Safety Management for Utilities

Seventh Edition
Job Safety Analysis

Jerry Criscito

Workers are injured or killed at workplaces across North America every day. Accidents can mean both human loss and financial loss to the employer and the employee. How can these losses be minimized? The best way to prevent losses caused by accidents and occupational illness is to develop a solid, working program for accident prevention. Systematically looking at workplace operations, establishing proper job procedures, and ensuring all employees are properly trained can help prevent workplace injuries and illnesses.

As a part of an effective Health, Safety, and Environment (HSE) program, a Job Safety Analysis (JSA) has proved to be an effective accident and occupational illness prevention tool in many industries. The JSA, also known as a Job Hazard Analysis (JHA), is a safety management tool in which the risks or hazards of a specific job in the workplace are identified and measures to eliminate or control those hazards are determined and implemented. Most safety programs are considered reactive, an action in response to an incident. A JSA is considered a proactive approach to workplace safety. A JSA is a process of systematically evaluating certain jobs, identifying the hazards or potential hazard associated with each step of the job, and finding effective control measures to eliminate or reduce the risk of hazards and make the workplace as safe as possible, before those hazards have a chance to become accidents.

The Occupational Safety and Health Administration (OSHA) defines a JSA as a means of “carefully studying and recording each step of a job, identifying existing or potential job hazards and determining the best way to perform the job to reduce or eliminate these hazards.”
JSAs are a valuable tool for water utilities that have a commitment to reduce and prevent accidents and illnesses on the job. Developing and implementing safe job procedures, and training employees to work properly to prevent accidents, are actions that are likely to result in fewer worker injuries and illnesses, reduced workers’ legal claims, more-effective work methods, and increased productivity.

JSAs play an important role in effectively managing HSE programs. This chapter provides a guideline for how JSAs can be used, prepared, and implemented. Key terms for understanding the function of a JSA are as follows:

A **hazard** is a potential for harm. If left uncontrolled, a hazard could result in injury or harm. A hazard can be a physical object, chemical, noise, radiation, extreme heat or cold, electrical energy, or anything else that has the potential to cause harm.

An **accident** is an unintended occurrence that may result in injury, loss, or damage. As soon as people are involved, a hazard may cause an accident. Someone slipping in an oil spill would be an accident.

An **injury** is the result of an accident. A sprained wrist or broken arm from a fall would be an injury.

A hammer balanced on a windowsill is a hazard. Knocking the hammer off the sill is an accident. The hammer striking someone and causing a cut or laceration is an injury.

**ADVANTAGES OF A JSA**

The JSA is used to determine physical, procedural, and/or environmental hazards that do or could exist. JSAs also identify actions of personnel that could result in accidents or injuries and preventive measures that would eliminate or control hazards so a job can be performed safely.

The JSA not only helps supervisors and employees become aware of hazards on the job; it also has many other uses as well. A JSA may be used

- To determine specific training or skill development an employee should receive
- As a basis for inspection
- As an informational tool for accident investigations
- As part of a continuing communication program on employee health and safety awareness

A JSA is especially helpful as a training tool, because this tool provides an organized system for training both new and existing employees. Once a JSA has been prepared for a specific job, training new employees on that job will become more consistent. The entire job procedure does not have to be redeveloped every time an employee is to be trained or retrained. With a thorough JSA as a guide, all the steps of the process are identified and won’t be overlooked during the training. The JSA also provides a basis for documentation of ongoing employee safety training. Training sessions with workers can be periodically conducted using the JSA to reinforce how to safely conduct a job.

A JSA can be of great value to the person investigating an accident. By reviewing the process and understanding the hazard, controls, job steps, and safe practices that have already been defined and implemented, accident investigators can gain valuable insight leading to a better accident investigation. The actions of the employee can be compared to the recommended job actions in the JSA to determine if the employee was performing the job properly. The investigator should also consider whether the JSA itself was correct and if any possible hazards are missing from the JSA that might have led to the accident in question.
JSAs may also help supervisors learn about the various jobs their workers perform. If the supervisors have not actually performed a specific job themselves, the JSA can guide them through process of that job. Because the JSA identifies what is involved in each job, step by step, the supervisor can learn in detail about each of the individual jobs they supervise.

**JSA DEVELOPMENT**

All jobs in an organization have common elements. They all require people performing at their best level of productivity, producing goods and services in a safe and efficient manner. Helping do that is what the JSA is all about.

Often, employers, foremen, supervisors, and safety professionals conduct JSAs that are subsequently reviewed by workers who perform the job. At other times, workers may discover a task on the job site that does not have a written JSA, and may conduct their own JSA on the job site before beginning the task. This worker-produced JSA should be documented for review by the safety manager and the supervisor.

**Preparing for a JSA**

- Review company accident history. Review with employees the worksite’s history of accidents, losses that required repair or replacement, and any “near misses”—events in which an accident or loss did not occur, but could have. These events are indicators that the existing hazard controls (if any) may not be adequate and deserve more examination.

- Involve company employees. Involving employees in the initial job hazard ranking of all jobs that are being considered for having JSAs completed on them, and the development and review of JSAs, creates buy-in and provides the whole-picture view. The people who do a job have a unique understanding of the realities of the job, and this knowledge is invaluable for identifying hazards as well as effective and workable control measures. Involving employees helps minimize oversights, ensures a quality analysis, and gets workers to buy in to the solutions because they will share ownership in their HSE program.

- Conduct a preliminary job review. Discuss with employees the hazards they know exist in their current work and surroundings. Brainstorm with them for ideas to eliminate or control those hazards. If any hazards exist that pose an immediate danger to the workers’ life or health, take immediate action to protect the workers.

- Any problems that can be corrected easily should be corrected as soon as possible. Do not wait to complete a JSA before correcting serious hazards. This will demonstrate a commitment to safety and health and clear the way for identifying all hazards that present unacceptable risks and evaluating types of hazard controls.

Development of a JSA is not a one-time activity, it’s a process. JSAs need to be developed properly with solid input from those familiar with the job in question, identified control measures must be agreed upon and implemented effectively, and affected workers and supervisors must be trained on the information contain in the JSA.

Additionally, JSAs should be seen as living documents. Keeping JSAs up to date may sound like a lot of extra work, but changes are not needed frequently. A company’s safety program should have a system for regularly reviewing and updating JSAs. If a situation, a job environment, or anything else changes, the change must be reflected on the JSA as quickly as possible. If the JSA is changed or revised, everyone concerned with the job should be informed of the changes and instructed in the new procedure.
When should supervisors review a JSA for possible updating? A JSA should be reviewed when an accident occurs on a job covered by the document. In this case, review the JSA to decide whether it needs revision. Check the JSA to see if the accident occurred because the JSA was not followed, or if the accident occurred because something was basically wrong with the job procedure or the analysis, or if a hazard existed that had not previously been recognized or eliminated.

When conditions change, such as job requirements, site conditions, manpower, or equipment operations, it is important to stop and reanalyze the job for potential new hazards created by these changes. New controlling measures should be put in place to eliminate or minimize the new hazard. If new controls cannot be implemented to reduce the hazard to an acceptable risk level, new engineering and administrative controls may need to be devised by job supervisors before work is resumed.

**Writing the JSA: Three Basic Steps**

There are three basic steps in writing the JSA:

1. Each job is broken down into a sequence of steps. Each step describes the actions of the job as that job is performed.
2. Each step is examined to identify and define hazards, i.e., actions, conditions, possibilities, that could lead to an accident.
3. Recommended actions or procedures are determined for each hazard. The JSA becomes a guideline for what actions are necessary to eliminate or minimize the hazards that could lead to an accident or injury.

**Step 1: List job tasks.** Nearly every job can be broken down into job tasks or steps. Outline those sequential steps that it takes to carry out the job. Begin a job safety analysis by watching the employee perform the job and listing each step as it is performed (Figure 2-1). Be sure to record enough information to describe each action without getting overly detailed. Avoid breaking down the steps in such detail that it becomes unnecessarily long or so broad that it does not include basic steps. It may be valuable to get input from other workers who have performed the same job. Later, review the job steps with the employee to ensure everything significant is included.
Point out that the analysis is done to understand the sequence of steps that it takes to conduct the job and is not an evaluation of the employee’s job performance. Include the employee in all phases of the analysis—from reviewing the job steps and procedures to discussing uncontrolled hazards and recommended solutions. Be sure to document the findings in order to create a written record of the JSA.

Sometimes it may be helpful to photograph or videotape the worker performing the job or to photograph the work equipment and work environment. These visual records can be handy references when doing a more detailed analysis of the work. Management and workers may also find it useful to assign a probability and severity ranking to each hazard in the job, noting how likely or probable it is that the hazard will occur, and the severity of the consequences should it occur.

**Step 2: Look for hazards.** Once the basic steps of the job have been recorded, the next step is to identify the potential hazards associated with each step. Consider talking with employees who have performed the job for several years, as they usually have a wealth of information and will be able to describe injuries or near misses they have had conducting the job, or injuries coworkers have experienced.

Don’t just look for obvious hazards like a pallet leaning against the wall in an aisle. Look at the total environment. Some potential hazards are not obvious. Always consider the possibility of debris or other obstructions in aisles even if nothing is there at the time the JSA is developed. In order to consider the entire work environment, ask the following questions:

- What can go wrong?
- What are the consequences?
- How could the hazard arise?
- What are other contributing factors?
- How likely is it that the hazard will occur?

Document the answers to these questions in a consistent manner. Describing a hazard in this way helps ensure that efforts to eliminate the hazard and implement hazard controls target the most important contributors to the hazard. Probe for details regarding the job steps and the work involved in doing the job: How often does the job need to be done (e.g., daily, weekly, annually)? How often is each step of the job carried out (e.g., per shift, per hour)? How heavy is equipment that is lifted, pushed, or pulled?

Good hazard scenarios describe
- Where it is happening (environment)
- To whom or what it is happening (exposure)
- What precipitates the hazard (trigger)
- The outcome that would occur should it happen (consequence)
- Any other contributing factors

The purpose of the JSA is to identify all hazards—both those produced by the environment or workplace conditions and those connected with the job procedure. Examine each step carefully from both perspectives to find and identify hazards (Table 2-1).

Practical questions to ask that will help identify potential hazards include these:

- Can any body part get caught in or between two objects?
- Do tools, machines, or equipment present any hazards?
- Can the worker make harmful contact with moving objects?
- Can the worker slip, trip, or fall?
• Can the worker suffer strain from lifting, pushing, or pulling?
• Is the worker exposed to extreme heat or cold?
• Is excessive noise or vibration a problem?
• Is there a danger from falling objects?
• Is excessive brightness or poor visibility a problem?
• Can weather conditions affect safety?
• Is harmful radiation a possibility?
• Can contact be made with hot, toxic, or caustic substances?
• Are there dust particles, fumes, mists, or vapors in the air?
• Can the worker make plant, insect, or animal contact?
• Can any foreign object contact the eyes?

A material safety data sheet (MSDS) is a good resource for assessing chemical hazards. An MSDS is a written document that outlines information and procedures for handling and working with chemicals. MSDS documents contain physical and chemical property information, potential hazard information, emergency procedures, and manufacturer contact information.

Recent changes to the OSHA Hazard Communication Standard require that MSDS transition to safety data sheets (SDS). The difference is that an SDS is constructed and formatted to conform to the globally harmonized system (GHS), which mandates all SDSs have 16 standardized sections arranged in a strict order. Manufacturers are required to produce the MSDS/SDS and, along with distributors, are required to provide them to purchasers of their products.

**Step 3: Recommended controls and actions.** Once the basic steps of the job and potential hazards associated with each step have been recorded, the final step in conducting the JSA is to determine ways to eliminate or control the identified hazards. A control measure is anything that will help to control the hazard by either preventing it from occurring or minimizing its impact if it does occur. If a hazard cannot be eliminated, steps should be taken so the consequences of the hazard are as low as reasonably practical in order to protect workers and the public.
When evaluating options for corrective measures, consider the hierarchy of controls:

- Elimination
- Substitution
- Engineering
- Administrative
- Personal protective equipment

As shown in Figure 2-2, progressing down the hierarchy results in reduced effectiveness. According to the Centers for Disease Control and Prevention, which developed the hierarchy, “The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced” (CDC 2010).

Elimination of the hazard altogether is the most effective control measure to reduce risk. By adopting the Planning through Design (PtD) methodology described in chapter 4, many hazards can be eliminated or designed out of a system. For example, human interaction with potentially hazardous machinery or equipment can be reduced by automating certain processes. Similarly, the design team or operations and maintenance (O&M) staff can opt for an appropriate material or process substitution that is less hazardous. It’s important to equally assess the substituted material or process for any risks it may pose.

Where elimination or substitution controls are not practical, the next strategy is to control the hazard at its source. Engineered controls do this, unlike controls that generally focus on the employee exposure to the hazard. The basic concept behind engineered controls is that, to the extent feasible, the work environment and the job itself are designed to eliminate hazards or reduce exposure to hazards. Engineered controls can be simple in some cases. They are based on the following principles:

- If feasible, design the facility, equipment, or process to remove the hazard or substitute something that is not hazardous.

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*Centers for Disease Control and Prevention.*

**Figure 2-2** Hierarchy of controls. Apply the highest level of control commensurate with the risk level.
• If removal is not feasible, enclose the hazard to prevent exposure during normal operations.
• Where an enclosure is not feasible, establish barriers or local ventilation to reduce exposure to the hazard during normal operations.

If engineered controls are not feasible, administrative controls should be considered. Administrative controls include safe work practices, such as the utility’s general workplace rules, standard operating procedures, or other operation-specific regulations. For example, even when a hazard is enclosed, exposure can occur during maintenance of the enclosed equipment. Through established safe work practices that incorporate additional protective measures when conducting maintenance operations, employee exposure to hazards can be further reduced. Administrative control measures also include additional relief workers, exercise breaks, and rotation of workers. These types of control are normally used in conjunction with other controls that more directly prevent or control exposure to the hazard.

When exposure to hazards cannot be engineered out of normal operations or maintenance work, and when safer work practices and other forms of administrative controls cannot provide sufficient additional protection, a supplementary method of control is the use of protective clothing or equipment. This is collectively called personal protective equipment (PPE).

While PPE (Figure 2-3) seems to be the most common form of protection and in some cases is mandated by law, it should be considered a last line of protection and always used in conjunction with engineered and administrative controls. PPE may also be appropriate for controlling hazards while engineered and work practice controls are being installed.

Note that one of the major weaknesses of PPE is the inconsistency of its effectiveness. This is primarily due to improper fit and application, both of which can be hard to monitor on a routine basis.

As with Steps 1 and 2, document all the specific steps that need be done to correct or mitigate the identified hazards. Specify exactly what is to be done to correct the hazard, then take action to make those corrections. Using the JSA as a roadmap, follow through regularly to ensure that precautions are in place and new procedures are being followed. If new techniques for doing a job are required, provide training to affected employees.

Figure 2-3  Personal protective equipment
The JSA can also be an effective means of uncovering health hazards in a job operation. The job could be contributing to a medical problem that otherwise might not become known for a long time. Examples are things like deterioration of the lower back, loss of hearing or loss of sight, chemical overexposure, or some other occupational disease.

These health problems are not visible or as dramatic as accidents because they usually don’t happen all of a sudden. Nevertheless, they are extremely costly to the company and are a serious detriment to employee health. Many health hazards have to be assessed through measurements conducted by an industrial hygienist or other qualified individual. If a potential health hazard exists, it’s important to determine the actual situation so appropriate steps can be taken to eliminate or control the hazard.

**Challenges**

Significant pitfalls are possible in developing JSAs that could result in a safety program being less effective than it might otherwise be. Common pitfalls include

- Not listing all hazards
- Listing hazards but taking no action
- Listing nonspecific action and recommendations
- Failing to involve all levels of staff
- Failing to update JSAs when changes occur
- Failing to train and retrain staff on JSAs

It may be impractical to develop JSAs for the hundreds or thousands of maintenance jobs that may exist in any given plant or field operations. At a minimum, JSAs should be done for

- Repetitive maintenance jobs such as changing a crane cable
- Basic tool and equipment usage jobs such as using a cutting torch
- Infrequently performed maintenance jobs that are extremely hazardous or have a history of accidents

**The JSA: An Important Safety Factor**

If adopted effectively, JSAs can be valuable tools to help to reduce accidents and occupational illnesses and to increase operational efficiency. They often result in cost reductions, may lead staff to find a better way to do a job, and serve to document employee training. They are an important tool in the overall safety program.

Measurement of past incidents, successes, and failures happens after the fact and is considered a “lagging” indicator. Measurement of future performance or commitment to tangible goals is considered a “leading indicator.” Performing a JSA can help workers and management identify potential hazards before they occur, and implement corrections to minimize the risks. Setting tangible goals to perform safety analyses of all jobs, or to correct hazards so that they reach a specific minimal level of risk, are examples of using leading indicators to drive a safety program, as opposed to lagging indicators, which measure past performance.

These items can be found in the electronic resources that are offered as part of this manual available at www.awwa.org/M3:

- Instructions for completing a Job Safety Analysis form
- Example of a completed Job Safety Analysis
- Job Safety Analysis – blank form
- Example of a job description and physical requirements for a conservation coordinator
• Example of a job description and physical requirements for waterworks operator field crew
• Hazard action list – blank form

REFERENCES


