Hazards are biological, chemical, or physical conditions that have the potential for causing harm to people, property, or the environment. They can include both equipment and material hazards. If a hazard is combined with unexpected circumstances, unreliable physical systems, or irresponsible actions, then it can become a risk.

The degree and complexity of management commitment and employee participation in a safety, health, and environmental (SHE) program should be based on the degree of hazard and risk that exists at a laboratory. Therefore, the complete and accurate identification of potential hazards and risks is essential to the effective management of SHE issues.

EPA laboratories must implement a multi-faceted approach to hazard and risk analysis and must also ensure comprehensive identification, evaluation, and control. Without effective analysis, the laboratory staff will not know when controls and training are needed to minimize employee exposures to any existing hazards.

The hazard and risk analysis techniques outlined in this chapter are intended to complement one another and add to the overall effectiveness of a laboratory's safety, health, and environmental management program (SHEMP). A laboratory that relies primarily on a single approach, such as inspections, may not completely estimate or identify hazards. For example, a job hazard analysis may be an invaluable technique to identify hazards for certain tasks or jobs where the hazards are not readily apparent in a walk-through inspection or superficial observation of the operation. Implementing the approaches discussed in this chapter will allow EPA laboratories to assume a proactive stance on hazard and risk analysis and management. Participation by employees and other affected parties during all stages of the risk management process is critical to successful decision-making and implementation. Laboratory personnel involvement is encouraged throughout *all* phases of risk management.

These chapters provide guidance for EPA laboratories on hazard and risk analysis and management:

Chapter	Topic
B2	Hazard Identification & Evaluation
B3	Risk Assessment
B4	Change Management

1.0 Introduction

There are a number of different methods that laboratories can use to identify and evaluate safety, health, and environmental (SHE) hazards. When used together, these methods will provide the laboratory with the information needed to recognize and understand all hazards and potential hazards. Approaches for hazard identification and evaluation include:

- Surveys
- Job hazard analysis
- Hazard reporting
- Inspections
- Accident and incident investigation
- Analysis of injury and illness trends

The first two approaches listed above address the need for developing a complete hazard inventory for the laboratory and anticipating potential hazards for a particular job. The last four techniques focus primarily on detecting hazards that may not have been controlled by existing systems. Change management, which is a crucial and integral element of laboratory operations, is discussed in Chapter B4 of this manual.

The following sections outline methods for hazard identification and evaluation. These methods have been categorized as baseline or periodic. Obviously, many techniques used for baseline evaluation may also be valuable tools for periodic analysis. This categorization is purely used to organize the material and is not meant to be exclusive.

EPA Program Requirements

For an effective hazard identification and evaluation program, each laboratory must:

- Conduct a baseline identification of all SHE hazards or potential hazards.
- Implement systems and approaches for the periodic identification of any hazards not controlled through existing programs and procedures, including an annual inspection.
- Implement a procedure that encourages the reporting of hazards by employees.
- Investigate accidents and incidents with an emphasis on determining root cause.
- Determine any trends in accidents and incidents.
- Identify and implement the appropriate corrective action(s).

SHEM Guide 53, “Workplace Inspections,” should be referenced for detailed guidance on conditions or situations that warrant inspections, as well as on inspection preparation, procedures, and follow-up activities.

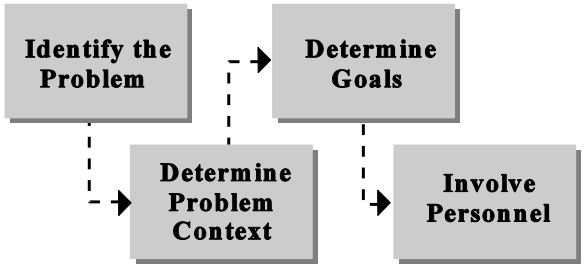
Program Administration

To effectively manage the hazard identification and evaluation program, responsibilities should be assigned for:

- Conducting a baseline identification of hazards
- Coordinating the ongoing identification and evaluation of hazards through inspections, reporting, etc.
- Performing inspections
- Quickly responding to, and evaluating, any hazards reported by employees
- Investigating accidents and incidents
- Completing accident and incident records and investigation reports
- Periodically evaluating accident and incident data to determine any trends
- Identifying corrective actions for any hazards or deficiencies identified through inspections, employee reports, incident investigations, or other means
- Tracking corrective actions
- Implementing and evaluating the effectiveness of corrective actions
- Maintaining documentation for the hazard identification and evaluation program (e.g., inspection checklists, accident/incident reports and investigations, corrective action logs, etc.)

2.0 Hazard Identification and Evaluation Methods

Identifying and evaluating hazards is a four-step process:



The steps can be performed in order, but do not have to be, depending on the situation. Each step, and examples of methods to complete the step, is described below.

2.1 Identify the Problem

A variety of methods are used to identify problems. For example:

- Inspection of SHE monitoring results and/or reports
- Literature reviews of toxicology and epidemiology studies
- Review of accident and incident records
- Sensory perception (e.g., irritation, odor, etc.)

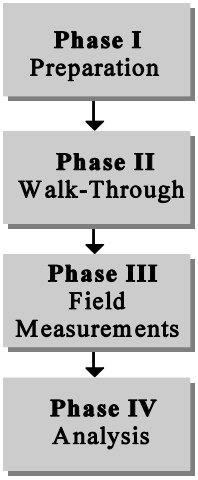
Two fundamental approaches to initial hazard identification and evaluation are baseline surveys and job hazard analyses (JHAs). These techniques should be used to establish a baseline for new or modified operations or procedures, but can also be used in the ongoing management of hazards. In addition, ongoing identification and evaluation methods must be implemented to determine if new hazards are introduced and if control methods are successful.

2.1.1 Baseline and Periodic Surveys

Surveys, both baseline and periodic, are fundamental to identifying hazards. Baseline surveys are used to establish an inventory of the hazards and potential hazards at the laboratory without the use of in-depth analyses. Additional periodic updates of the baseline survey can be conducted later to ensure that previously detected hazards have been controlled and that new hazards have been identified. In addition, periodic surveys can be used to conduct a more intensive analysis in areas that have a high potential for new or less obvious hazards.

At a minimum, EPA laboratories should conduct a preliminary baseline survey, followed by annual periodic surveys to update the original findings. These surveys should be conducted by a multidisciplinary team with sufficient experience and expertise to recognize hazards in their area of review, and to identify effective corrective actions. For some laboratories, it may be necessary to supplement the team with appropriate personnel from outside the laboratory, such as independent SHE consultants or regional personnel. When conducting a survey, the team should divide the process into four phases as shown in Figure B2-1.

Figure B2-1: Four Phases of Baseline Surveys



The components of each of these phases are discussed in more detail in the following sections.

Phase I: Survey Preparation

Adequate preparation is essential to the success of a survey. Prior to a survey, the team should become familiar with the operations at the laboratory, and identify which areas or operations have potentially significant risk and might require closer evaluation. Since the survey team must understand the extent of the regulatory requirements, it is also necessary to have an up-to-date list of applicable regulations, as well as the laboratory-specific requirements, prior to starting the survey. This task should be completed before every baseline and periodic survey, since existing regulations may have changed and new regulations may have been promulgated.

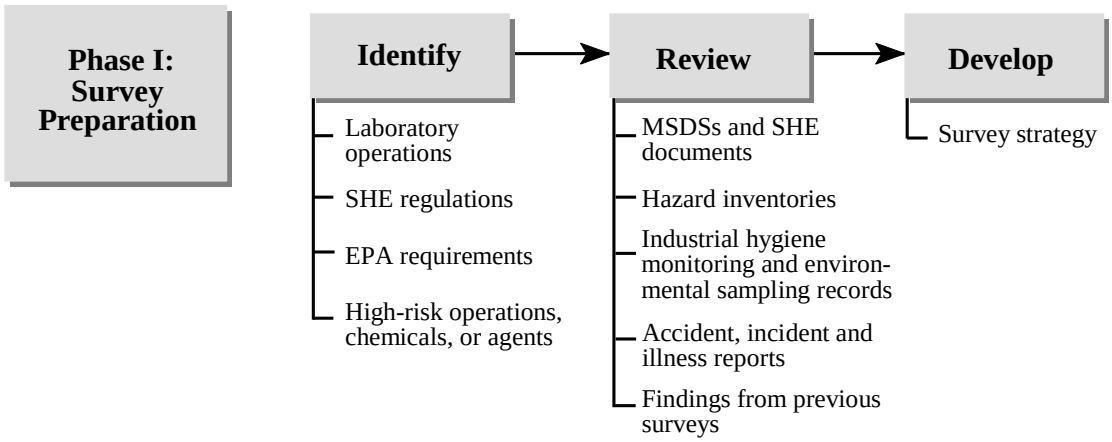
Once the survey team has gained a clear understanding of laboratory operations, and has reviewed all of the relevant documentation, it should be able to evaluate the potential hazards that may be encountered in the laboratory. The survey team should then use this information to develop a strategy that will result in an efficient and thorough hazard identification. Refer to Figure B2-2 for a summary of the components of Phase I.

Phase II: Walk-Through

Once the survey preparation has been completed and the potential hazards have been identified, the team should conduct a walk-through survey to:

- Verify compliance and conclusions made in Phase I.
- Identify easily recognizable hazards not anticipated in Phase I.
- Assess the effectiveness of the hazard controls in place.
- Determine which detailed studies will be needed for Phase III.

Figure B2-2: Phase I of a Baseline or Periodic Survey



During the walk-through, the survey team must be ready to accept any new information that may change the direction or focus of the survey from the original design established in Phase I. Team members should observe and interview employees performing routine and special tasks; review equipment and facilities (including ventilation systems); and note obvious signs of exposure, contamination, or emissions. For example, signs of exposure could include: airborne dust, smoke, mist, and aerosols; surface accumulation of dust, liquid, or oil; odors from solvents or gases; unusual tastes; and burning or irritation of the nose or throat.

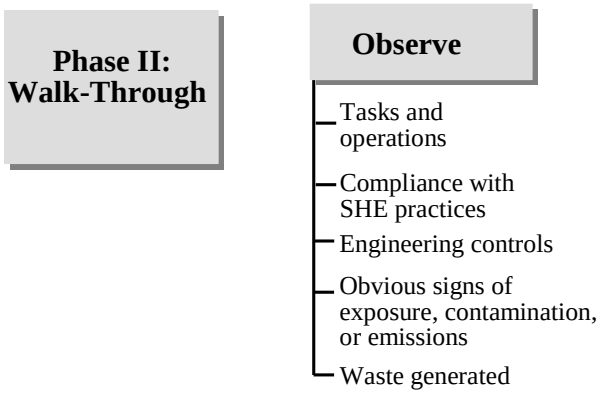
If industrial hygiene or environmental sampling is needed in Phase III, a walk-through will also provide the survey team with critical details for the design of an effective sampling plan. As the survey team conducts the walk-through, they should ensure that the following items are documented pertaining to potential Phase III concerns:

- Description of tasks and operations having potential exposures or emissions
- Description of associated controls for these tasks and operations
- Frequency and duration of operations with potential exposures or emissions
- Number of employees potentially exposed
- Description of air, water, solid, and hazardous waste generated

Although a walk-through survey is only a snapshot in time, the effectiveness of the hazard controls in place (e.g., engineering, administrative, and work practice) can be assessed easily through observation.

Issues that should be evaluated include, but are not limited to, chemical and waste storage, disposal, ventilation, respiratory protection, protective clothing, radiation shielding, training, general work practices, standard operating procedures (SOPs), written programs, and recordkeeping. Refer to Figure B2-3 for a summary of the components of Phase II.

Figure B2-3: Phase II of a Baseline or Periodic Survey

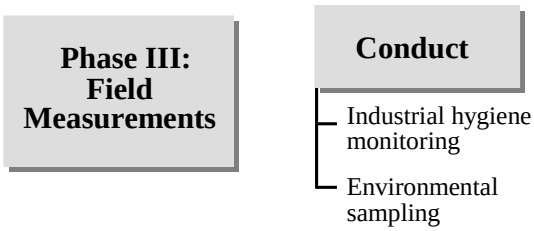


Phase III: Field Measurements

Once the walk-through has been completed, enough information should have been obtained to determine whether follow-up investigation is needed. For example, after determining that workers may be exposed to levels of methylene chloride above acceptable limits, the survey team should coordinate industrial hygiene monitoring to quantify the potential exposure more accurately. Refer to Chapter C5 of this manual for additional information on industrial hygiene sampling.

Refer to Figure B2-4 for a summary of the components of Phase III.

Figure B2-4: Phase III of a Baseline or Periodic Survey



Phase IV: Analysis

The final phase of a survey involves evaluating information obtained in Phases I through III. Both the qualitative and quantitative findings concerning hazards encountered in the survey should be used to develop a list of needed controls or work practices, as well as improvements to the management systems. In addition, this final phase should include an evaluation of any new permitting or monitoring requirements that were identified during the walk-through. Refer to Figure B2-5 below for a summary of the components for Phase IV.

Information obtained from the surveys can also be incorporated into other hazard analysis techniques. For instance, observations recorded in the walk-through can be used to develop a checklist for routine inspections. Once the analysis has been completed, the team, along with the appropriate laboratory personnel, should review the concerns identified in the survey.

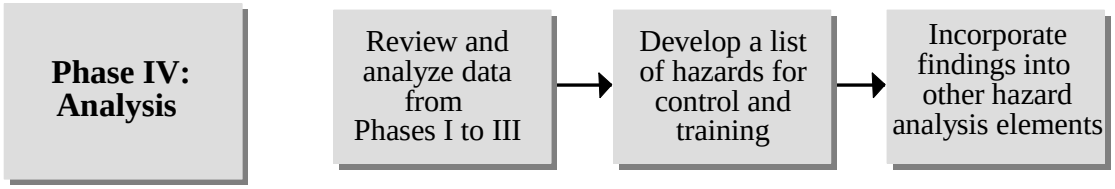
In addition to the baseline survey, the team should evaluate hazards with the potential for off-site impact. The evaluation should include determining the applicability of the U.S. Occupational Safety and Health Administration's (OSHA's) Process Safety Management Standard in 29 CFR 1910.119 as well as EPA's Risk Management Program requirements in 40 CFR 68.

2.1.2 Job Hazard Analysis

A job hazard analysis (JHA) is a systematic method for identifying the hazards of a particular task or job, hazards that may not be readily apparent from a cursory examination of the operation. This technique is a process that provides a thorough evaluation of the entire procedure in question. First, all the basic steps required to complete a job or task are identified in the sequence in which they occur. Next, each step is closely examined to identify where potential accidents could occur, where exposure to hazardous agents could exist, and which changes in practice or conditions could create new hazards.

After each hazard or potential hazard has been listed and reviewed with the employee performing the job, recommendations on eliminating the hazards are

Figure B2-5: Phase IV of a Baseline or Periodic Survey



developed. Table B2-1 outlines the steps of the JHA process. A sample JHA worksheet is presented in Attachment B2-1 to this chapter.

For a JHA to be most effective, it should be conducted by trained personnel who have experience in many aspects of SHE management (e.g., industrial hygiene, fire safety). In many cases, a team approach will provide the most valuable information. Whether JHAs are conducted by individuals or teams, it is essential to always involve an individual who performs the task being assessed.

Recommendations resulting from a JHA can take many forms. Some may involve combining or changing the sequence of job steps, adding engineering controls, or revising written programs. For instance, a properly conducted JHA may reveal that the laboratory's SOPs are incomplete or nonexistent, or that the personal protective

Table B2-1: JHA Process

1	Select the job to be analyzed.
2	Break the job down into successive steps.
3	Identify the hazards and potential accidents. For each job step, determine what accidents could happen to the employee performing the job step: • Recall past accidents and incidents. • Examine how the task and environment interact with the employee: — Can the employee be struck by anything? — Can the employee strike up against or come into contact with anything? — Can the employee be caught in, on, or between anything? — Can the employee fall? — Can the employee overexert? — Can the employee be exposed to anything injurious? • Examine how the employee interacts with the each job step: — In what ways can the employee's implementation of steps (sequence) present hazards? — In what ways can the time frame for the job step present hazards? — In what ways can the employee's use of materials present hazards? — In what ways can other deviations of expected actions and assumptions present hazards?
4	Evaluate the effectiveness of existing control measures.
5	Review the findings with employees who perform the job task.
6	Formulate recommendations for improved SHE management.

equipment selected does not adequately protect the employees from the hazardous agents used. A JHA may also show that the training provided to employees has not been effective. In other instances, it may be necessary to redesign equipment, change tools, or provide extra machine guarding. In all cases, however, recommendations should be clearly communicated to the employee, and should be as specific to the procedure as possible.

A JHA should be updated periodically, even if changes have not been made in the job. Also, if an accident or injury occurs, the JHA specific to that job should be reviewed to determine if changes in the procedure are necessary. When changes are mandated, SHEMP Managers should ensure that affected employees have been properly trained in the new procedure.

2.1.3 Ongoing Hazard Identification and Evaluation

Periodically, the laboratory should determine if hazards identified through the baseline survey are being effectively controlled by existing systems and procedures. In addition, ongoing identification and evaluation methods are important in identifying any new hazards that may not have been captured by change management procedures. Ongoing hazard identification and evaluation techniques include:

- Hazard reporting
- Inspections
- Accident and incident investigation and analysis
- Tracking and trending
- Employee input and participation

Each of these techniques are described in the following sections.

Hazard Reporting

Employees who work in a laboratory every day are an invaluable source of SHE information. With proper training, employees are likely to be the first to identify a hazard or a possible inadequacy in protective systems, equipment, or procedures. For this reason, the laboratory should institute a reliable system for employees to notify management of existing or potentially hazardous conditions. In an effective system, employees must have no fear of reprisal, and management must take credible and timely action to address problems that are revealed. In EPA laboratories, employees should be encouraged to first report a hazard to their supervisor and the SHEMP Manager. If this is not possible, SHE committee members should be contacted. If any of these persons cannot be reached, the Laboratory Director should then be contacted.

As discussed in Chapter A2 of this manual, employee involvement is critical to the success of a SHEMP. Each laboratory should develop a mechanism to encourage hazard reporting; this system should be based on management controls that are founded on employee involvement, responsibilities, authority, and resources.

Inspections

Once hazards have been identified in a workplace and hazard controls have been established, the laboratory should conduct routine SHE inspections to monitor the effectiveness of these controls and to identify new or previously undetected hazards. Unlike comprehensive surveys or audits, inspections require minimal time and are conducted more frequently.

EPA laboratories are required to conduct an inspection at least annually, but most locations conduct some form of inspection on a weekly, monthly, or semiannual basis depending on laboratory, regional, or divisional requirements.

Also, since routine inspections require less expertise than surveys and JHAs, the inspection team should consist of laboratory SHE professionals and laboratory employees who have received training in hazard recognition. This integration enhances employee involvement in the overall SHEMP. Inspections of this type should not be used in place of surveys or audits since they will not identify all regulatory requirements or management system deficiencies for the laboratory; they should be used only as a routine tool for hazard identification.

To conduct the inspection, the team should develop a checklist of SHE issues that need to be examined and reviewed (e.g., safety equipment, general work practices, personal protective equipment, chemical storage and handling, etc.). The inspection team can develop customized inspection lists for each work area from the hazards identified in the baseline and periodic surveys.

A sample laboratory inspection checklist is presented in Attachment B2-2 to this chapter. This is a generic checklist that should be used only as a reference tool. Appendix A of SHEM Guide 53 lists the topic-specific inspection checklists that can be found in other SHEM Guide chapters. Each EPA laboratory should develop a checklist that addresses the hazards at the labortory and incorporates laboratory policies and procedures.

Each laboratory inspection should be documented, and written records should be maintained. A review of these records will help identify hazards for which controls have not been developed, as well as recurrent problems in the control systems and accountability systems. Also, since the success of the inspection process depends on the completeness of the follow-up, documentation will improve the program by providing a written tracking system to monitor the correction of deficiencies.

Accident and Incident Investigation

A comprehensive accident and incident investigation program can uncover hazards missed by other approaches. In addition, when causes of accidents and injuries are identified and analyzed, effective measures can be developed to prevent future occurrences. For more information on accident and incident investigation, refer to Chapter G of this manual.

Tracking and Trending

Periodically, a laboratory should review all accident and incident investigation reports to determine if any trends or patterns are evident. This review may indicate the need to modify procedures, and may also provide justification for taking actions that may require significant time or money to implement. Furthermore, this review can reveal when incident rates have increased or decreased, and can be used to measure the effectiveness of the SHEMP.

Trends may be identified in a variety of investigation report components. For example:

- Job task
- Department or work area
- Body part
- Type of incident (e.g., laceration)
- Hazardous agent involved, if applicable
- Root cause

2.2 Determine the Problem Context

Inherent in the identification and evaluation processes is the consideration of the context of a potential risk. Key factors to consider include:

- Multiple sources of exposure to the same hazard
- Multiple exposure routes (e.g., absorption, inhalation, ingestion)
- Exposure to multiple hazards from the same source
- Multiple risks from multiple exposures

Each of these are discussed in the following sections.

2.2.1 Multiple Sources of Exposure

Persons responsible for identifying and evaluating hazards must determine if there is more than one opportunity for employee exposure to a given hazard. Evaluations of risk may be underestimated if this factor is not considered. It is important to include the potential for exposure outside the workplace. For example, laboratory personnel may be exposed to loud noise during the work day, but may also be exposed to loud noises at home (e.g., lawnmowers and chainsaws). The resultant effect of these exposures is important in determining risk.

2.2.2 Multiple Exposure Routes

All potential routes of exposure to a given hazard must be considered, especially if not inherently obvious. Common multiple exposure routes in the laboratory involve inhalation and absorption. If multiple routes are not considered, the risk may be underestimated. This underestimation will ultimately affect decisions such as consequence determination and control method selection.

2.2.3 Exposure to Multiple Hazards

The potential for exposure to more than one hazard from a given source must be determined. The cumulative effect of multiple hazard exposures is critical to determining risk. Effects may be additive, multiplicative, or synergistic. For example, employees may be exposed to an aerosol and a chemical simultaneously. The chemical may attach to the aerosolized particle, which may transport it to unexpected areas of the respiratory tract. This could pose an additional and/or completely different risk potential.

2.2.4 Multiple Risks from Multiple Exposures

The variety of hazards that a laboratory employee may encounter must be considered as a whole. This involves not only a consideration of cumulative or resultant effects as described above, but also a comparison of the different types of hazards people face each day. This may complicate risk analysis, but it is intended to be an additional method to put a risk into

context. Multiple risks from multiple exposures are considered when looking at one given effect. For example:

- What are the potential hazards that may cause this effect?
- What are the controls for different hazards and risks than can be implemented to result in one overall effect?

2.3 Determine Goals

Another step in the hazard identification process is to determine goals. This must be done early in the process, as goals should guide identification and analysis. Analysis may lead to a redefinition of goals. Goals are often dictated by statute and/or regulation, policy, and internal standards. Goals should be general or specific, as needed for a given situation. Examples of general goals include the following:

- Reducing or eliminating risks of exposure to hazardous substances and agents
- Reducing the incidence of adverse effects
- Reducing environmental impact

Specific goals will typically focus on determining compliance with specific aspects of a regulation, policy, and/or written program.

2.4 Involve Personnel

Involvement of EPA laboratory personnel in hazard identification, risk analysis, and decision-making processes is critical. With employee involvement, decisions are typically more widely accepted, as well as more effective. Various personnel will add important experience and expertise to the process, along with different interpretations and perceptions of risk.

The involvement of personnel will depend on the particular situation. Certain persons may become involved based on expertise, experience with similar risks in the past, and even based on interest. The nature, extent, and complexity of personnel involvement should be appropriate to the scope and impact of the decision. For positive participation, personnel will need management support, training, guidance from experts, and experience. It is also very important to involve personnel from the very beginning of the process.

3.0 Corrective Actions

All hazards or areas of noncompliance identified through surveys, inspections, reporting or other means must be documented and investigated. Hazards include any condition or situation that could pose a threat to human health or safety or to the environment. Noncompliance could be a deviation from EPA policies and procedures; regulatory noncompliance; or deviation from laboratory objectives and targets.

Corrective actions should start as a list of options that address the root cause of the deficiency. For example, if, during the course of repeated inspections of an area, the emergency exits are continually obstructed by stored objects, the appropriate corrective action would involve two steps. First, remove the stored objects to provide clear egress. Second, to reemphasize the importance of keeping exits clear,

provide additional awareness training, post signs, review the issue during monthly meetings, etc.

For each, the cost and benefit must be weighed. Other important factors to consider include the following:

- Who receives the benefits?
- Who bears the cost?
- How feasible is the option, considering the time, money, resources, and other potential limitations?
- Could a solution create another problem?

Corrective actions may include education and training, incentives, monitoring (e.g., data gathering), surveillance (e.g., observation of effects), and others. Additional research is often necessary to analyze options and/or assess costs and benefits.

Documented corrective action plans should be developed to include, at a minimum, a description of the corrective action, the individuals responsible, and the target date for completion. Completion of corrective action plans must be tracked by an individual in the laboratory. The designation of the appropriate individual (e.g., SHEMP Manager, chemical hygiene officer, etc.) will depend on the organizational structure at each laboratory.

The effectiveness of corrective actions must be evaluated through subsequent inspections, audits, and performance monitoring.

Attachment B2-1: JHA Worksheet

Purpose: To be used to perform a job hazard analysis (JHA).

Instructions: Complete the table for each activity/task to be assessed. An example of a completed table is included for guidance.

JHA Worksheet

		Approved By:
Job Title or Task:	**Team Leader:**	**Analyzed By:**
Employee/Operator:	**Area:**	**Reviewed By:**

Required Personal Protective Equipment:		
Sequence of Basic Job Steps	**Potential Hazards, Unsafe Acts, or Conditions**	**Recommended Action or Procedure**

JHA Worksheet

		Approved By:
Job Title or Task: Bulk Unloading (Truck)	**Team Leader:** John Doe	**Analyzed By:** Bill Smith
Employee/Operator: Ann Johnson	**Area:** Bulk Unloading	**Reviewed By:** Sally Brown

Required Personal Protective Equipment: ANSI Z87.1 Safety Glasses with Permanent Side Shields, ANSI Z41-1991 Safety Shoes & Ear Protection

Sequence of Basic Job Steps	Potential Hazards, Unsafe Acts, or Conditions	Recommended Action or Procedure
Safely guide truck back into loading area.	Truck backs into person and/or equipment.	Slowly guide truck to designated area (look out for people and equipment).
Using portable ladder, climb up ladder to top of truck and obtain sample using probe. The employee doing the sampling hands the probe to another employee on the ground to empty the probe into the tray. Three samples are taken from the truck; front, middle and back.	Fall off ladder. Ladder slips out from under person. Probe is dropped and strikes employee.	Slowly climb up ladder using caution. Attach ladder safety hooks to top of truck.
Make sure hose is attached to the proper silo, reattaching it as necessary.	Slip/trip on loose product and/or tools (hoses).	Use caution when walking and keep area clean.
Place tarp under truck compartment opening.	Slip/trip on loose product and/or tools.	Watch where walking and keep area clean.
Place unloading hose on top of tray (under truck compartment opening).	Back/shoulder/arm injury due to improper lifting technique. Slip/trip on loose product and/or tools.	Use caution when lifting hose (keep back straight and bend knees). Watch where walking and keep area clean.
Hit sides of truck compartment opening with rubber hammer until product drops.	Arm/shoulder injury. Bump into ratchet. Slip/trip on loose product and/or tools.	Use control when swinging hammer. Keep body clear of ratchet. Watch where walking and keep area clean.

JHA Worksheet (continued)

		Approved By:
Job Title or Task: Bulk Unloading (Truck)	**Team Leader:** John Doe	**Analyzed By:** Bill Smith
Employee/Operator: Ann Johnson	**Area:** Bulk Unloading	**Reviewed By:** Sally Brown

Required Personal Protective Equipment: ANSI Z87.1 Safety Glasses with Permanent Side Shields, ANSI Z41-1991 Safety Shoes & Ear Protection

Sequence of Basic Job Steps	Potential Hazards, Unsafe Acts, or Conditions	Recommended Action or Procedure
Check pressure gauge on hose, keeping pressure between 8 and 10 psi.	Pressure set too high, causing hose to blow off and spew material.	Check pressure as soon as the system is turned on.
Climb ladder to top of truck and rake out product using metal tool.	Fall off ladder. Ladder slips out from under person.	Slowly climb up ladder, using caution. Attach safety hook to top of truck.
Shovel leftover product into unloading hose (only after last compartment is empty).	Back/arm/shoulder injury due to repetitive shoveling. Slip/trip on loose product and/or tools.	Use caution when shoveling (keep back straight and bend knees). Only shovel amount that can be reasonably transported. Watch where walking and keep area clean.
Pull unloading hose nozzle and tarp from under the truck compartment opening.	Back/arm/shoulder injury due to improper lifting technique. Slip/trip on loose product and/or tools.	Keep back straight and bend knees when lifting hose. Watch where walking and keep area clean.

Attachment B2-2: Laboratory Inspection Checklist

Purpose: To conduct a walk-through SHE survey of EPA laboratories.

Instructions: Conduct the survey using the portions of the checklist that are applicable to the potential hazards of the laboratory to be inspected.

Laboratory Inspection Checklist

Date of Inspection:	**Location:**
Conducted By:	**Position:**

1.0 General Safety						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
1.1	Corridors clear					
1.2	Aisles more than 3 feet wide					
1.3	Bunsen burners have proper hoses					
1.4	Electrical cords in good condition					
1.5	Electrical cords grounded					
1.6	Electrical circuits not overloaded					
1.7	Extension cords used only temporarily					
1.8	Electrical equipment UL listed					
1.9	Good housekeeping					
1.10	No trip hazards					
1.11	No wall/ceiling penetrations (holes)					
1.12	No food or drink					
1.13	No open-toed shoes					
1.14	Water maintained in traps					
1.15	Sharps container not overfilled					
1.16	Appropriate disposal of biohazards					
1.17	HazWaste containers properly managed					
1.18	Accumulation point manager assigned					
1.19	Appropriate disposal of glass and sharps					
1.20	Mercury devices in secondary containment					

Laboratory Inspection Checklist (continued)

Date of Inspection:	Location:
Conducted By:	Position:

2.0 Information						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
2.1	CHP available					
2.2	Specific SOPs available					
2.3	Safety training documented					
2.4	MSDS locations known					
2.5	Chemical inventory available					
2.6	Chemical inventory up-to-date					
2.7	Chemicals labeled properly					
3.0 Signage						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
3.2	Hazard signs on cabinets					
3.3	No-smoking signs present					

Laboratory Inspection Checklist (continued)

Date of Inspection:	**Location:**
Conducted By:	**Position:**

4.0 Chemicals						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
4.1	Chemicals stored by compatibility					
4.2	Containers labeled properly					
4.3	No chemicals stored on the floor					
4.4	No hazardous liquids stored above eye level					
4.5	Storage shelves have lips					
4.6	No polymerized or unstable chemicals					
4.7	Bottle carriers available					
4.8	Peroxidizables dated and tested					
4.9	Flammable liquids in approved storage areas					
4.10	Over-10-gal containers of flammable liquids stored in safety cabinet					
4.11	Flammables stored in approved refrigerator or freezer					
4.12	Combustibles not adjacent to flammables					

5.0 Toxic Gases						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
5.1	Containers properly secured					
5.2	Leak test performed routinely with gas					
5.3	Toxic gas stored in ventilated cabinet					
5.4	Toxic gas has detection system					
5.5	Toxic gas respirator program in place					

Laboratory Inspection Checklist (continued)

Date of Inspection:	**Location:**
Conducted By:	**Position:**

6.0 Compressed Gases/Cryogens						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
6.1	No more than one spare tank stored in room					
6.2	Tanks stored properly					
6.3	Compressed gases properly secured					
6.4	Compressed gases equipped with regulator or cap					
6.5	Leak test routinely performed on cylinders					
6.6	Cryogenic materials stored in proper containers					
6.7	Cryogenic PPE available					
7.0 Electrical Safety						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
7.1	Electrical cords in good condition					
7.2	Extension cords used only temporarily					
7.3	Electrical outlets secure					
7.4	Only approved space heaters used					
7.5	Power strips being used					

Laboratory Inspection Checklist (continued)

Date of Inspection:	**Location:**
Conducted By:	**Position:**

8.0 Fire Safety						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
8.1	Corridors free of obstructions					
8.2	Floor clean and dry (no loose carpet or tiles)					
8.3	No holes in corridor walls					
8.4	Doors not blocked					
8.5	Doors self-close and latch					
8.6	Free access to fire extinguisher					
8.7	Stairwells clear of obstructions					
8.8	Elevator lobby clear of obstacles					
8.9	Ceiling is intact					
8.10	Illuminated exit signs visible in corridor					
9.0 Ventilation Systems						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
9.1	Fume hoods certified					
9.2	Fume hoods not blocked					
9.3	Fume hoods working properly					
9.4	Sash moves freely					
9.5	Traps filled with water					
9.6	Hood alarms operational					
9.7	Biosafety cabinets certified					
9.8	Gloveboxes certified					

Laboratory Inspection Checklist (continued)

Date of Inspection:	**Location:**
Conducted By:	**Position:**

10.0 Sharps						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
10.1	Sharps containers available					
10.2	Sharps containers leak-proof and puncture-proof					
10.3	Sharps containers properly labeled					

11.0 Personal Protective Equipment						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
11.1	Correct eye protection worn					
11.2	Appropriate gloves worn					
11.3	Nitrile/butyl rubber gloves used for spills					
11.4	Appropriate lab coat or apron worn					
11.5	Respirator available					
11.6	Respirator training documented					
11.7	Medical evaluation for respirator use performed					
11.8	Fume hood without obstructions					
11.9	Fume hood certified within one year					

Laboratory Inspection Checklist (continued)

Date of Inspection:	Location:
Conducted By:	Position:

12.0 Emergency Equipment						
Item		Yes	No	N/A	Comments	Corrective Action
12.1	Safety shower within 100 feet of hazard					
12.2	Safety shower clear of obstacles					
12.3	Eyewash within 100 feet of hazard					
12.4	Eyewash flushed weekly					
12.5	Spill kit for corrosives available					
12.6	Spill kit for solvents available					
12.7	Spill kit for biohazards available					
12.8	Spill kit for mercury available					
12.9	Fire extinguisher unobstructed					
12.10	Fire extinguisher inspected within one year					
12.11	Emergency lighting adequate					
12.12	First-aid kit available					
12.13	Emergency numbers posted					

13.0 Other Equipment						
Item		Yes	No	N/A	Comments	Corrective Action
13.1	Vacuum pumps properly maintained					
13.2	Vacuum pumps filtered, trapped, or ventilated					
13.3	Auto shutoffs for unattended operations					
13.4	Guards and interlocks in place					

Laboratory Inspection Checklist (continued)

Date of Inspection:	**Location:**
Conducted By:	**Position:**

14.0 Specialty Laboratories*						
Item		**Yes**	**No**	**N/A**	**Comments**	**Corrective Action**
14.1	Animals used					
14.2	Human/primate tissues used					
14.3	Recombinant DNA used					
14.4	Etiological/pathogenic agents used					
14.5	Radioactive materials used					
14.6	Lasers used					

*A “yes” answer here indicates that the laboratory must be in compliance with additional federal, state, and local regulations and policies (i.e., CDC, NRC, HSS, etc.).

1.0 Introduction

Risk assessments are very useful tools for laboratory management and safety, health, and environmental (SHE) professionals. Risk assessment techniques allow efforts to be focused on the most serious hazards or those that are most likely to result in an adverse outcome. They can be used to help make better, scientifically qualified decisions and to perform cost/benefit analysis.

Risk assessments go further than traditional hazard identification and evaluation techniques, and they attempt to define the hazard in terms of its probability and consequence, or risk:

- *Hazard probability* deals with how likely the incident is to occur, or how likely the adverse effects are to occur from exposure to the hazard.

- *Hazard consequence* relates to the magnitude or severity of an outcome.

For effective hazard and risk analysis and management, an integrated approach must be taken that involves hazard identification, risk assessment, decision-making and implementation, and review processes. There are many tools available for each phase of risk management. It is important to recognize that phases of risk management often overlap and need revisiting.

This chapter provides an overview of risk assessment and its application to laboratory SHE management. It is not intended to provide a thorough discussion on the intricacies of risk assessment methodologies.

EPA Program Requirements

For an effective risk management program, each laboratory should:

- Identify laboratory-specific risks.
- Use risk assessment techniques, as appropriate, to evaluate laboratory risks and prioritize corrective actions.

Program Administration

In support of the hazard and risk analysis program, responsibilities should be assigned for:

- Identifying laboratory-specific risks through qualitative risk screening along with traditional hazard evaluation and identification methods

- Coordinating (e.g., with regional, divisional, or outside consultants) the application of comprehensive risk assessment techniques, as appropriate (e.g., special cases)

2.0 Risk Assessment Methodologies

Application of risk assessment methodologies will allow laboratories to focus resources on problem areas and to leverage business advantage, essentially getting "more for less." Risk assessment methodologies can be used for a variety of SHE applications:

- Prioritizing audit/inspection findings and corrective actions
- Assessing employee exposures and prioritizing monitoring
- Determining personal protective equipment requirements
- Justifying training programs
- Supporting capital expenditures for new equipment or modifications

Risk assessments can be qualitative, semi-quantitative, or quantitative. Examples of methodologies include:

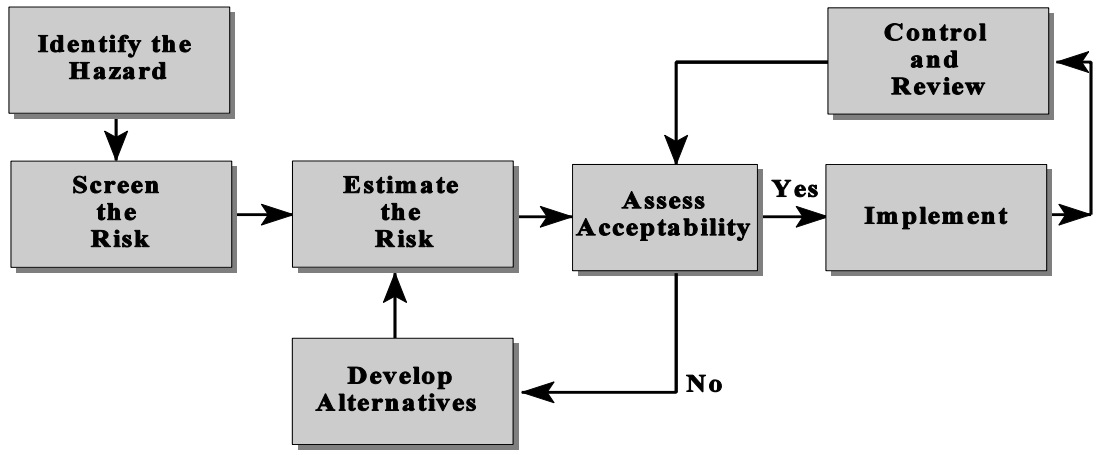
- HAZOP
- "What If" analysis
- Fault tree analysis
- Risk screening

A Hazard and Operability Study (HAZOP) is used to identify process hazards and operability problems in design, procedures, etc. "What If" analysis is used to identify potential accident sequences, thus identifying hazards, consequences, and methods of risk reduction. Fault tree analysis identifies combinations of equipment failures and human errors that can result in an accident event. A risk screening provides general hazard identification information and can assist with prioritization.

The qualitative risk screening approach is a technique that can be applied to all EPA laboratories. This methodology can be used to analyze and prioritize the hazards or findings generated from traditional hazard identification and evaluation techniques. The risk screening process is presented in Figure B3-1.

Risk assessments are concerned with evaluating two variables: hazard consequence and hazard probability.

Figure B3-1: Risk-Screening Process



Examples of parameters related to hazard consequence variables are presented in Figure B3-2.

These parameters are based on fatality and personal injury. However, similar parameters could be developed for business interruption (e.g., less than 24 hours, 24 to 72 hours, 72 to 168 hours, over 168 hours). When assessing parameters for business interruption, include internal systems (e.g., electrical, HVAC, and information technology) and external events (e.g., adverse weather and contiguous hazardous material transportation incidents). In addition, there are more intangible consequences such as the potential for adverse publicity.

Parameters related to hazard probability variables are presented in Figure B3-3.

Figure B3-2: Hazard Consequence Parameters

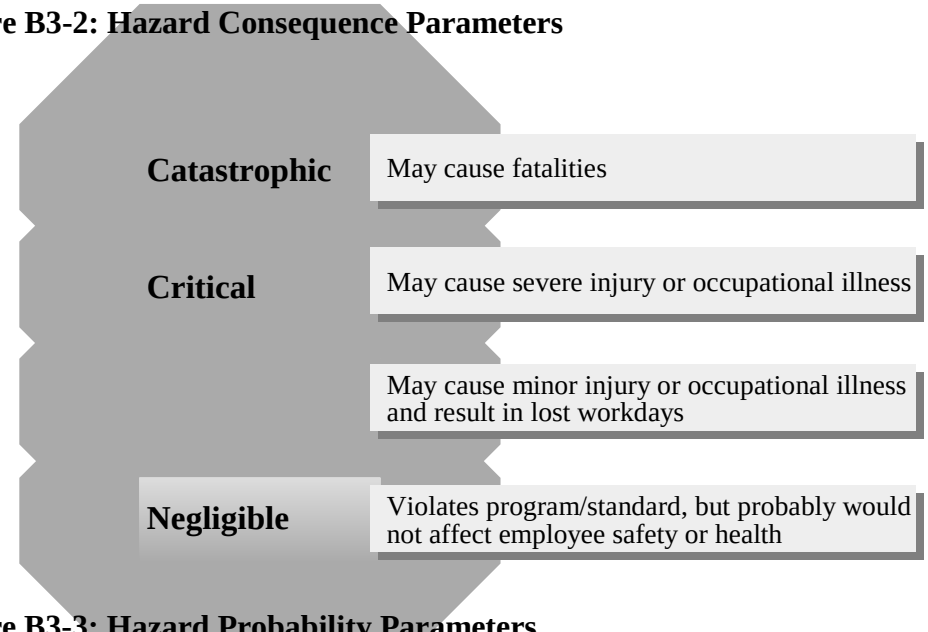
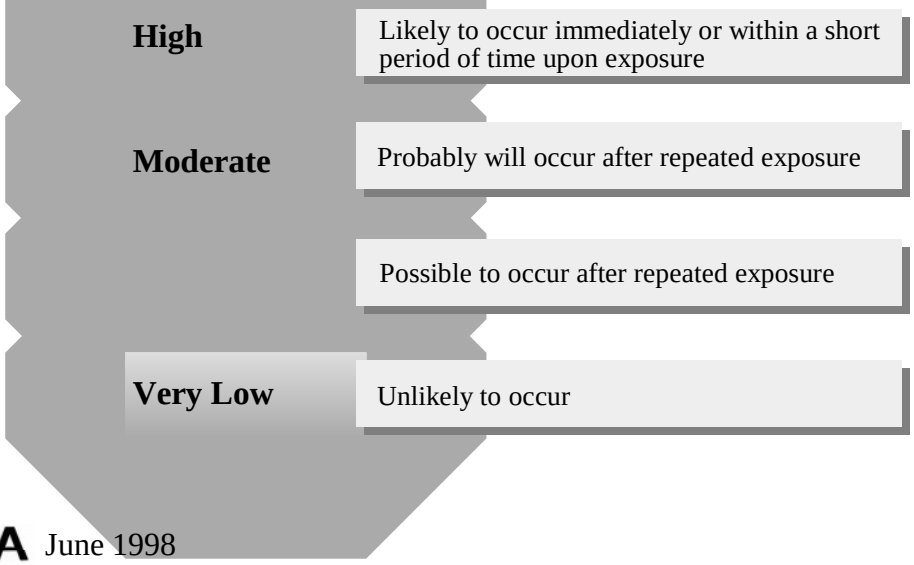


Figure B3-3: Hazard Probability Parameters



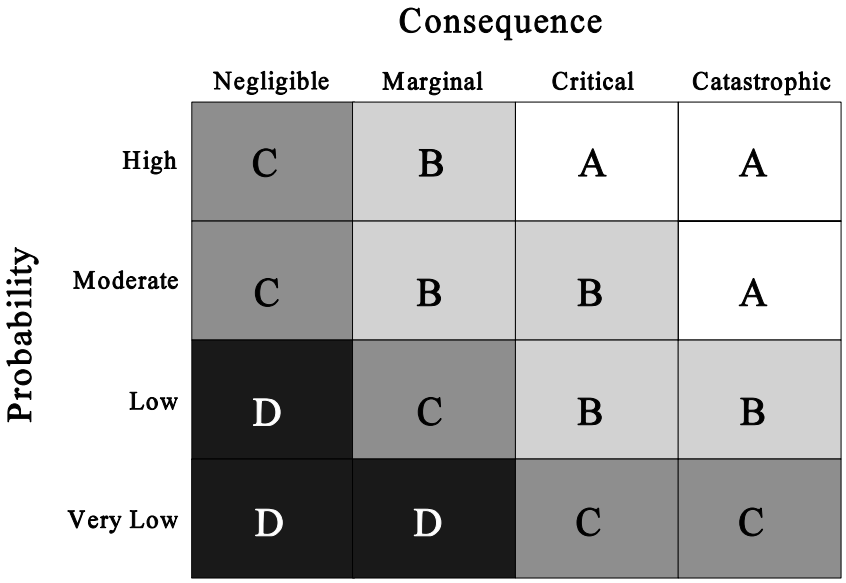
The parameters used to describe hazard consequence and probability can be modified based on the scope and objectives of the study. The impact can be presented in terms of:

- Loss of life
- Injury or illness
- Natural resource damage
- Volume of soil contaminated
- Property damage
- Business interruption
- Loss of reputation

Once each of these two variables—consequence and probability—are defined, a matrix is used to represent the overall risk level. This risk assessment matrix is presented in Figure B3-4.

By using this matrix, laboratories can prioritize the implementation of corrective actions. For instance, a risk categorized as Level A would require immediate correction, while one of lesser urgency may be addressed over the next few months or years.

Figure B3-4: Risk Assessment Matrix



Level A: High-risk condition—Immediate action (highest priority for risk mitigation and contingency planning)

Level B: Moderately high-risk condition—Prompt action (addresss risk by mitigation and contingency planning)

Level C: Low to moderate risk condition—Planned action (risk condition sufficiently high to further mitigation and planning)

Level D: Low-risk condition—Advisory in nature (additional mitigation and contingency planning)

3.0 Decision-Making and Implementation

Once results have been gathered, decisions to reduce or eliminate the identified risk must be made. These decisions should:

- Consider scientific and technical resources.
- Address the problem's root cause.
- Include a careful cost/benefit justification.
- Give priority to risk prevention, not control.
- Include incentives for innovation, evaluation, and research.
- Involve employees and their recommendations.

After identifying the risk level, consider all possible control options, and perform a cost/benefit analysis (CBA) for those options capable of reducing program costs and improving results. Although the CBA may differ by hazard type and available control and prevention opportunities, it is essential to consider information from various sources (e.g., SHEMP manager, employees, reference materials), and to include indirect costs and additional factors. Examples of situations where CBAs may be applied include program implementation, prevention projects, and compliance activities.

A CBA's results can be difficult to quantify because the benefits may reflect changes in employee attitudes (e.g., individual productivity and morale) or event occurrence (e.g., reduced likelihood or severity, the effects of an avoided loss). Nevertheless, always seek to implement recommendations designed to reduce both risk occurrence and magnitude.

Employee involvement during the implementation phase is crucial. When involved, employees are most likely to understand and support the agreed-upon decision (e.g., employee education and training, empowerment, and risk management involvement).

4.0 Evaluating Effectiveness

Evaluating the effectiveness of risk management actions that have been implemented involves monitoring and measurement. One measurement includes comparing actual costs and benefits to the estimates made for decision-making purposes. The decision-making process, itself, should also be evaluated at this phase.

An evaluation can answer the following important questions:

- Were actions successful? Did they accomplish what was intended?
- Were predicted costs and benefits accurate?
- What actions can be taken to improve the risk management plan and process?
- Has any new information surfaced to trigger re-evaluation of the decision?
- Was any critical information missing?
- How did employee involvement contribute to the outcome?
- Were scarce resources (e.g., time, personnel, money) used wisely?

To perform an evaluation, employees must be interviewed, relevant records must be reviewed, and costs and benefits must be analyzed. Frequent evaluation is vital and the evaluation focus may shift throughout the implementation phase.

It often takes a significant amount of time to determine the full impact of a decision. It is important to involve employees in the evaluation process, assisting to:

- Establish the criteria of the evaluation.
- Ensure the integrity of the evaluation process.
- Determine if an action is successful.
- Identify lessons to be learned.
- Identify information gaps.
- Determine whether cost and benefit estimates were reasonable.

1.0 Introduction

Over time, laboratory activities and workforces may change, and it is important for management to both respond to change and to anticipate change. Change management activities can include the following:

- Identification of new hazards or risks
- Evaluation of process changes to anticipate safety, health, and environmental (SHE) implications
- Continuous improvement of programs to improve effectiveness or efficiency
- Modification of programs to reflect personnel changes

The evaluation of new facilities, processes, operations, materials, and equipment prior to their design or use is instrumental to an effective hazard analysis program. In addition, as risks and requirements change, it may be necessary to adapt laboratory programs and procedures to respond to these changes.

This chapter provides an overview of change management for the following types of laboratory change:

- Procedures
- Equipment
- Purchases
- Location

In addition, this chapter describes the use of SHE research protocols as tools to identify and manage changes in laboratory operations.

EPA Program Requirements

For an effective change management program, EPA laboratories should:

- Implement procedures to anticipate and identify proposed changes in procedures, equipment, materials, etc., prior to making any decisions.
- Review proposed changes for implications to SHE programs.
- Discuss results with involved parties.

Program Administration

To effectively manage change, responsibilities should be assigned for:

- Overseeing and coordinating the laboratory change management program
- Performing a technical review of proposed changes in procedures, equipment, hazardous materials, location, etc., for implications to SHE programs
- Providing recommendations on the proposed change and any additional measures needed (e.g., further research, control measures, etc.)
- Following-up, once changes have been implemented, to perform any necessary final evaluations
- Providing administrative support by tracking proposed changes, evaluation and feedback reports, etc.

2.0 General Change Management Procedures

Often, laboratories will change operations without considering the implications of these changes. Items that were once hazardous may no longer exist and new hazards may be overlooked. By conducting SHE evaluations at an early stage, EPA laboratories can ensure that changes do not result in new hazards.

Effective change analyses can be accomplished by several methods, depending on the type of operation. Methods for change analyses of procedures, equipment, chemical purchases, or location are discussed in the following sections and summarized in Figure B4-1.

2.1 Procedures

Any modifications to existing laboratory procedures, or the introduction of new procedures, should be reviewed for SHE implications. The review should be conducted as early as possible during the modification or development process to ensure that time and effort are not wasted on a procedural change that is not acceptable for SHE reasons. It is essential that new or revised procedures are not implemented without an effective SHE review.

2.2 Equipment

Prior to the purchase of any new equipment, a review must be conducted to ensure that:

- The equipment specifications meet all relevant SHE requirements (e.g., machine guarding).
- EPA guidelines for energy efficiency are met.
- The equipment will not introduce any additional hazards (e.g., high noise levels).
- The need for additional training or other controls is identified and implemented prior to installation and use of the equipment.

Any retrofitting of existing equipment should also be reviewed for implications to SHE programs.

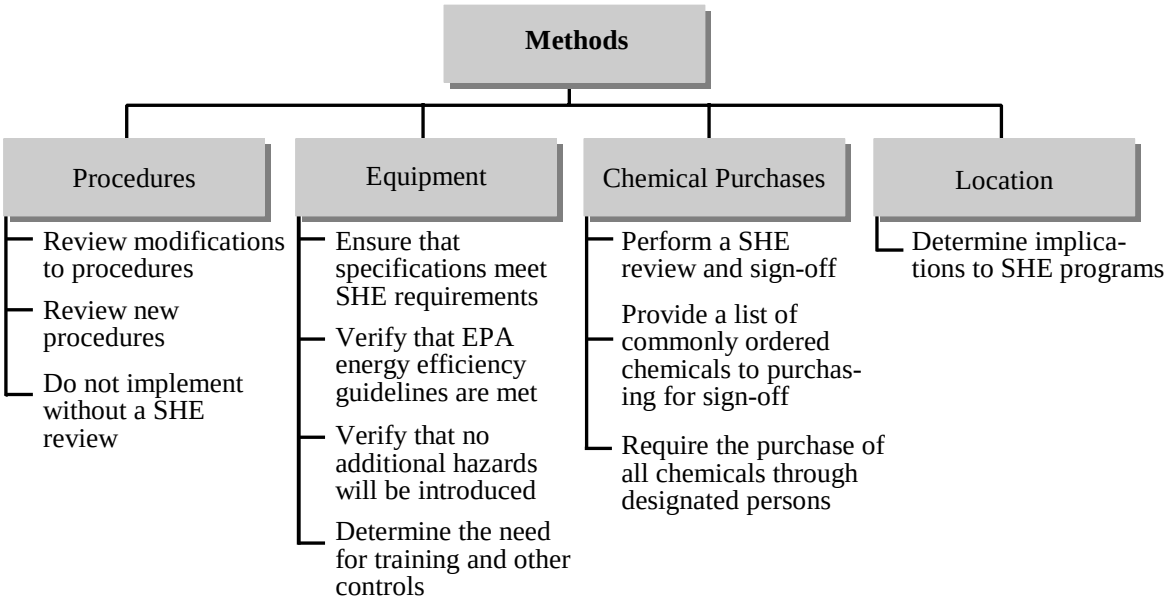
2.3 Chemical Purchases

Each laboratory must implement a system to manage the purchase of hazardous chemicals. This is important for a number of reasons:

- To track the materials coming into the laboratory
- To ensure that less-hazardous substitutes are considered where applicable
- To identify the need for additional training, monitoring, or controls for the use of a chemical
- To ensure that the chemical is not available in the laboratory through a chemical adoption program (a past user of a particular chemical may have excess in stock)

Depending on the organization and structure of the laboratory, suitable options for managing chemical purchases may include the following, alone or in combination:

Figure B4-1: Methods for Change Analyses



- Requiring a formal SHE review and sign-off by designated authorized individuals before the purchasing department will process an order for a chemical

- Providing the purchasing department with a list of routinely used chemicals that can be ordered without the required sign-off

- Requiring the purchase of all chemicals to go through one appropriately trained individual (e.g., chemical hygiene officer), or through department managers, etc.

Many laboratories may find an electronic database useful in managing the chemical purchasing process.

2.4 Location

If laboratories are choosing a location for the construction of new facilities, it is essential that implications to SHE programs are considered during the selection of a suitable site, as well as during the design of the buildings and systems. This special case of change management is addressed in more detail in Chapter D2 of this manual.

3.0 SHE Research Protocols

Researchers using any toxic or hazardous agents must complete a SHE research protocol before ordering the material. A blank protocol is included in Attachment B4-1. A protocol must be completed and approved for all hazardous chemicals and agents.

According to OSHA's Laboratory Standard, a hazardous chemical is a chemical for which there is statistically significant evidence (based on at least one study conducted in accordance with established scientific principles) that acute or chronic health effects may occur in exposed employees.

A hazardous agent possesses one or more of the characteristics presented in Table B4-1.

Protocols are also required for certain research involving hazardous equipment. Hazardous equipment or facilities are defined as equipment or facilities that present a potential physical hazard (e.g., excess heat, electrical shock, steam, explosion, etc.) to employees.

The protocol must be signed by the appropriate personnel at the Branch and Division levels and submitted to the SHEMP Manager. The protocol will be reviewed by an industrial hygienist. If any deficiencies in SHE compliance precautions are noted, the protocol will be returned to the researcher for clarification or additional input.

After the initial review is complete, the SHEMP Manager will distribute the protocol to the review panel. The members are given two weeks to review the protocol. If panel members discover problems or discrepancies, the protocol will be returned to the researcher for clarification or additional input.

Once the protocol is approved by all panel members, the industrial hygienist approves it for the review panel. Any restrictions or special requirements pertaining to the proposed research are noted at that time. The protocol is then submitted to the Laboratory Director for final approval.

Table B4-1: Hazardous Agent Characteristics

LD_{50}	< 50 mg/kg body weight [oral, rat]
	< 200 mg/kg body weight [dermal, rat]
LC_{50}	$\leq$ 2 mg/L [particulate, rat]
	$\leq$ 200 ppm [vapors and gases]
Carcinogenic, teratogenic, or mutagenic	
Infectious	
Explosive or violently reactive	
Causes an irreversible illness	

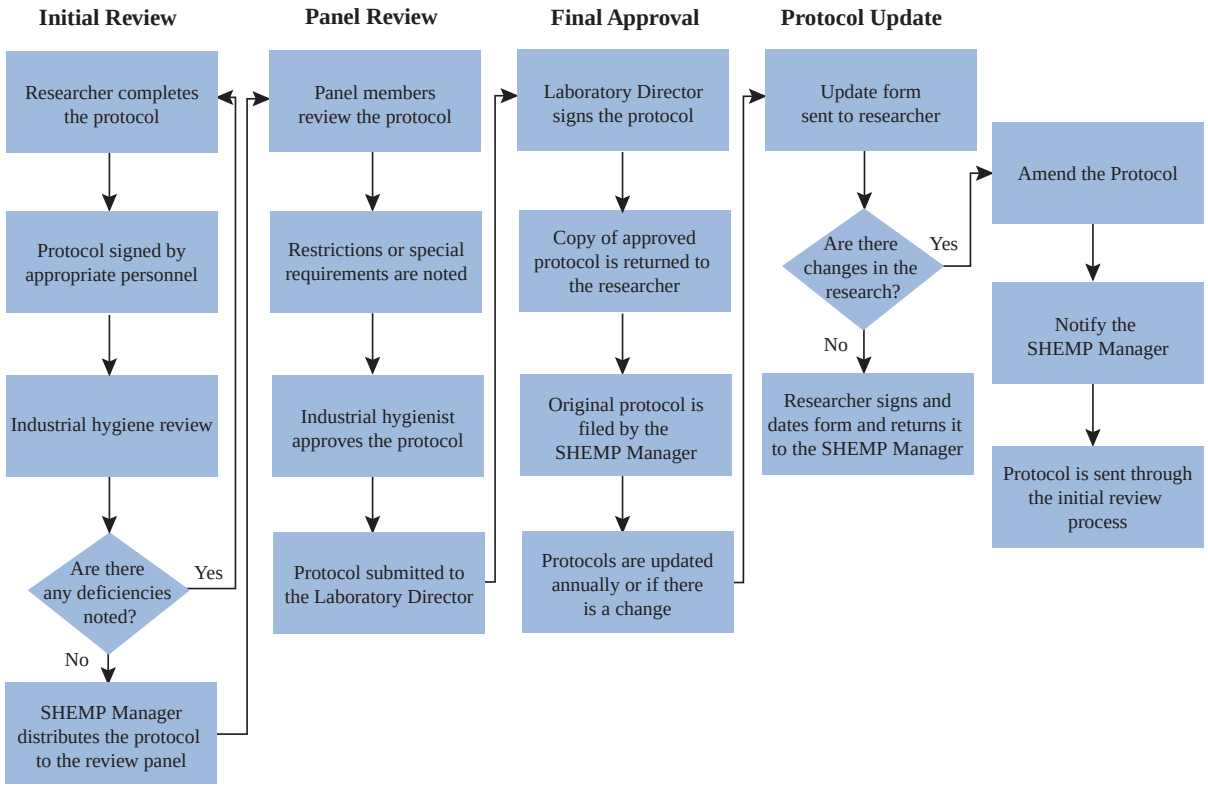
The Laboratory Director then signs the protocol and it is considered "approved." After this final approval, a copy of the protocol, with all appropriate signatures and any noted restrictions or special requirements, is returned to the researcher. The original protocol is maintained on file by the SHEMP Manager.

Protocols must be updated annually or whenever there is a significant change in chemicals or equipment used, or other modification to protocol. Update forms will be sent to each researcher for review.

If research continues and involves the same procedures, the update form must be signed, dated, and returned to the SHEMP Manager. If any conditions related to the research have changed, the SHEMP Manager must be notified. The changes must be submitted to the SHEMP Manager as amendments to the protocol. They may travel through the same approval process and then be entered into the researcher's protocol file.

This protocol review, approval and update process in depicted in Figure B4-2.

Figure B4-2: Review, Approval and Update of SHE Research Protocols



Attachment B4-1: SHE Research Protocol

Purpose: To ensure adequate review of proposed SHE precautions, procedures, and techniques for the use, storage, and disposal of hazardous agents used in research activities. The Principal Investigator should be most cognizant of the specific or potential hazards associated with agents being investigated.

Instructions: This SHE research protocol should be completed by the Principal Investigator and sent to the SHEMP Manager for review and approval.

Title of Study:	
Principal Investigator: Last Middle First	**Duration:**

Location	**Telephone Number**
Office:	Office:
Lab:	Lab:
Principal Investigator (Signature)	**Date**
Approvals	
Branch Chief	Date
Division Director	Date
(Obtain signatures above prior to sending to the SHEMP Manager)	
Review Panel Chairman	Date
SHEMP Manager	Date

Title of Study:	
Principal Investigator: Last Middle First	**Duration:**

Part 1. Personnel Potentially Exposed to Hazardous Agent	
1A. Personnel Authorized to Use Hazardous Agents	
1. Last Middle First	6. Last Middle First
2. Last Middle First	7. Last Middle First
3. Last Middle First	8. Last Middle First
4. Last Middle First	9. Last Middle First
5. Last Middle First	10. Last Middle First
Note: Personnel Qualification form must be completed and signed for each authorized person.	
1B. Location(s) Where Work Will Be Conducted (Include Storage Location)	
1C. Description of the Study (Attach the Research Protocol)	
1D. Hazardous Operations and Their Duration	
Note: Describe the procedure used to weigh the hazardous agent, where and how weighing will be performed, total quantity weighed, how solvent will be added, etc.	

Title of Study:	
Principal Investigator: Last Middle First	**Duration:**

1E. Hazardous Agent		
Common name:	Chemical name:	
Quantity to be ordered:	Maximum quantity needed:	
Method of storage:	Storage location:	
Physical Chemical Properties		
Form:	Solubility:	Flash point:
Vapor pressure:	Stability:	Other:
Reactivity:	Volatility:	Other:
Special handling procedures (e.g., weighing of stock in glovebox):		

1F. Toxicity
LD_{50} (carcinogen, etc.): *Note: Attach a copy of reference*
Acute symptoms:
Chronic symptoms:
Are antidotes readily available for emergency use if needed? □ Yes □ No If yes, where and by whom?

1G. Types of Protective Equipment Required		
Eye:	Hearing:	Respiratory:
Face:	Gloves:	Other:

Title of Study:	
Principal Investigator: Last Middle First	**Duration:**

1H. Precautionary Procedures	
Controlled access:	Fume hood:
Covered work surfaces:	Type:
	Certification date:

1I. Emergency Procedures
Personal exposure (e.g., inhalation, ingestion, inoculation):
Spill plans:

1J. Hazardous Waste Disposal

Type of Waste	Volume*	Waste Minimization Method	Labeling Requirements
Paper, plastic, glass			
Unused stock			
Solvent			
Gas			
Solid			
Carcass, bedding			
Other			

**Include time period for generation of waste (e.g., 1 liter of solvent per week, etc.)*

1K. Material Safety Data Sheet
Attach a copy of the MSDS for each hazardous material, or a copy of information found in NIOSH *Registry of Toxic Effects of Chemical Substances.*

1L. Animal Use
Will animals be used in this study? □ Yes □ No If yes, complete Part 2 of this Protocol.

Title of Study:	
Principal Investigator: Last Middle First	**Duration:**

Part 2. Animal Use Information		
2A. Species		
Number of animals:	Person dosing animals:	Dosing method:
Location of dosing:	Concentration of dose per animal:	
Animal Maintenance		
Location:	Duration:	
Person responsible:	Housekeeping:	
2B. Coordination with Animal Resources Staff		
Has the planned study been coordinated with Animal Resources Staff to discuss technician responsibilities, precautions, and availability of proper housing and space?		
☐ Yes ☐ No	If no, explain:	
2C. Animal Diet Preparation		
If the test agent will be incorporated into the animal diet, describe the method, by whom and where the diet is to be prepared, where it will be stored, what quality assurance will be done and by whom. If that is the plan, has the animal diet been coordinated with animal resources staff to obtain timely delivery?		
2D. Protective Equipment and Procedures		

Personnel Qualifications for Working with Hazardous Agents

Name: _____ Last Middle First	**Location:**
Protocol Title	
Research-specific formal training: *(Note: Also include all safety and health courses applicable to this type of work).*	
Relevant on-the-job training: *(Note: Work with specific hazardous agents related to this research, quantities worked with, and training received on these hazardous materials.)*	
Medical Monitoring	
Restrictions (to be completed by the SHEMP Manager):	
I have read the Safety and Health Research Protocol and agree to comply with all procedures and protective measures outlined in the protocol. _____ Signature _____ Date	