I’ve never had an executive tell me they are opposed to preventing injuries, but their words do not create an integral value in their operating culture.

Remember the first line of this article, there is no silver bullet or one size fits all? Are there organizations with an excellent safety culture? Sure. Do different organizations take different paths on this journey? Sure. I’m proposing a different model that could be of value to companies that realize if they want to change historical results it’s time to take a different approach.

Most organizations do not integrate safety metrics and initiatives into their operating culture regardless of how they verbalize their commitment to injury prevention. In this discussion we will focus on a balanced scorecard to create and sustain the implementation of a management process to drive change. Ideally, this would result in integrating injury prevention metrics and initiatives into an organization’s Manufacturing
Excellence initiatives (e.g., Kaizen projects, Lean Manufacturing, 5-S).

I’ve had excellent success in focusing on continuous reduction in operating risk as the driver to minimize injuries and illnesses worldwide. This is a metric that is consistent with most operating cultures and is readily embraced as a counterpoint to regulatory compliance. From an executive perspective, this provides a means to enhance corporate branding, risk management due diligence, financial performance and investor confidence.

**Safety Management Processes**

There are two widely recognized safety management systems that we would like to reference in our discussion: ANSI Z10 (2012) and the OHSAS 18001 systems. We mention these two processes just to set the stage for our discussion. Both systems are widely accepted and represent a program model of best practices. Both systems are measurable and auditable. But does creating another program silo really provide cultural integration?

The ANSI Z10 model is based upon the W. Edwards Deming process cycle that business processes should be analyzed and measured to identify sources of variation. Likewise, the OHSAS 18001 system is a recognized methodology incorporating a management process for continuous improvement. While both of these processes are formalized and auditable, neither format requires integration into the existing business system. Herein lays the weakness. If we want to change the operating culture of an organization we need to penetrate the operating culture and not just create another silo. In my opinion, successful safety programs must be owned by operations management and not environmental health and safety.

**Business Integration**

So we’ve laid the foundation for a paradigm shift. Over the past 15 years, I’ve been using an approach that focuses on establishing loss prevention best practices as an integral component of the business process. Goals and KPIs are established the same way as other metrics. Strategies are formalized so that goals can be achieved. Activities (i.e., reducing operating risk) are assigned and linked to the performance review process. Improvement plans are required from all operating elements of the organization. And finally, employees are encouraged to participate in risk reduction activities, loss prevention initiatives and promote the advancement of safety being an integrated cultural value.

I’ve validated this process with clients worldwide. When I’m describing the process to a site manager I tend to receive comments like “I get it, this is just like the rest of our business metrics.” We’ve all said that preventing loss is good business. I’m proposing that the time has come to approach loss prevention as a business system like any other business system.

I visualize the business of loss prevention as any defined business objective. We start with a goal. This could be increasing sales, improving on-time delivery, or reducing injuries (or other associated metrics such as TRIR).

I know that focusing on numbers is an exercise in lagging indicators. But think of it this way; from a senior management perspective business metrics are expressed as numbers. I work with organizations that want to improve based upon historical poor performance. Hence, goals are usually expressed as a percent improvement over the previous year. If your organization has already achieved a very low recordable incident rate, you will need to establish program deployment metrics (i.e., risk reduction priorities) or enhanced process deployment as the ultimate goal in the absence of injuries.

**Operational Accountability**

Most organizations haven’t undertaken an active effort to establish operational accountability through balancing of business metrics. If there are 10 active business metrics in your organization, but one metric dictates 90% of the annual compensation, guess what happens? Activities not related to metrics which do not impact compensation don’t receive attention. If we balance performance metrics, then performance expectations for all business metrics are defined and will impact compensation. This is one of two core constructs that establish operational accountability.

The second operational accountability construct which I believe is important consists of allocating the cost of risk. The basic concept is that in a loss sensitive risk allocation system, performance is rewarded and non-performance is penalized from a profit and loss (P&L) standpoint. Most of the organizations I work with allocate the cost of risk, but they standardize the charges (cost per employee, etc.) so there is no incentive to reduce losses. While these two accountability vehicles are relatively simple, I’ve found that most organizations are not very good at sponsoring this type of internal change process.

**A Business Model for Safety**

In the pyramid illustration in Figure 1 (p. 12), we’ve provided an example for such a business system:

- **Goal:** Incident rate, reduction or other numeric goal (i.e., 20% TRIR).
- **Strategy (risk reduction):**
  1. risk assessment deployment
  2. reduce operational risk
  3. leadership development program
  4. department orientation program
- **Action plans:** Each segment of the operation develops a safety improvement plan for the risks unique to the business segment and/or area of responsibility.
- **Performance monitoring:** Risk reduction activities are formalized and monitored.
- **Audits are conducted and results are communicated.** Corrective actions become more proactive.
instead of resulting from incident investigations. Loss prevention best practices deployment and risk reduction activities are integrated into business strategies of continuous improvement.

- Management and employee engagement:
  1) employee involvement in risk assessments and risk reduction process;
  2) risk communication activities;
  3) incident investigation process;
  4) special project involvement (5-S, Kaizen and lean manufacturing projects);
  5) link responsibilities to annual review.

- Operational accountability: Risk reduction KPIs are formalized and linked to the performance review process and compensation. KPIs are balanced to other business metrics to promote one integrated business excellence system. The cost of risk is allocated to the business segment to reward performance improvement and P&L accountability.

Sponsoring Change

IBM Global conducted a study several years ago entitled “Making Change Work.” Its summary concluded, “The gap between the magnitudes of change and the ability of organizations to manage it continues to widen”. If we want to take our organizations injury prevention program to the next level, this will involve our becoming change agents to facilitate the process.

When I’m asked what kind of job I have, I typically respond that I am a management consultant, which usually gets an eye roll. Even though I am a safety professional helping other companies improve their safety process, I’ve found that most often the issue isn’t with safety. It’s identifying and coaching to change those organizational barriers that isolate injury prevention from business integration. As I see it, navigating organizational change is at the heart of improving safety performance.

This seems to be reiterated by a summary of the 1440 respondent companies, which participated in the IBM Making Change Work survey (“Summary of IBM” sidebar):

I think we can safely say that sponsoring change is difficult and most safety professionals are challenged in this regard. If we were to design a safety process that replicated other business processes, wouldn’t that make our job much easier?

Reducing Operating Risk as a KPI

I am a big proponent of conducting and utilizing risk assessments as means to reduce operating risk, increase risk communication and employee awareness. This is a concept that has been a regulatory requirement in Europe for some time and is beginning to get traction in the US. While there are many similarities between job hazard analysis and risk assessments, I find the numerical ranking of risk is an effective means of developing strategies which support KPIs and further integrate injury prevention into the operating culture. Risk reduction is a simple project strategy, which is much easier to integrate than references to a code of federal regulations that are primarily focused on physical hazards.

I have a client who has created an internal audit team for their European operations. The auditors are site general managers. I find the concept interesting. In addition to the fact that the program works extremely well, they’ve been very successful converting operations management into safety auditors (they use a defined best practice model to guide the process). In addition to assessing the deployment of injury prevention best practices, these auditors see new manufacturing methods and interact with their peers in all phases of the business to promote business excellence. Unfortunately, as well as this works in Europe and Asia, I don’t see this being accepted in the US. Our paradigm here revolves around OSH personnel being the tip of the spear due to the emphasis of regulatory best practices.

Many safety professionals I interact with want to improve the outcome of their program but don’t want to change their paradigm. We have been indoctrinated that regulatory compliance is the foundation of all safety programs. Higher education promotes this paradigm, and when students get into the business world they wonder why they encounter resistance to their efforts. It might be easier to make operations safety wise from a business perspective, than it is to make safety professionals business wise.

Conclusion

The challenge that faces our profession is how we help sponsor organizational change to better integrate risk reduction and injury pre-
vention into the operating culture of our business. Are we given the tools that we need to succeed in the business arena? Do we understand the need to navigate the operating culture through balanced performance metrics, risk allocation and operational accountability? Do we understand that regulatory compliance is what comes out of a successful safety program? In my opinion, the goal of a class safety program lies in continuous risk reduction and integrating injury prevention into the operating culture.

The resulting continuous improvement process is measurable and sustainable. I’ve had multiple members of Sr. Management tell me that the safety function does not report to Operations because they view this as the fox guarding the henhouse. This is the paradigm that creates functional silos.

Remember that change is a process typically comprised of taking small steps. To take an organization from typical to exceptional is a long-term process (3 to 5+ years). Cultural change is not a bright shiny object.

There are two business truths I’ve learned over the years that are relevant to the change process: 1) what gets measured gets done; and 2) people do what they are held accountable to do.

This isn’t rocket science, but it flies in the face of what we’ve been traditionally taught. We don’t need another organizational silo for injury prevention; we need to become savvier in sponsoring process integration and organizational change. We need an integrated process that is proactive and not reactive, firmly embedded in the continuous improvement process.

This is the paradigm shift, which in my opinion, needs to take place if we are to elevate from the tactical to the strategic, and to be recognized as business partners instead of a business distraction. Instead of getting management to buy into the safety silo, we should work at structuring our program elements into a business framework the same as other business goals and objectives.

Business integration, process deployment and continuous improvement are the targets. Our challenge (and opportunity) is to better understand how to sponsor and navigate change within our respective organizations to take safety performance to the next level and beyond.

**References**


John McConnell, CSP, MBM, CRSP, has 17 years’ experience with Willis and is currently North America practice leader for Willis Blue (risk/change management best practice deployment). He helps clients navigate organizational change to improve safety performance and reduction of operating risk; his primary focus is international manufacturing clients. McConnell is a member of Willis International Risk Engineering, serving accounts in the Americas and globally. He has travelled globally assisting corporations optimize their operating culture to improve safety performance. He is past president of the ASSE’s West Michigan Chapter. He has served on numerous advisory committees including the Michigan Manufacturers Association and State Chamber of Commerce.
Fatal vehicle crashes are trending downward, but they are still at epidemic levels across the U.S. There were 33,561 deaths recorded in 2012 (NHTSA, 2013). While vehicle crashes have negative effects on the productivity, profitability and safety of the American workforce, they are not on the regulatory radar. OSHA is not creating any new action plans for addressing the number one way to be killed on the job.

Likewise, there have been only a few safe driving campaigns or regulatory initiatives for work-related driving. ANSI/ASSE Z15.1 provides employers, insurers and regulators with a framework for addressing management systems, policy, driver behaviors and vehicle with the overall goal of reducing fleet crash risk.

This article aims to increase awareness about the leading cause of worker fatality in the U.S. and how organizations can use the Z15.1 standard and methodology to improve safety and reduce fleet incident risk. Federal and state laws are considered minimum standards. Current strategies are not having the desired effect, as work-related crashes remain the top cause of worker fatality.

The Z15.1 standard provides “above and beyond” safety guidance for all types of fleets, no matter what type of vehicle is driven, type of employer or range of the fleet. Year after year the Bureau of Labor Statistics as well as state workers’ compensation reports show that the top cause of on-the-job fatality is vehicle crash.

The following statistics gathered from numerous sources prove that vehicle crash remains the leading cause of worker fatality across the U.S.

• In Ohio, transportation incidents were the leading cause of worker fatality in 2012, with 39% of fatalities (33 deaths) represented (Ohio BWC, 2013).
• According to the California Commission on Health and Safety and Workers’ Compensation, the transportation and material-moving occupation had the greatest number of fatalities in 2012 (CHSWC, 2013).
• In 2013, 31% of Missouri worker fatalities were due to vehicle crash.
• 42% of fatalities handled by Missouri Employers Mutual were related to vehicle crashes.
A fleet safety program should be regarded as the most important safety and risk management effort in a company. Why? These efforts will combat the most common type of worker fatality in American industry.

ARE SAFETY PROFESSIONALS FULLY AWARE OF THE PROBLEM?

Is the safety industry fully aware of number one way cause of worker fatality? Is compliance alone enough? Are safety managers aware of resources and tactics available for developing and implementing safer fleet policies? Are safety professionals solely focused on OSHA compliance and forgetting about the leading cause of death for American employees?

Fleet safety efforts can control costs. Missouri Employers Mutual (MEM) data shows that improved safety processes can reduce overall workers’ compensation costs. The average workers’ compensation costs for a single claim after fatality vehicle crash averages around $438,000. Costs are drastically reduced when crashes are injury-only, with workers’ compensation costs averaging around $32,000 for injury crashes. But fleet safety efforts can also have a positive effect on off-the-job crashes. Employees who wear seat belts on the job are very likely to wear them when off the job. This can also mean that group health insurance rates can be controlled as personal injury incidents are reduced as a result of a sincere company belief in safety.

MEM has already noted two fleet safety success stories from 2014 that can be educational. In March, a 33-year-old male was involved in a head-on crash on a rural Missouri road in which he survived but the other driver did not. The other driver was unrestrained, while the surviving employee was wearing a seat belt. Although he was injured, workers’ compensation claim reserves remained around $300,000. Had he not used a seat belt and died, the claim would have exceeded $1.8 million. Adopting the recommendations found in ANSI/ASSE Z15.1 is key to avoiding crashes in the first place as well as minimizing injuries when a crash does occur.

EXPANDING UPON KEY POINTS WITHIN Z15.1

The ANSI/ASSE Z15.1 standard consists of five key emphasis areas. These include management’s commitment to employee safety, analysis of risks in the operating environment, focus on driver qualifications, the vehicle and analysis of incidents and the overall fleet safety program. The standard gives safety directors, fleet managers and insurance companies specific, detailed and actionable strategies including the development of safety policies and procedures for reducing fleet crash risk.

This presentation will highlight key components of the Z15.1 standard and how they save lives and money.

The first section of the Z15.1 standard focuses on management commitment to safety. The safety industry has always known that true and sincere management commitment is key to a successful safety program. Management commitment is a critical key component of the fleet safety program. Management commitment must be garnered through education, facts about incident costs, insurance costs and key data regarding incidents in your specific industry and workers’ compensation data.

Has your management or executive team been apprised of the fleet safety exposure from a worker injury and death perspective, or have they been groomed over the years to focus solely on OSHA compliance that does not currently regulate fleet activities? To lower fleet risk, management must be willing to develop fleet safety policies comprised of actions that exceed compliance. These include bolstering employee selection criteria, widen the offering of employee training and driver certification and provide safe vehicles and equipment that are appropriately maintained. Management must develop a policy and stick to it.

Additionally, employers need to know who can assist them in policy development. Worker’s compensation and fleet/liability carriers can provide guidance. Employers must know who their insurance agent who and who their insurance carriers are. Then, employers must create a dialogue with both, set expectations and take action. MEM always, no matter the size of the company, recommends written seat belt policy, drug-free workplace policy and written safety rules on which employees are trained and refreshed regularly.

The Z15.1 standard provides guidance on a variety of driver behaviors and challenges, as well as support for core safe driving principles. Attention is given to driver behavior, route planning and the “hidden fleet,” which includes rental cars, personally owned vehicles and leases. The Z15.1 standard recommends that employers address (through policy, training and audits) driving behaviors to include impaired driving, aggressive driving, distracted driving and fatigued driving. The standard also recommends that employers develop and manage a written seat belt policy.

Employees should be trained on all policies on a regular basis. The assumption that being “licensed” is enough is simply wrong. Employers must foster safe driving behaviors because societal changes are at work. Technology is changing daily. Texting and driving unfortunately is here to stay. Vehicle and cell phone functionality is seemingly making distracted driving worse. Drivers may not have had safe driver training ever in their lives, except from a few weeks of drivers’ education training back in high school. Safe driving should be a top focus of your safety training activities, as well as regular and routine policy updates. Require each employee to sign policies recommended in the Z15.1 standard, to include:

- written seat belt policy;
- written distracted driving policy;
- written drug-free workplace policy;
- written driver agreement;
- written incident/injury reporting procedure.
All should be enforced. The easy part is writing the policy. How will you audit and enforce a seat belt policy? How do you plan to enforce a drug-free workplace program? Do all employees in your organization know and understand the company distracted driving policy?

Insurers, employers and regulators should be ready to collect success stories. The principles of the Z15.1 standard are routinely producing saved lives. Another Z15.1 success story occurred in early 2014. Two workers were traveling in a pickup truck in Kansas when the truck skidded on black ice, entered the median and overturned. Both employees were wearing seat belts and both escaped with only minor injuries. In 2013, a semi-truck driver was uninjured when his truck left the roadway and overturned. The driver was restrained and the highway patrolman on the scene stated that the driver most definitely would have been ejected if not for the seatbelt.

**Total Fleet Safety**

The third major component of a total fleet safety program, as described in the Z15.1 standard, is a focus on driver qualifications and physical capabilities. Verification of driver history and health is a true risk management tactic. Are your drivers licensed properly and licensed to drive the equipment they’re issued? Have you verified that each employee has a valid operator’s license, with proper endorsements? Z15.1 recommends that each employer develop and provide a written job description, to include the types and complexity of the vehicles to be driven. Drivers should complete a written job application form as well, which should lead the way to background checks. Criminal and motor vehicle background checks must be performed, to include criminal history that can affect driving behaviors as well as verifying their motor vehicle driving history. Employers that perform criminal and motor vehicle record background checks are recommended to develop written criteria for disqualification. Should a driver’s physical capabilities be scrutinized? Even though many operators do not drive for DOT-regulated fleets, physical and eyesight checks are recommended to verify that a driver can physically control the vehicle that s/he is issued.

This section of the standard is an opportunity for the business owner to show employees that safety is important. It can also be a failure point. Employees are forced to use fleet vehicles and are all too familiar with deferred maintenance. What happens in your organization when a work order is submitted? Action? Or is the work order placed on a back burner until things change? Do you make employees drive machines that are unsafe or that need maintenance? What do the tires and brakes look like? Is there visible damage on the vehicle? Do you make vehicles perform work that they were not designed to do? This is an opportunity to show and prove to your employees that safety is a focus. Repairs must be made. Thought must be given to the types of vehicles purchased. Employees will always recognize when the organizations is putting them in an unsafe, damaged or poorly maintained vehicle.

**Incident Reporting**

The fifth major section of the Z15.1 standard creates expectations for employers to develop procedures for incident reporting. These incidents would include any vehicle-related incident that results in damage or injury, to any vehicle or person. This policy should clearly define what incidents should be reported, how to report these incidents and the acceptable timeframe for reporting. Most companies require employees to report all damage or injury incidents, in writing, to their supervisor, by the end of their work duty. Once management receives a report from supervisory staff, the determination is made to further report the incident to the company insurance carrier.

But one area of incident is not widely reported. This is the near-miss incident. Such an incident does not cause injury or damage. The only difference between a near miss and an injury are luck and timing—the incident must still be investigated. Employees, supervisors and management staff should be educated as to the importance of near miss reporting and how near misses closely resemble injury or damage incidents.

An incident report should trigger an investigation. Contributing factors should be discovered and used to create change and prevent future similar incidents. Investigations show employees that the company is serious about safety and serious about preventing incidents. Valuable information can be used to create prevention strategies for future use.

What gets measured gets done. As safety professionals have recommended each year for industrial and construction organizations, all safety, incident, workers’ compensation and cost data should be analyzed for trends. Topics for analysis include incidents per million miles, lost-time workdays, near misses, noncompliance with safety rules and instances of safe behavior during inspection.
**PROJECTS THAT SUPPORT Z15.1**

MEM has long known the effects of vehicle crashes in Missouri. Claims data proves that vehicle crashes are particularly catastrophic in nature and is a risk for each of the 14,000 current policyholders. To support customer safety and prevent injuries, MEM embarked on three projects in 2013 and 2014. They include a seat belt policy verification campaign, drug-free workplace policy verification campaign and a seat belt wrap campaign. These efforts were created to verify that customers did, in fact, have written risk management policies in place. The programs were also designed to help those with inadequate policies to develop and implement them.

The first was dubbed the “seat belt policy verification” project, which began in the first quarter of 2013. MEM claims and loss prevention personnel embarked on a mission to make sure that all accounts over $50,000 in premium size had a written seat belt policy in place and that it was covered in employee training. MEM also supplied each account with seat belt training materials and “click it” window cling decals for each vehicle in the customer’s fleet. Now, due to the success of the program the threshold has been widened to include all policies over $25,000 in premium size.

The second of three projects is the “drug-free workplace verification” project. Similar to the seat belt verification project, the topic is drug-free workplaces. MEM verified that programs were in place and for those without, MEM supplied sample policies, door decals and training material.

The third major fleet safety project began in the first quarter of 2014 and was created to support customer seat belt policies and encourage seat belt usage among employees. MEM began issuing fluorescent, reflective orange seat belt wraps. At $3 each, these wraps encourage seat belt use by drivers of all kinds of machines and they help safety representatives audit compliance. $35,000 (the average cost of a lost-time incident, according to MEM) was set aside to purchase 10,000 seat belt wraps. All of these projects were to support management’s commitment to fleet safety.

The only difference between a near miss and an injury are luck and timing—they still need to be investigated.

**REFERENCES**


**Mark Woodward** has instructed thousands of Missouri employees and has provided educational resources to more than 3,000 safety-related classes. He is a certified CPR, first-aid and AED trainer, defensive driving instructor and OSHA outreach trainer (OSHA 10 and OSHA 30 in construction). His experience includes managing workers’ compensation claims and safety for 6 years as a Missouri Employers Mutual policyholder. For the past 15 years, Woodward has been active in the Missouri fire and ambulance service as a firefighter and emergency medical technician. He holds a B.S. in Safety Management from the University of Central Missouri and a master’s degree in Education from William Woods University.

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Does this scenario sound familiar? A three-man crew was attempting to shut down a 23-in. water main when the incident occurred. One worker entered the 10-ft deep valve pit (vault) through the 22-in. manhole opening using a built-in steel ladder and a few minutes later called for help. One worker on top went in to assist and was overcome. The third worker started to enter and realized he would soon be in trouble. He immediately exited and called for help. Both workers died at a local hospital (NIOSH, 1994).

This is one of many examples of mistakes made by employees and employers that ended worker fatalities. Upon review, it appeared that a lack of ventilation was the greatest contributing factor in this incident. Had a forced air ventilator been placed to

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Confined Space Entry: Determining Your Stand-By Rescue Needs

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bring in fresh outside air, the need to call 9-1-1 for rescue could probably have averted.

When confined spaces exist on a work site, employers must follow the 29 CFR 1910.146 Permit Required Confined Spaces standard. It is important to understand that it is a performance-based standard, not a prescriptive standard, meaning that this regulation identifies the end result and it is the employer’s job to decide how to get there.

1910.146 (b) defines a confined space as a space that meets all of the following criteria:

1) is large enough and so configured that an employee can bodily enter and perform assigned work;

2) has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults and pits are spaces that may have limited means of entry); and

3) is not designed for continuous employee occupancy.

Additionally, a permit required confined space is a confined space has one or more of the following characteristics:

1) contains or has a potential to contain a hazardous atmosphere;

2) contains a material that has the potential for engulfing an entrant;

3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section;

4) contains any other recognized serious safety or health hazard.

This article does not review all of the requirements of having a proper permit required confined space entry program. OSHA 29 CFR 1910.146 identifies these requirements in detail. This article focuses on the requirements for rescue services.

1910.146(d) outlines the requirements for the entry program and states that rescue must be provided. Most employers with permit required confined entry programs excel in identifying their spaces and the requirements for safe entry. Their training, on paper, anyways, includes employee self-rescue and non-entry rescue procedures. Programs instruct workers/authorized stand-by personnel to never enter a space unless relieved by another equally qualified authorized stand-by person. When it comes to entry rescue many programs are silent or simply state that local EMS/fire are to be called. If you are one of those employers, have you asked that agency if it will provide rescue services?

The San Francisco Water Power Sewer’s 140 miles of tunnels and pipelines extends from the Sierra Nevada Mountains in Yosemite National Park to San Francisco through more than 35 fire/rescue jurisdictions. Ten years ago, these agencies were surveyed to determine their ability to provide rescue services to our confined space operations. All but four said they were not equipped or qualified for entry rescue. However, they would respond to the call and assist us once the injured employee was extracted from the space. Of the four agencies that are “confined space entry rescue operational,” none indicated a willingness to commit to being stand-by rescue during some of our more dangerous entries. They also would not commit to actually being able to respond to a confined space event with their rescue squad when called. The primary purpose of a fire department’s rescue squad is to be available to rescue its own personnel; they respond to all large fires, ready to assist their fellow fire fighters.

1910.146(d)(9) states that the employer 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, and for preventing unauthorized personnel from attempting a rescue.” Many employer confined space entry programs already include provisions for self-rescue and non-entry rescue required by this section. They assign the authorized attendant as the gatekeeper to ensure that unauthorized personnel do not attempt rescue. If an employee is injured or incapacitated and cannot self-rescue nor be removed from the space by the attendant staged outside, then someone must enter the space to rescue her/him.

Regulations are in place to provide the minimum requirements for safe entry, but don not always provide adequate guidance to employers as is the case for entering confined spaces to rescue injured employees.
There are three options for entry rescue:

1) **Call the local fire department for rescue as needed.** Relying on the local fire departments is generally not an option as they are not configured to be a stand-by rescue company. They will respond to a call, but will not enter a space due to lack of training. They will assist the employer once the downed employee has been extracted. Only larger agencies have the capability to equip and staff a rescue squad. But, remember, the primary responsibility of those squads is the rescue of firefighters involved with firefighting operations within their jurisdiction. They may not come to the rescue in a timely manner.

2) **Contract with a private stand-by rescue company.** Many providers offers on-site stand-by rescue. Many hire off-duty firefighters to be rescuers. Cost and access to your spaces are the driving factors. A private stand-by rescue team can cost up to $3,000/day, or more. Many factors must be considered, the configuration of the space, the need for air-line or self-contained breathing apparatus, accessibility of the space and the number of personnel needed to support the rescue, to name a few.

3) **Staff, train and equip an in-house confined space entry rescue team(s).** Choosing this option is not to be taken lightly. Training and equipping an in-house rescue team is costly with respect to time for training and equipment; it is a full-time effort. But how much training is required? 1910.146(k)(2)(iv) states that employers must ensure that affected employees practice making permit space rescues at least once every 12 months and also states that the training must be realistic; however, it but does not go into detail what it takes to train employees so that they are ready for that simulation. Is 10 hours or 100 hours enough? Is an annual drill enough? Should more frequent drills be required? The answer to these questions is up to your organization and the level of hazard within your confined spaces. Non-Mandatory Appendix F—Rescue Team or Rescue Service Evaluation Criteria provides some guidance, but is not specific as to the training requirements.

An additional factor that may influence the selection of an outside rescuer versus investing in an in-house rescue team is the number of entries made per a given time period. Is it more cost effective to hire, equip and train an in-house team versus hiring a private rescue team? One last thing to consider is whether your organization has the wherewithal to implement this last option?

After being cited by Cal/OSHA, a large city in the San Francisco Bay Area sought a memorandum of understanding with the city’s fire department to provide rescue services to the department on an as-needed basis. The public works department, owner of the majority of the permit required confined spaces in the city, pays an annual fee to the fire department to cover the costs. It was determined that the estimated $1 million/year cost to train and equip a dedicated stand-by rescue team was not feasible. Additionally, this option would only provide for services within the city limits, leaving the majority of our operations without these services.

The Hetch Hetchy Water and Power division’s operations in the Sierra Nevada Foothills and Yosemite Park are located in a remote rural/mountain area. This division decided to form its own team due to the long response
times of the region. This group has been training and equipping a combined hazmat/low-angle/high-angle/confined space rescue team for 15 years. Drills have been held on a semi-annual to annual basis combining many aspects of the hazards of operating a regional water collection and hydroelectric generating system. The division invites CalFire, national parks rangers and other county agencies as these drills also serve as an opportunity for the other agencies to train as well; this fosters inter-agency goodwill and cooperation. In addition to these drills, the team meets/trains monthly to quarterly to practice skills including space ventilation techniques, patient packaging, rope/pulley systems and knot tying.

Permit required confined space entry is hazardous work, but with proper hazard identification and controls this can be reduced to an acceptable level. Regulations are in place to provide the minimum requirements for safe entry, but do not always provide adequate guidance to employers as is the case for entering confined spaces to rescue injured employees. If an employee must enter a confined space to perform work then entry rescue must be considered and planned. Each option for personnel rescue has a cost in both time and funding. Consider your options and fully commit to ensuring the safety of your workers.

REFERENCE

Stephen Brooks, CSP, ARM, is safety officer for the San Francisco Public Utilities Commission. He also serves as the President of the Utilities Practice Specialty. Brooks holds a bachelor’s degree in Zoology from the University of California-Santa Barbara.

Utilities Practice Specialty
Safety Professional of the Year

David Driver received the Utilities Practice Specialty’s 2014 Safety Professional of the Year award. Driver has continually displayed commitment to the advancement of the practice specialty as one of the organizations team volunteers. He has been involved with Utilities Practice Specialty since the early stages of the group’s inception as a branch. As membership chair in 2010, he excelled in soliciting a steady membership growth. In 2011 he was recognized as the ASSE Utilities Branch Significant Contributor and in June 2012, accepted the vice chair position. He continues to be an active participant in the practice specialty as the assistant administrator. Driver is seen as a reliable leader and organizer of efforts to promote the organization. He is committed to making the Utilities Practice Specialty a central point of networking and instrumental in creating a place that utility safety professionals can find answers. Throughout his career, he has demonstrated a genuine passion for helping people and that has and continues to be one his strongest assets for the Utilities Practice Specialty and the safety profession as a whole.

Council on Practices & Standards
Safety Professional of the Year Award

Pam Walaski is the 2014 Council on Practices and Standards (COPS) Safety Professional of the Year. The Consultants Practice Specialty nominated Walaski, who has done an outstanding job as its administrator. Her many accomplishments include the development of the online Consultants Directory and she is one of three editors of the book Becoming an Effective SH&E Consultant. Walaski is a well-respected SH&E professional who tirelessly volunteered her time for ongoing COPS initiatives such as the Body of Knowledge and the upcoming digital expansion program for our publications. She has coordinated a section on emergency response in The Safety Professionals Handbook and authored a chapter on Cost Analysis and Budgeting for Emergency Response. Her diligence has benefited ASSE for many years and she has been a presenter at many professional development conferences. Walaski is also active in standards development as a member of the U.S. Technical Advisory Group to ISO for the PC283 Committee, which is drafting a global standard for occupational health and safety management systems.
Beijing to Geneva to New York City
The Long Road Toward Protecting Health for All by Increasing STEM Opportunities for Women

BY ILISE FEITSHANS, J.D., SCM, DIR

The true-to-life image of only one or two women in a crowded field of male engineers was not a fantasy a generation ago, as exemplified by the group portrait of male trustees of Virginia Commonwealth University hung in its academic building in 2015. Only through close observation could one find the sole woman nestled at the rear of the desk, seated alongside a lamp.

Women’s progress toward equal employment opportunities to do the hard work of ensuring health and security for all in the STEM professions is inextricably tied to implementing the platform of action for women’s rights prepared by the UN in China in 1995. That platform is a complex and verbose document that is undergoing a global strategic review, first in Geneva, Switzerland among the regions of the world and then in New York City before the UN’s commission on the status of women.

This article outlines key concerns discussed in the process called the Beijing plus twenty review, offering a glimmer of insight about where the UN signatory nations were in 1995, where steps forward for women in STEM have been made and the way forward to implement this critical social change beyond paper promises.

By including women in STEM, and using women’s previously untapped talents to advance the health and safety engineering professions, there is a greater chance of enhanced workplace health for all. To monitor the progress made toward equal opportunity for women, the Beijing plus twenty processes brought governments, academia, UN agencies and non-governmental organizations together twice recently—in November 2014 at the UN in Geneva Switzerland and in March 2015, at the UN in New York.

The single goal for these elaborate and expensive weeks of international meetings was to review long-term impacts and long-term obstacles to gender equality that have come up in the 20 years after the Beijing platform for action was adopted at the UN 4th world conference on women in 1995. There was widespread consensus that governments and the private sector should be encouraged to finally implement the commitments undertaken in Beijing in 1995 that have not been fulfilled.

Surprisingly, there was consensus that despite progress towards equal employment opportunity, many gaps remained from the standpoint of wages, accessible child care, paid maternity leave and most of all, access to training in areas such as science and math which were considered inappropriate for girls education in previous generations.

Across many areas of law and social policy, access to high quality education with jobs remains a key obstacle to equality.
The Beijing plus twenty regional review meeting in Geneva was co-hosted by the UN economic commission for Europe and UN Women. Representatives from 48 countries shared consensus that as part of their continued commitment to empowering women governments must implement legislation, provide sufficient funds at national and local levels, and improve sex-disaggregated statistical reporting in order to monitor progress and challenges. Chairpersons were Hijran Huseynova, chair of the state committee for family, women and children affairs, Azerbaijan, Carlien Scheele, director, gender equality and LGBT equality department, ministry of education, culture and science, Netherlands. The rapporteur was Thomas Fitschen, ambassador, deputy permanent representative of Germany to the UN, Geneva. To follow-up, in March 2015 review conclusions were sent to the commission on the status of women in New York.

The deliberations were the first step towards evaluating the long-term impact of the principles codified in the Beijing platform document for the first time, on a global level. Despite increased awareness and advances in legal expertise on discrimination and women’s rights, possibilities for women and girls to claim redress when their rights have been violated are insufficient. Across many areas of law and social policy, access to high quality education with jobs remains a key obstacle to equality. The importance of access to education could not be understated, and has been the subject of several subsequent UN initiatives. For example, in Europe the Marie Curie grants and fellowships make a special effort to find, and fund research opportunities for women in sciences.

Although most ECE countries are parties to the committee on the elimination of discrimination against women convention, many face difficulties in fully implementing it. The committee is currently developing a general comment on access to justice. Across the ECE ad-hoc bodies and inter-ministerial structures have been created. The capacities of national mechanisms to implement, coordinate, and monitor gender equality policies, and their possibility to hold others accountable, however, remain limited. They often lack adequate resources, and coordination remains a challenge.

Even where women can be considered employed, they are disproportionately found in precarious employment, part-time employment, lower paid jobs or suffering from wage discrimination. In 2013, only 1 out of every four parliamentarians in ECE countries was a woman. Gender quotas to increase women’s representation in government have been introduced in some countries, yet women remain underrepresented in key decision-making spheres throughout the ECE region, and there was consensus that the absence of female perspective influences the funding for programs and the ability to implement legislation advancing women.

Why Did The UN Need a Women’s Conference?

The author attended the non-governmental organization (NGO) forum of the UN fourth world conference on women, August through September 1995 in China. Subsequently, the author served as a delegate for the global alliance for women’s health, which is an accredited NGO of the UN. Accredited means granted a special status by the United Nations, allowing members of the organization to participate in meetings at the UN and on rare occasions provide information or lobby official delegates from member nations about pressing issues. This function closely resembles its antecedent in the U.S. Congress or other legislative bodies. NGOs frequently unite to strategize, share information and ultimately influence UN international policy decisions, in manner that also closely resembles the work of lobbyists in any nation’s government. The meeting represented a major vehicle for exchanging information and for setting a global policy agenda to protect the health, provide education and support women’s rights throughout the world.

The Beijing declaration is the preamble to the platform for action. In language that unsurprisingly harks back to the declaration of sentiments of the women who demanded suffrage a hundred years before in New York’s Seneca Falls, the preamble notes commitment to:

“The equal rights and inherent dignity of women and men...ensure the full implementation of the human rights of women and of the girl child as inalienable, integral and indivisible part of all human rights and fundamental freedoms.”
The 1995 NGO forum at the UN fourth world conference on women was the first half of a two-part conference, a division that was confusing. First, the NGO Forum began on Aug. 31, 1995, and ended Sept. 8, 1995. Second, the official diplomatic delegates to the fourth world conference on women met from Sept. 4, 1995, through Sept. 15, 1995.

The second conference produced the so-called platform document, and involved a famous speech in which First Lady Hillary Clinton proclaimed, “Women’s rights are human rights.”

It is worth noting, however, that there were many male diplomatic delegates to the second conference, and few males in attendance at the NGO Forum. There was an officially printed and electronically transmitted tangible product for the second part of the conference, but the NGO forum did not produce any written accounts or official transcripts of its work. Some individuals had credentials to both parts of the conference, furthering the confusion.

The NGO forum produced more than 5,000 workshops on policy issues affecting women concerning every imaginable topic. Some attendees distributed papers informally at the workshops, while others photographed each other and exchanged addresses. There was no formal list of NGO registrants, no formal message center for locating people, and most critically, no official written product of these meetings. Nevertheless, videotapes of the NGO Forum demonstrate that it produced invaluable reports, documents and souvenirs, although it did not produce a treaty or a convention or other example of the rule of law.

The NGO forum’s heritage reaches far back into the UN, a 50-year history that reached critical mass at the Nairobi meeting of the third UN world conference on women. There, more than 300 NGOs assembled spontaneously in tents that they had built outside of the official diplomatic meeting. It made Nairobi the buzzword for a watershed moment in UN history.

Afterward, NGOs were included in a new, stronger role as part of the fabric of UN deliberations. The change after Nairobi represents a new wave of democratization within international legislation and policy, as NGOs speak for people, not governments. They are not elected, but often represent the views of minorities or the oppressed as a counterweight to government.

We like this result when NGOs oppose repressive regimes; but the success of the NGOs also implicitly represents an erosion in the power and influence of all governments, whose sovereignty are guarded by the terms and conditions of the UN charter, regardless of the nature of their regimes. This is an important feature of the NGO forum and the UN fourth world conference on women because this influential but threatening—for some governments, subversive—role may explain in part why so much confusion, almost a deliberate diplomatic fog, surrounded the preparations for the meetings.

What Happened at the UN Fourth World Conference on Women?

There is significant debate about the significance of what happened at the NGO forum. Delegates came home from China only to find that a truly exciting and vibrant meeting was described in scant news reports that concentrated on the pouring rain, bad housing, muddy tents, bacteria in food and undue surveillance, rather than reporting accurately upon the hard work of the meetings.

Another facet of this misunderstanding, however, cannot be laid at the feet of the media. Rather it suggests an instrinsically feminist approach to communication and products, compared to the process and result that lay at the heart of the NGO forum. The activities that occurred at the NGO forum—meetings, workshops, exchanges of ideas, transfer of otherwise unobtainable and possible illegal clandestine information—are, according to feminist theory, characteristically female types of communication.

In this model of communication, process is the product. The goal is education through communication, without providing documentation of the process or the work, much the same way that a mother or grandmother might convey important unwritten information to their child. This process of communication is the hallmark of child rearing, which until recently was if not exclusively, then at least traditionally, the heart of women’s empow-
erment domain. This approach, feminist theory posits, takes a long-term approach to learning and sharing ideas through unwritten communication.

The goals of communication for exchange of ideas are not precisely quantified; they remain long-term, rather than easily achieved. Children for example, learn to speak by imitating their mothers as best that they can, but not in one or two days. Process-oriented communication develops a profound common bond between the participants. This makes talking the heart of the process and a prized result.

What Was Accomplished by the NGOs?

The NGO forum united many women from every part of the world. Many common issues that should play a greater role in the international policy agenda were discussed, especially health issues, education for women and child care. In contrast to the NGO Forum, diplomatic delegates produced an official document, whose significance will offer perennial debate among legal scholars and historians.

The differences between these parts of the same whole are underscored by one visual image: in contrast to the NGO forum where women wore colorful sari, kimonos, t-shirts or dashikis, as of Sept. 3, there was a increasingly steady incoming stream of well-groomed men in silk suits and designer ties who came as caretakers and participants in the second part. They performed official, documented tasks. Tight security around those diplomats had a chilling effect on meetings. They also had a vast cadre of secretarial staff to transcribe and record their every word.

I learned by presenting three workshops at the NGO Forum, when thousands of women come together in any given place to exchange ideas about their situation and strategize about improving the world, and securing world peace for their children and parents and partners, language barriers and differences of experience become interesting but unimportant. It is a powerful, dynamic time when those differences melt away.

New York & Beyond, But Where Next?

Perennial issues addressed in the Beijing platform for action have not been solved, despite government efforts, which are insufficient according to the data discussed at the review. For example, discriminatory stereotypes influence the educational choices of women and restrict their future employment opportunities in science and technical areas. Gender-based violence penetrates all areas of life and affects women of all ages worldwide today. Women in the safety and health professions are especially key in shaping programs that can target the prevention of such violence and provide support for women who have been victims of violence, whether that support comes from resources in the workplace, the community or at home.

Women in the safety and health professions also can play a key role in mentoring by informing male colleagues men about the inaccuracies of professional stereotypes, or by mentoring to help women enter the STEM professions. Despite policy efforts undertaken over the last two decades, the ill health caused by violence against women continues to exist in every country. All these factors lead to a persistent gender pay gap and sharply lower pension payments for women as compared to men.

Many countries reported significant legislative progress, nonetheless there was strong consensus that education for women is the linchpin for climbing out of disempowerment by obtaining well paying jobs. This notion was underscored at the global symposium “Women Changing the World,” a parallel event to the UN activities that was live streamed across the globe. At Barnard College, speaking at a panel discussion Queen Noor of Jordan underscored these key points, noting that human rights and education to promote those rights remain important for women around the world. Better education in the gap-areas of science technology engineering and math are one way to ensure that the existing gaps will diminish.

New Issues

An emerging health issue that will impact access to health insurance and quality health care for women is the projected gender gap in pensions and retirement income. Unequal pensions will redefine the feminization of poverty because men work full time and in large percentages max out pension rights. By contrast, women more often hold lower paying or precarious employment, lose jobs or abstain from work for caretaking of
partners, older family and children and have lower paying jobs due discrimination and lack of pay equity. In this aspect of preventing new health disparities, the safety and health and environment professions have a key role to play protecting the health for all.

But, in the realm of enriching the advancement of safety and health through the applications of women’s perspectives to the overall professional ethos, there is good news. It was noted anecdotally in NGO meetings in New York also, that women who have arrived in the STEM professions (including safety, health and environment professions) exhibit different trends for manifesting their leadership and have a keen ability to target areas that require attention that may have been overlooked in the past.

This perspective, regardless of the reasons for its origins, means that including a larger percentage of women as professional leaders will have positive impacts on advancing the agenda for occupational safety and health. In the final report, recommendations included:

- Strengthening data collection,
- Expanding research work and surveys on gender-based violence and its root causes,
- Access to redress for harm from discrimination
- Unpaid women’s labor require high priority attention.

Administrative data systems need to be strengthened, and data and survey results made available for the public. Governments can work to fill this gap.

Where Next?

The obvious next agenda item was the question of whether there is a clear and strategically manageable way forward. Women and men must work together to overcome stereotypes and proactively seek opportunity to provide inquisitive young ladies with educational advancement, even in the face of cultural opposition in the workplace, in academia or at home.

Since so much remains to be done regarding the implementation of the roadmap and pathway set forth in Beijing twenty years ago, there are no immediate plans for a fifth UN world conference on women, since no new document is needed. Yet, a small group meeting at the NGO forum in New York for the commission on the status of women headed by Dr Jean Shinoda Bolen suggested the next stop on the UN World Conference path towards women’s equality should be India.

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