

## **Techniques for Hazard Recognition**

**David F. Coble, MS, CSP  
President  
Coble, Taylor & Jones Safety Associates  
Cary, NC**

Even within organizations with the best of safety and health management systems, both the line organization and safety and health professionals can overlook hazards. Therefore, effective techniques must be used to recognize potential hazards so that controls can be implemented to prevent unwanted events such as injury, illness, and property damage. There are many hazard recognition techniques, and almost all organizations need to use varied and different techniques in order to be more assured that hazards are recognized.

### **When Can Hazards Be Recognized?**

There are three opportunities to recognize hazards.

1. **Before Exposure to the Hazard:** The hazard should be recognized in the planning, design and preparation phase. This is the best time to recognize potential hazards because at this point, no one has been exposed to any hazards. There should be adequate time allowed to review the upcoming job and determine what hazards may be presented.
2. **During Exposure to the Potential Hazards:** After the job, task, or operation has started, hazards can be found preferably before an unwanted event occurs.
3. **After Exposure to the Hazard Ceases:** After exposure has occurred, recognition may be the result of an incident such as an injury or illness, or could be the result of a critique or review of the task or job just performed. This phase also includes review of work permits, policies and procedures, and debriefing of the individuals that took part in the job.

To be effective, multiple techniques may be required to be used simultaneously or back-to-back to find hazards. Many hazard recognition techniques are useful when applied at all three of these opportunities. The key objective for every organization is to implement enough techniques at all phases of the operation to find and control hazards.

### **Effective Hazard Recognition Techniques**

During the past 30 years as a safety professional, I have used a variety of techniques in many different locations and many different types of entities including manufacturing, service

organizations, construction sites, migrant labor camps, shipyards, public sector agencies, aviation and maritime. The following paragraphs list the most useful hazard recognition techniques, advantages, and examples of how the technique can be used and how to use that technique. This list is not in any particular order.

1. *Multi-Step Planning Process:* This technique is intended to be used before exposure to the hazard. Every task, every job, every activity needs to be planned and organized. To do that job, task or activity safely, a simple, short multi-step question process will cause the employee to stop and consider the hazards and controls. Some employers even put these questions on a wallet card, the back of the employee's ID, or on a sticker for the toolbox or hardhat (If you want to put a sticker on a hardhat, follow the hardhat manufacturer's requirements for applying adhesives to a hardhat.). Most multi-step planning processes have 4 or 5 questions or steps that the individual or work group needs to ask. The steps should be similar to:
  - What am I about to do?
  - What do I need to do this job and how will I do it?
  - How could I get hurt?
  - What am I going to do to prevent injury?
  
2. *Pre-Use Analyses:* This technique is intended to be used before exposure to the hazard. Pre-use analyses can be applied to new personal protective equipment, a new industrial hygiene sampling device, a new tool or piece of equipment. For example, a pre-use analysis has helped an organization discover that the new plano safety glasses for visitors did not have an ANSI Z87 approval. In another case, a company learned that a new environmental sampling device was not intrinsically safe. In a third example, a manufacturing plant learned that the purchasing folks had bought rolling ladder stands that did not have adequate guardrails. Before any new equipment, device, protective equipment, etc. is put into use, someone qualified should conduct a pre-use analysis.
  
3. *Blueprint Reviews:* This technique is intended to be used before construction starts and during construction as well. How many times have I seen retrofits or remodeling needed on structures and buildings because they were designed wrong! Examples include inadequate numbers of exits or the exits are not placed remote from one another, the location where the maintenance folks must be located to work on equipment puts them at the edge of the roof and no guard rails are installed, and the eyewash is installed several hundred feet from where the hazardous chemicals are used. With virtual computer-design plans, this process has even gotten to be more effective. The safety and health staff should review the drawings before the construction starts.
  
4. *Work Permitting:* This technique is intended to be used before the task or job begins. Issuing a written permit or approval document to perform all but the most routine tasks will require the workers to go through a checklist to ensure that hazards have not been overlooked. Some organizations have multiple work permits for different activities but it is also quite effective to have a single work permit that will cover hot work, vessel entry, excavations, overhead work, working alone, lockout/tagout, etc. A technique for finding hazards after the exposure occurs is for permits to be reviewed periodically to look for additional missed hazards, oversights, and procedural errors.

5. *Safety and Health Management System Reviews:* This technique can be used before exposure, during exposure and after exposure has occurred. Because the vast majority of injuries and illnesses are the result of failures in the safety and health management systems, those systems need to be reviewed. The best practice is to conduct routine (annual) audits of the management systems. These audits should uncover failures in training, inspections, policies, medical surveillance, etc. These failures ultimately lead to hazards and unwanted events.
6. *Equipment Inspections:* This technique is intended to be used before equipment is used on a particular work shift. OSHA has nearly 100 inspection requirements such as for slings, cranes, respirators, forklifts, machine guarding, grinding stones, etc. There are many more equipment inspections that OSHA does not specifically address such as eyewashes, machine emergency stops, etc. that should also occur. To do these inspections, the inspections must be planned and organized and those who do the inspections must be adequately trained. These inspections and training increase hazard awareness as well as find potential hazards before the equipment is used.
7. *The Ten-Second Drill:* This technique is intended to be used during exposure to the potential hazards. This technique is also known as the Observation Technique. The purpose of this technique is to give the auditor a snapshot of what is really occurring in a work area. The auditor steps into a work area and plants his/her feet and looks immediately at what the people in the work area are doing. The auditor watches the people for 10 seconds or so. This is enough time to determine if the machine guards are in place, if personal protective equipment is being worn, if powered industrial truck seatbelts are being used, etc. If this equipment is not being used, the hazards are obvious. Steps can be taken to improve the management systems so that employees do their jobs right all the time.
8. *Effect Mapping:* This technique can be used anytime, but should be used before a task or operation begins. It is also known as Risk Mapping. It involves drawing out on a map of the entire work site, and including surrounding areas if necessary, the operations that are occurring and the hazards that each generate. Then, synergistic or causal effects of one operation impacting another operation are considered. For example, arc welding in an area where flammable vapors can be carried by prevailing winds into the welding area can produce deadly fires and explosions. Unless the impact of one operation on an adjacent operation, or even an operation with separation, is studied, these hazards can be overlooked. The placement of administrative staff adjacent to areas that have vibration and excessive noise is another example.
9. *Out-of-View Audits:* This technique can be used during exposures to potential hazards. It is fairly easy to walk through a work area and take a quick look at the obvious, in-plain-view items and find potential hazards. However, many hazards are behind closed closet or electrical panel doors, in drawers and toolboxes, behind and under desks and cabinets, and otherwise just not in plain sight. Take the time to talk to the employees and ask if you can look behind doors, in drawers, under desks, and inside of homemade boxes, etc. The employees in the area are exposed to these hazards and they need to be found and corrected. For example, I find missing circuit breakers in electrical panels frequently. In

another example, I opened a shop made wooden cabinet in a maintenance shop and found a “hot box” for heating lunches. The electrical wiring was improper and food was being stored with glue that needed to be kept warm.

10. Employee Suggestion Methods: This technique can be useful any time. I have found over the years that the employees out on the floor or in the field are quite perceptive in recognizing hazards even if training and education have been insufficient. As I stated earlier, many hazards are overlooked, but certainly not all. Employees need two methods to be able to report hazards. First, they need a formal policy to report a hazard so that they get recognition for reporting the potential hazard and can be informed of the outcome of their concern. Second, some employees prefer to report a hazard anonymously. A suggestion box is a good technique to keep the suggestions anonymous and still have a method for responding to the concerns by posting the concern and the response on an adjacent bulletin board. I understand that some suggestions are simply whining and griping. But you will also find legitimate hazards that could go undetected otherwise.
11. Industrial Hygiene Surveys: This technique is normally useful after the operation begins. The industrial hygienist will use other techniques to recognize hazards before exposure such as new chemical reviews, material safety data sheet reviews, historical sampling data reviews, etc. The industrial hygienist will probably want to know the employee’s typical exposure and the worst-case exposure to the contaminant. In some cases, air monitoring for a suspected or known contaminant can uncover exposure to a contaminant that was not known to be present.
12. Hazard Operability Studies: This technique can be used anytime. Sometimes, these studies or reviews are called HAZOP’s, What-If Reviews, process analyses, and other names. In many cases, OSHA and EPA require these studies for some chemical processes. Every chemical process would benefit from this type of review. The purpose of this review is to prevent or minimize the consequences of catastrophic releases of toxic, reactive, flammable and explosive chemicals by identifying improper procedures, equipment, employee training, management systems, and maintenance. For example, during the study, you may find that galvanized piping has been used for a chemical that is highly reactive to galvanized piping.
13. Walkthrough Safety and Health Audits: This technique is normally used during operations when hazards may exist. The purpose of this technique is to observe work as it takes place, have an opportunity to talk with the employees who may be exposed to the hazard, and learn how the safety and health systems interact with the other management systems such as production, quality, and cost control. You may see the shortcuts that have been learned, the lack of accountability to follow safety policies, unintentional incorrect use of respirators, unsafe work practices, and unsafe conditions. This technique is widely used but can be highly ineffective unless the personnel conducting the walkthrough audit have received adequate training and education about safe practices and conditions.
14. Incident Analysis: This technique is used after exposure to the hazard has occurred and an unwanted event, such as an injury, illness, near hit, or property damage resulted. It is

also called Accident Investigation. For this technique to be truly effective, a thorough root cause analysis should be conducted. All unwanted events have multiple causes. Too often, the incident is written up as “The employee was careless.” People get hurt at work primarily because of failures in the safety and health management systems. In order to prevent the recurrence of the unwanted event, all failures must be found. The eight cornerstones of why incidents occur and the eight cornerstones that must be analyzed to get at the root causes are: 1. Ineffective management leadership, 2. Inadequate employee involvement in the safety part of their job, 3. Inadequate rules and procedures, 4. Inadequate training and education, 5. Failing to adequately match an employee’s skills and the required tasks, 6. Failing to recognize hazards, 7. Failing to adequately control hazards, and 8. Poor purchasing practices (purchasing unsafe equipment, tools, etc.) A root cause analysis, including such methods as Fault Tree Analysis, Multiple Whys, TapRoot®, and others will help to keep the unwanted event from recurring.

15. Perception Surveys: This technique can be used anytime. Every organization has three safety and health management systems: 1. The one you have written in your safety manual. Many of you have very detailed policies and procedures for safety and health. 2. The one you think you have in the field. You know that not every single item in the safety and health policies manual is being done or followed to the letter, but you have a good idea of how well the activities follow the prescribed systems. And, 3. The one you really have in the field – what is really going on. Perception surveys will tell you what employees really think about safety, work practices, risk acceptance, management leadership and more. You learn about hazards that are occurring through ignorance, shortcuts, miscommunication, and nonchalance. Conduct a survey every two years for a while and see if there is improvement. The goal is to get all three safety and health systems the same!
16. Management of Change: This technique is most useful after a process, piece of equipment, or machine has been placed in service and changes need to be made. Whenever any changes are made, with the usual exception of “changes in kind,” a new hazard can be introduced: the wrong valve, the wrong type of metal in the piping, the wrong circuit breaker, the wrong gloves, the wrong ladder. Analyze each change for what could happen.
17. Key Questions: This technique is used most often during walkthrough audits while there is exposure to potential hazards. One does not need to be a safety professional or expert in hazards to begin the recognition process. There is a key question that any one can ask: “Is there anything different?” The auditor should look for differences in the working environment based on that auditor’s training, education, life experiences, and expectations based on the rest of the work place. For example, if there are ten machines of the same type in a row and one of the machines has an open cover that the other nine machines do not, that is a difference. The auditor may not know if that open cover presents a hazard or not. But there is something different. Based on this observation, the auditor should ask others who will know if the open cover presents a hazard. There is a second key question primarily intended for supervisors and managers: “If someone gets hurt due to that condition, would I change anything? If I would change that condition after someone gets hurt, why don’t I change it now before someone gets hurt?” This

question forces management to determine if conditions are acceptable risks or unacceptable risks. If no changes would be made should someone be injured, then the condition is an acceptable risk. But if an honest assessment would result in a change after someone is injured, then management is, in effect, stating that a hazard exists and changes are needed now.

18. *Job Hazard Analysis*: This technique is used primarily when the job is being conducted and there is exposure to potential hazards. This technique is also called job safety analysis, job safety and health analysis, and other names. When using this technique, the auditor lists each major step required to perform a particular task. Beside each step, the auditor lists the hazards that are present when performing that step in the task. Then, in the third column, the auditor lists the potential control measures for each hazard noted. You will find very thorough guidance for using this technique in the National Safety Council's *Accident Prevention Manual, Administration and Programs*, 12<sup>th</sup> Edition, pages 173 through 179.

## Steps to Take to Manage Hazard Recognition

Since every organization needs multiple hazard recognition techniques to be reasonably assured that most hazards will be detected and controlled before unwanted events occur, this system needs to be managed. There must be planning, coordination, leadership and control. There are five steps to take to set up this management system.

1. Prepare a list that includes all of the known hazard recognition techniques used at your organization. Start with the techniques described in this paper, and add other techniques as you learn that they are being used. On this list, try to give an example of how the technique is used, who uses the technique, and any time frame in which the technique may be used.
2. Using walkthrough observations, employee interviews, incident reports, near hit reports, the OSHA 300 and other medical records, and your own knowledge of the work site, determine if there is a technique available that is likely to identify and analyze the potential hazards for each task, each job, each operation. For example, at one plant that I visited, we found that there was no technique for the placement of new electrically operated equipment. Specifically, the plant bought a general purpose electrically operated water cooler and installed that water cooler in a Class I, Division 2 location (where the presence of flammable vapors is possible.)
3. Determine who uses that hazard recognition technique and then assure that adequate training and education has been provided so that the technique is used properly. The OSHA 10-hour and 30-hour courses are good sources of training.
4. Implement a system to record or document all observed hazards found during the use of any of your techniques and then track the resolution of each hazard found. This documentation helps to manage hazard recognition and control, helps to evaluate the severity and priority of each hazard, and provides a method to give employees feedback on hazard control. The typical method used to track hazards is a simple spreadsheet on a computer that anyone at the location can access and read (but not change). Only those who have authority to update the spreadsheet should be making changes. Columns in the spreadsheet should include: Date of Hazard Finding, Location of Hazard, Finding,

Resolution of Hazard Assigned To, Corrective Action Taken, and Date of Corrective Action or Resolution. You can also add a column for the Target Date to Resolve the Hazard.

5. Assure that the hazard recognition management system is audited annually, just as qualified personnel should audit all other safety and health management systems annually.

## **Summary**

There are numerous hazard recognition techniques available. Every organization needs a variety of techniques to be able to find the different hazards that are present to be able to evaluate the severity and probability of an unwanted event occurring. The hazard recognition system must be properly managed through planning, organization, leadership and control. This system must be periodically audited to recognize deficiencies and needed improvements.

Think about this: How bad can someone be injured at your work site? They could die, couldn't they? Your employees deserve the best hazard recognition management system that you can provide.