Outside the Norm

Understanding the unique challenges of nontraditional work environments

By Wendy D. Ash

THE AFTERMATH OF AN EARTHQUAKE, a tornado, a hurricane or a flood. The large-scale emergency response and cleanup of a city following a disaster. These are examples of what can be called a *nontraditional work environment.* In this context, this term is generally defined as any work environment outside the parameters of standard occupational safety and health regulations, laws and statutes, in which it is not feasible to apply existing regulations to a mandatory operation or in which the situation is so dynamic that it cannot be predicted or controlled.

Traditionally, SH&E professionals deal with emergencies and cleanup operations in a structured manner, with trained professionals performing tasks that have been planned, practiced and mastered. The scene of a disaster can be overwhelming and chaotic, as hundreds of workers, employers, agencies and volunteers descend on a site to perform multiple simultaneous tasks, each of which carries countless risks. In an emergency, people are faced with a mountainous task which preoccupies their focus—so much so that safe work behaviors may not be exercised.

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Experience in nontraditional work environments and guidance documents from various agencies indicate hidden and extreme hazards and challenges that may be present include:

- unknown chemical, biological, radiological and/or nuclear substances;
- hazardous concentrations of dusts and fibers;
- worksites that span large geographical areas (e.g., 100 miles or more);
- multiple worksites, landfills, traffic routes;
- potential failure of traffic control and city emergency systems;
- utility failures (e.g., broken gas lines, water lines, downed power lines);
- heat or cold stress exposures;
- long work hours and extended work weeks with few days off;
- presence of stinging and venomous biting insects, snakes, alligators and other wildlife;
- security threats to workers from the general public and the presence of weapons;
- unspent munitions;
- uncontrolled fires;
- presence of sharps, broken glass and needles;
- uneven/unstable walking and working surfaces;
- multiple simultaneous operations including heavy equipment and ground personnel working in close proximity;
- shortage of food, water or sanitary facilities for workers;
- shortage of PPE (supply chains are strained on large-scale projects);
- foot, head and hand hazards;
- shortage of fuel or electrical power (OSHA, 2008a-d; NIOSH, 2004a, b; USACE, 2003).

Traditional regulations, safety management principles and established safe work practices are often inadequate for managing the magnitude and concurrent multiple hazards found in a nontraditional work environment. Therefore, specially tailored safety and health policies and programs must be developed, which requires the SH&E professional to be adaptive and innovative in order to solve problems.

The Nontraditional SH&E Professional

In industries with established regulations, SH&E professionals act as a "live guidance document," able to recite subparts and paragraphs, and debate application with employees and management. They are in a comfort zone with the regulations and the company policies that mirror or elaborate on existing standards and laws. The traditional safety and health program eventually reaches equilibrium—the policies have been written, the training has been provided, and it is primarily a matter of continuing and improving existing processes to maintain a safe work environment.

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Abstract: *Nontraditional work environments often require a departure from the ideals, methodologies and regulations employed in traditional work environments. The tasks required in these environments are unusual in that the operation or goal cannot be abandoned even when it is deemed unsafe by conventional measures. To prevent injuries and illnesses, employers and SH&E professionals involved with these projects must design, institute and enforce specialized policies to maintain the highest standards of safety in the midst of seemingly insurmountable risks.*

The nontraditional work environment generally unfolds in three stages; rescue, recovery and cleanup. Each stage requires a different method of management, a different approach to hazards and a fresh perspective on operations. New hazards and challenges arise constantly and each new step in the operational process presents a new list of tasks—each of which is operationally required to meet the goal—to be analyzed.

Traditional safety and health practices dictate the use of Level A PPE in the face of unknown hazards, which are treated as immediately dangerous to life and health (IDLH) [OSHA, 29 CFR 1910.120(c)(5)(iii)]. In the author's experience, such measures are not feasible in the aftermath of a disaster and would significantly impede rescue and recovery operations. This is likely the most difficult paradox in bridging the gap between traditional safety practices and those necessary at the scene of a disaster.

Traditional SH&E programs mandate that work not be performed when it is inherently unsafe or could cause harm to the employee performing the work or others nearby. SH&E programs traditionally strive to identify and remove each hazard or reduce it to an acceptable level. In other words, both the work environment and the operation are frequently controlled by the focus of safety for the workers. This is the traditional application of operational safety.

In a nontraditional work environment, however, the operation, the hazard, the work and the work environment may not be controllable—and often the operation cannot be avoided. This concept is foreign to traditional safety and health strategies. Imagine the following nontraditional scenarios:

- Workers must hand separate disaster debris known to contain used hypodermic needles (OSHA, 2008d).
- An abandoned car containing an active bee hive must be moved and the services of a pest control expert are not available (OSHA, 2008a).
- A task that can only be performed safely if it is performed carefully, whereby equitable hazard controls ("Hierarchy" sidebar, p. 22) are not enough to protect personnel from harm, are not practical or would significantly impede performance of a necessary operation (OSHA, 2008a).

When the operation must be performed and the hazard cannot be removed, traditional safety practices may hold that proceeding would essentially be the same as condoning injury. When charged with designing methods to protect personnel in a nontraditional work environment, those involved must approach those challenges methodically, with a good degree of humility and the use of collaborative operational safety. Operational safety is accomplished when personnel responsible for operations and those responsible for safety and health advocate the necessity of each.

Although operational safety is not new to the traditional work environment, such a symbiotic relationship is critical in the nontraditional work environment. Although many industries have inherent risks, many SH&E professionals and operational managers are not accustomed to the extreme hazards present following a disaster. One must remember that these risks affect not only the workers, but may also present significant liability risks and potential long-term legal costs for employers and agencies. A strong safety and health program with a low

Hierarchy of Safety & Health Controls

The controls in this hierarchy are presented in order of effectiveness.

1) **Elimination or substitution.** Whenever possible, eliminate the hazard from the work area (e.g., repair or remove fallen electrical power lines before allowing other work to proceed in the area). Although desirable, elimination and substitution may not be options for most airborne/chemical hazards created by a natural disaster.

2) **Engineering controls.** Examples include guarding pinch points associated with a machine's moving parts; providing ventilation to a permit-required confined space; using heavy equipment with temperature-controlled cabs; and placing barriers around the swing radius of rotating heavy equipment.

3) **Warnings.** Examples include odor in natural gas; signs and labels; backup alarms; and beepers and horns.

4) **Training and procedures; administrative controls.** Use well-rested crews and daylight hours to perform higher hazard or unfamiliar tasks. Take frequent breaks during hot weather. Remove nonessential personnel from the area during certain task/operations. Decontaminate equipment and personnel after contact with contaminated floodwater or chemicals. When possible, use water to suppress dust and work upwind in dusty conditions. Where extensive hot work is performed in the form of cutting and burning, use extended-length torch handles to increase the distance from the individual's breathing zone to the generation of toxic fumes.

5) **PPE.** Examples include use of safety glasses, ear plugs, face shields, safety harnesses and lanyards, respirators and snake chaps. If other controls are not available, not feasible or do not provide sufficient protection, select and use PPE appropriate for the hazard and level of exposure. OSHA provides additional assistance on PPE selection and use.

Note. *Adapted from "Hurricane eMatrix: General Recommendations—Hazard Control," by OSHA, 2008, Washington, DC: U.S. Department of Labor, Author.*

injury rate will create significant credibility and help protect against future legal concerns.

In the nontraditional situation, the SH&E professional must act as a scientist, an analyst, a diplomat, a policy maker and a regulator. This requires a departure from traditional roles. In disaster recovery work, the only clearly defined guidance may be that written by the SH&E professionals and project leaders as a means of protecting personnel under unusual circumstances. SH&E personnel must leave their comfort zone and adapt to intuitive and practical emergency field procedures, personnel training and collaborative administrative management of safety and health plans. They must also adapt on many other levels, ranging from methods of hazard analysis to methods of achieving compliance. The nontraditional work environment includes tasks, personnel and policies, each also nontraditional.

Emergency Field Procedures

Existing occupational safety and health regulations, guidelines and consensus standards reach as far as possible into the nontraditional work environment to protect life and health, but the unpredictable gaps between existing conventions and the nontraditional conditions must be bridged in real time. Hazards must be evaluated and policies must be in place in a matter of hours or days, unlike traditional laws that are forged over years. The absence of directly relevant regulations does not remove the obligation to provide a safe work environment.

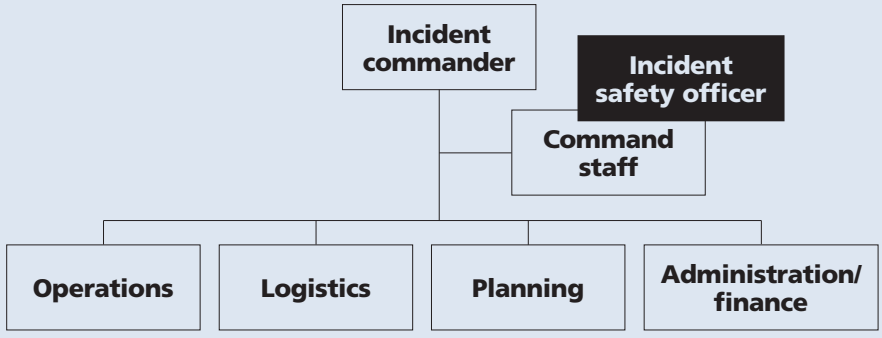
While many issues cannot be abated by traditional policies, those policies are an essential resource. Existing guidance—whether from research organizations, laws, industry guidelines, guidance from previous disaster response efforts, or guidance from similar applications in other industries or countries—can facilitate the process of identifying potential hazards and developing creative methods for avoiding injuries. Ideally, the SH&E professional will be familiar with safety and health requirements in most industries and organizations.

Appreciating and understanding similar safety requirements in other applications is the first step in designing a safety and health code for a nontraditional setting. The SH&E professional must understand the intent or spirit of the conventional law and its application in order to intuitively design a nontraditional application of those conventions to establish hazard controls.

With the concept of operational safety in mind, a policy can be created through a type of reverse job hazard analysis. Similar to proofreading a document by reading it backwards, the reverse job hazard analysis allows the SH&E professional to focus on each task element and anticipate potential risks. The task or operational goal is placed at the beginning and the analysis is defined step-by-step backward toward the employee performing the task. The analysis must consider the worst possible scenario and modify operation methods and hazard controls (above) until the least hazardous condi-

Figure 1

National Incident Command System



Note. *Adapted from* Protecting Emergency Responders *(NIOSH Publication No. 2004-144) (Figure 3.2), by NIOSH, 2004, Washington, DC: Department of Health and Human Services, CDC, Author.*

tion exists while maintaining the same operational outcome. The preliminary methods are then discussed and refined with operational leadership.

When designing new policies, SH&E professionals must gather data concerning the physical, chemical and other hazards in the work environment, then write "virtual" policies, where the safe work practices are developed before the work is performed. Those policies would then be placed into the operational process, personnel would be properly trained and the task would be analyzed for safety practice efficiency. In most cases, the SH&E professional actually designs the methods of operation through the safety practices employed.

The use of administrative controls and PPE are generally paramount in the process. SH&E professionals should not be afraid to introduce significant PPE to the program when the potential hazard involves the unknown. However, such PPE should not be required to such a degree that employees will simply not use it because of extreme discomfort or if its use presents a greater hazard.

When analyzing the virtual policy, one must consider not only its effectiveness from a safety perspective, but also the operational practicality and efficiency of the safety practices. Frequently, an analysis of the process in the field will require some modification of the policy. Similarly, the process must be continually monitored, as the needs for PPE will change as the project evolves. It is during these stages that the initial extensive use of PPE may be adjusted to the most practical level. It is important to remember that no policy will fail faster than one that is difficult to apply or severely impedes operations.

All nontraditional policies must be documented and agreed upon by the relevant entities involved in performing the work. Whether compliance is by contract or a condition of employment, the vehicles of compliance must be clearly defined and accepted. In addition, collaboration with local and federal safety and health authorities is encouraged, even when their jurisdiction does not apply or has been temporarily suspended due to a national emergency. Acceptance of the project's safety and health policies by these authorities provides many important benefits. For example, including OSHA and EPA in the process of designing emergency field procedures lends credibility to those policies and plans, and it avails the project of the knowledge held by national experts.

Lessons Learned: The Author's Experience Following Hurricane Katrina

Challenge: Trucks hauling debris to landfills were prone to rollover, largely because of unstable ground, unleveled loads (loads were often wet and adhered to truck beds) and the weight of materials inside the truck beds, which differed greatly and created uneven weights on areas of the truck bed. Rollovers occurred in transit to the landfills as well as during the dumping process at the landfill.

Correction: The hazard of rollover in transit was controlled through the use of training and administrative controls. Haulers were required to maintain low speeds and avoid sharp turns, and loaders were required to distribute load weights as evenly as possible when placing debris within the truck bed.

The hazard of rollover during dumping at the landfill could not be adequately controlled. Therefore, an administrative control was initiated. It required that two truck bed lengths be maintained between trucks dumping at the landfill, thereby removing personnel and equipment from the hazard zone. This control was maintained through frequent training and the use of flaggers and spotters at the dump sites to control distance between trucks dumping.

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Residential debris, such as that in Orleans Parish, New Orleans, LA, following hurricanes Katrina and Rita had to be hauled to landfills, which created many hazards.

Challenge: The number of safety corrections necessary each day in the beginning of the project were difficult to manage in terms of maintaining a metric for performance and also to put the severity of the deficiencies into perspective for project management. With thousands of personnel on the ground working in many different tasks and disciplines, the number of monitored safe work practices was very high. Project personnel on all levels needed a manageable way to place a hierarchy on safety concerns to better understand risk.

Correction: The project safety team instituted the use of risk assessment codes (RACs) (U.S. Navy, 2002). Each safety hazard was analyzed and placed into a category as follows:

- RAC 1: Critical risk (e.g., electrical, chain saw, other hazards that could cause death or critical injury).
- RAC 2: Serious risk (e.g., climbing on trucks, flagger work practices, ground personnel working too close to heavy equipment, other hazards that could cause serious injury).
- RAC 3: Moderate risk (e.g., failure to wear PPE, equipment in disrepair, other hazards that could cause injury).
- RAC 4: Minor risk (e.g., failure to correct requested deficiencies, failure to use proper temporary traffic control devices, other hazards that could contribute to injury).

With the use of the RAC system, personnel projectwide were able to better understand the type and severity of the deficiencies. Later in the project, these metrics were used for crew safety record evaluation for administrative decisions.

Such collaboration also helps avoid future barriers when traditional authorities assume jurisdiction over the nontraditional environment.

SH&E Programs

In general, the systems needed to protect personnel in the nontraditional work environment are similar to those found in the traditional work environment. Their shared goal is to control hazards, employ safe work practices and reinforce safe work behaviors. The programs require written plans that encompass both the traditional and nontraditional aspects of the tasks, including detailed job hazard analyses (USACE, 2008). In the nontraditional environment, a balance must be achieved between the necessity of the operations and worker safety.

Generally, the sooner SH&E personnel are involved in this process, the better. Ideally, a senior project SH&E professional will be introduced when the incident command system, also known as the National Incident Command System (Figure 1, p. 22), is initiated (NIOSH, 2004b). When SH&E personnel are involved early on, they can begin collecting industrial hygiene and safety data to establish baselines for environmental and worker impact. These data can then be used to design safe work practices that will set the pace for the safety program throughout the project.

Successful nontraditional safety and health programs have included the following elements (OSHA, 2008a-d; NIOSH, 2004a, b):

- defined worksite(s);
- early identification of existing hazards and anticipation of pitfalls;
- detailed site orientation for new employees;
- defining worker roles and maintaining consistent roles for workers day to day;
- microworksites or work zones that designate established operations, tasks and compliance requirements;
- establishment of PPE-free zones where workers can remove PPE, rest, eat and drink;
- a sufficient number of clean restrooms;
- collaboration between operations personnel, SH&E professionals and governmental authorities in designing safety programs and communicating operational needs;
- traffic control plans and established traffic routes, including proximity policies for ground personnel, vehicles, trucks and heavy equipment;
- clearly defined safety policies for each task to be assigned;
- job-specific safety training;
- clearly defined administrative policies concerning safety compliance and performance;
- routine safety compliance audits of each task to establish safety compliance and analyze the practicality and operational efficiency of safety requirements;
- immediate correction of unsafe work practices;
- use of risk assessment codes to properly classify safety hazards and make them easier to understand (Figure 2);
- documentation of safety compliance by risk assessment code for analysis of program compliance;
- routine safety briefings associated with the most common safety compliance challenges;
- investigation and documentation of incidents, injuries and near-hits for expedient administrative and corrective action;

Figure 2

Risk Assessment Code Explanations

1) **Hazard severity.** The hazard severity is an assessment of the worst reasonably expected consequence, defined by degree of injury or occupational illness that is likely to occur as a result of a hazard. Hazard severity is based on the following criteria:

a) Category I - Catastrophic: The hazard may cause death.
b) Category II - Critical: May cause severe injury or severe occupational illness.
c) Category III - Marginal: May cause minor injury or minor occupational illness.
d) Category IV - Negligible: Probably would not affect the safety or health of personnel, yet is a violation of a safety and health regulation applicable to this contract.

2) **Mishap probability.** The mishap probability is the probability that a hazard will result in a mishap, based on an assessment of such factors as location, exposure in terms of cycles or hours of operation and affected population. Mishap probability is based on the following criteria:

a) Subcategory A - Likely to occur immediately;
b) Subcategory B - Probably will occur in time;
c) Subcategory C - Possible to occur in time;
d) Subcategory D - Unlikely to occur.

3) **Risk assessment code (RAC).** RAC is an expression of risk that combines the elements of hazard severity and mishap probability. Using the matrix below, the RAC is expressed as a single Arabic number that can be used to help determine hazard priorities.

MP \ HS	A	B	C	D	RAC Codes
I	1	1	2	3	1 - Critical
II	1	2	3	4	2 - Serious
III	2	3	4	4	3 - Moderate
IV	3	4	4	4	4 - Minor or Procedural

MP – Mishap Probability
HS – Hazard Severity

Note. *Adapted from* Hazard Abatement Processing and Tracking. Navy Occupational Safety and Health Program Manual *(Chapter 12, Section 1202), by U.S. Navy, 2002, Washington, DC: Department of Defense, Author.*

• frequent communication between safety and operational personnel concerning each incident of concern (e.g., safety corrections, security concerns, identified hazards);

• empowering SH&E professionals, supervisors and quality control personnel with authority for program implementation and enforcement, and identifying them through signage or color coding on safety vests or hardhats so that they are easily recognizable to workers;

• where multiple SH&E consulting firms are operating on the site, project leaders establish source for the development of projectwide safety policies and implement policies with a unified top-down approach.

Policies and programs must be applied consistently and well communicated throughout the worksite. For example, the uses and applications of various types of PPE for different tasks can be confusing if not clearly defined, understood and followed equally by all personnel on the jobsite. Defining work zones where PPE is required can help delineate policy requirements.

Ideally, policy designers—who are the project leaders of both the safety and operations branches of the worksites—will remain involved in the process on a daily basis for the project's duration. This consistent leadership ensures a continuity of policy, practice and enforcement. As new jobs and new safety policies are introduced, communication, repetition and the continual presence of SH&E professionals are among the key elements of success.

Employees & Safety

Employees in the nontraditional work environment differ from traditional workplace employees in many ways. They face significant physical, emotional and psychological stressors. They work in difficult surroundings, often for many hours with few days off, and they must perform work that is labor-intensive, unique to the worker and stressful. In addition to learning new tasks in such an environment, personnel are learning new safe work practices and wearing PPE to which they are unaccustomed.

In this environment, it can be difficult to distinguish between compliance-avoidance behavior and a flaw in the task's safety design. Therefore, supervisors and SH&E personnel must continually monitor employees for special issues such as signs of fatigue, heat or cold stress, repetitive motion injuries and proper fit (and the need for) PPE. When new safety policies are introduced, those policies must be communicated repeatedly and through different modes, such as briefings, safety stand-downs and toolbox meetings.

Safety stand-downs—during which project operations stop until a projectwide safety briefing can be held—should be used only when a severe incident has occurred or is considered imminent due to recognized trends in operations or unsafe work behaviors. During emergency or other high-stress nontraditional activities (e.g., rescue stage of operations), employees must be repeatedly guided toward safe work practices because in these situations people are typically focused on operations.

ANDREA BOOHER/FEMA

Providing basic provisions, such as food and water, sleeping quarters, and bathing and sanitary facilities, is critical in a nontraditional work environment.

The nontraditional work environment will also present conditions rarely found in traditional work environments. These include the need for food and water, sleeping quarters, bathing facilities and sanitary facilities. Therefore, SH&E professionals must at times focus on these fundamental human needs. Providing basic provisions or access to them is critical. SH&E personnel should also consider the emotional health of workers during rescue-and-recovery operations, training workers and supervisors to recognize the signs of significant fatigue, posttraumatic stress disorder and other stress-induced conditions.

Additionally, training must be reinforced daily, which includes immediately correcting unsafe work behaviors and holding regular safety briefings to reiterate information covered during employee orientation and job-specific training. As the project evolves, changes to safe work practices must be repeatedly communicated to personnel as well.

Employees should be included in the creation of the emergency field procedures. They can provide valuable input on a task's operational challenges and how safety procedures may affect the overall efficiency of the process. Ultimately, the workers determine the success of the program, so collaboration with the workforce should be a goal of SH&E personnel.

Safety Compliance & Enforcement

Compliance is often viewed primarily as a way to avoid legal and administrative penalties, so it may be easy to lose sight of its real purpose. Instead, compliance must be viewed as critical to avoiding injury.

In the nontraditional environment, SH&E professionals must take a more active role in solutions. If the goal of the operation is a part of the professionals' domain, so too is the task of ensuring compliance. During a disaster response, SH&E professionals are not just consultants, they are also problem solvers. To succeed, they cannot be hindered by traditional concepts that safety is the responsibility of the employer and they cannot be viewed as the enemy. During the rescue and recovery phases of an operation, compliance is sought by any means necessary—even if that includes following workers around the jobsite distributing PPE and providing one-on-one retraining in safe work behaviors.

When the operation transitions to a cleanup effort, the level of urgency is tempered and the program

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Receding flood waters following hurricanes Katrina and Rita left a great amount of debris and residual solids throughout Orleans Parish in New Orleans.

assumes a more organized routine. While the risks remain, the processes surrounding them can be better controlled due to a slower, more structured pace. When well-defined policies are in place, approved and accepted by each employer, job hazard analyses have been evaluated in practice and refined for the most efficient and operationally effective practices (USACE, 2008), training and retraining has been provided to program personnel, then administrative enforcement is the necessary next step.

No safety program is complete or effective without enforcement. Enforcement is not only a means of gaining compliance, but it is also a necessary component of a safety program that aims to reduce the injury rate. If the goal of enforcement is to influence compliance and avoid injuries, then it should take on many forms and be accomplished through multiple techniques.

Enforcement practices in the field are not just for the purpose of documenting deficiencies, they should also be used to correct unsafe work behaviors. Optimal enforcement in the nontraditional work environment may include the following (NIOSH, 2004a; b):

- regular patrols of the worksite by SH&E personnel to collaborate with workers and supervisors to resolve emerging hazards;
- enforcement of safety requirements at and by all levels and branches of the project (e.g., operations personnel enforcing safety regulations);
- documentation of safety corrections made by SH&E personnel in the field (on the spot);
- communication of corrected deficiencies to worksite supervisors at the time of the correction;
- written enforcement policies using risk assessment codes that are clearly understood by personnel;
- focus on the number of safety corrections rather than the number of safety deficiencies (information that can be used to determine the practicality of a safety requirement);
- employer initiated disciplinary action for recidivist noncompliance (where retraining and other administrative actions have been ineffective).

SH&E professionals in the nontraditional work environment should not have a direct role in disciplinary action in response to noncompliance, and such actions should be used by employers only after other enforcement methods fail.

Conclusion

This discussion has only touched on some elements of nontraditional work environments, which are becoming more commonplace. These environments range from personnel working in the aftermath of disasters to emergency operations performed by fire protection and law enforcement personnel, from military personnel working in a war zone to emergency medical and rescue personnel working in the field. They also include work performed in personal residences (that of employees or the general public) or in industrial environments not owned or operated by their employers. SH&E professionals in these environments must redefine their ideals and methodologies, as well as their concepts of risk management and perceived outcomes of hazards. In essence, they are using "raw safety" and making a transition from concrete to abstract thinking. Through operational safety, the safety and health professional becomes part of the team—no one makes decisions alone.

In both traditional and nontraditional work environments, SH&E personnel must interject themselves into the process. They must bridge the gap between worker safety and meeting operational goals. SH&E professionals must strive to be an integral resource to help employers meet operational goals wisely. Regardless of the work environment, it remains the responsibility of SH&E professionals to adapt and seek innovative ways to protect the most significant aspect of any mission and the most valuable resource of any operation—those performing the work. ■

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