Module 2-

The Four Step Incident Investigation Process

TLO 2: Apply the four step process to conducting an incident investigation.

ELO 2.1: Preserve/document the scene.

ELO 2.2: Collect information.

ELO 2.3: Determine root causes.

ELO 2.4. Determine corrective actions.

Module 2: Four Step Incident Investigation Process

OSHA's *Incident (Accident) Investigations: A Guide for Employers* describes a systems approach for responding to, documenting, and analyzing workplace incidents.

This process is documented on an Incident Investigation Form designed. The employer creates a form that reflects the particular workplace and reflects the workplace Incident Investigation Procedures that the employer develops.

In conducting investigations and writing reports, it is helpful to think about who will reviewing the report, such as:

- Worksite management;
- Worker's compensation adjudicators;
- Medical professionals;
- Safety committee members;
- Yourself or your successor in future years.

A report is a communication tool: It communicates what happened, how root causes were identified and what the root causes were, and what corrective actions were identified to prevent these root causes from contributing to future workplace incidents.

Exercise/Discussion: Review the sample incident investigation forms on the following pages. What elements on these forms could you adopt for an incident investigation form in *your* workplace?

Sample Incident Investigation forms from Oregon OSHA:

Accident investigation form (example 1)

Use this form to help you investigate workplace accidents or incidents. Note: this form is for use within your company. It is not intended to replace DCBS Form 801: *Worker's and Employer's Report of Occupational Injury or Disease*.

Company: _____ Report no.: _____

Operation: _____ Investigator _____

Name of accident victim: _____ Victim's job title: _____

How long has accident victim been with this company? _____ How long on this job? _____

(Attach this information for each additional person injured.)

Witnesses:

Name: _____ Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

When did the accident occur? Date: _____ Time: _____ Shift: _____

Where did the accident occur? Department: _____ Location: _____

What happened? (Describe sequence of events and extent of injury. Attach separate page if necessary.)

Has a similar accident ever occurred? ☐ Yes ☐ No If yes, when? _____

What caused the accident?

List all causes and contributing factors, which might include lack of supervision, inadequate training, poor equipment maintenance, and inadequate policy.

- _____
- _____
- _____
- _____
- _____

1

Accident investigation form (example 1)

List each corrective action to be taken. Who will do it and when will it be done?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Attach photographs, sketches of the scene, or other relevant information.

Prepared by: Title: Date:

Accident investigation form (example 2)

Use this form to help you investigate workplace accidents or incidents. Note: this form is for use within your company. It is not intended to replace DCBS Form 801: *Worker's and Employer's Report of Occupational Injury or Disease*.)

Employee portion

Employee name: _____ Employee work phone: _____

Work unit: _____ Work section: _____

Supervisor name: _____ Supervisor work phone: _____

Length of service in present position: ☐ Less than 6 months ☐ 6 months-1 year ☐ 1-2 years ☐ 2-3 years 3-5 years ☐ More than 5 years

Exact location of accident/incident: _____

Accident/incident date: _____ Time: _____ ☐ a.m. ☐ p.m.

Witnesses Name: _____ Phone: _____

(☐ check if no witness) Name: _____ Phone: _____

Body part affected (check all that apply) ☐ Neck ☐ Shoulder(s) ☐ Elbow(s) ☐ Wrist(s)/hand(s) ☐ Thigh(s) ☐ Lower leg(s) ☐ Ankle(s)/foot(feet) ☐ Knee ☐ Hip ☐ Upper back ☐ Lower back ☐ Chest/abdomen ☐ Other: _____

Task that led to the incident: ☐ Driving ☐ Lifting ☐ Carrying ☐ Pushing/pulling ☐ Keyboarding ☐ Climbing ☐ Reaching ☐ Handling ☐ Bending ☐ Twisting ☐ Other:

Describe accident/incident in detail (use additional sheets if necessary):

Employee signature: Date:

Supervisor portion

Reported to: _____ Date: _____ Time: _____ ☐ a.m. ☐ p.m.

Supervisor's description of incident (what happened and why):

Corrective action:

Employee signature: Date:

Sample Incident Investigation Form from OSHA's *Incident Investigations: A Guide for Employers*

APPENDIX A: INCIDENT INVESTIGATION FORM

Form Section *Systems Approach*

Section A: Information *Step 1*

Company Name: _____ Date: _____

Investigator (or) Team Name (s) and Titles:

Name	Title
_____	_____
_____	_____
_____	_____
_____	_____

Section B: Incident Description/Injury Information *Step 1 and Step 2*

1) Name and Age of Injured Employee: _____

Employee's first language: _____

Employees Job Title: _____

Job at time of injury: _____

Type of employment: ❑ Full-time ❑ Part-time ❑ Temporary ❑ Seasonal ❑ Other: _____

Length of time with Company: _____

Length in current position at the time of the incident: _____

Description and severity of injury: _____

2) Date and time of incident: _____

3) Location of Incident: _____

NOTE: Items 4, 5, and 6 are used for both Step 1 and Step 2

4) Detailed description of incident: Include relevant events leading up to, during, and after the incident. *(It is preferred that the information is provided by the injured employee.)*

_____

_____

_____

_____

_____

_____

Use additional pages if needed

A-1

5) Description of incident from eye witnesses, including relevant events leading up to, during and after the incident. Include names of persons interviewed, job titles and date/time of interviews.

_____

_____

_____

_____

_____

_____

_____

_____

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_____

Use additional pages if needed

6) Description of incident from additional employees with knowledge, including relevant events leading up to, during and after the incident. Include names of persons interviewed, job titles and date/time of interviews.

_____

_____

_____

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Use additional pages if needed

Section C: Identify the Root Causes: What Caused or Allowed the Incident to Happen? *Step 3*

The Root Causes are the underlying reasons the incident occurred, and are the factors that need to be addressed to prevent future incidents. If safety procedures were not being followed, **why were they not being followed**? If a machine was faulty or a safety device failed, **why did it fail**? It is common to find factors that contributed to the incident in several of these areas: equipment/machinery, tools, procedures, training or lack of training, and work environment. If these factors are identified, you must determine why these factors were not addressed before the incident.

_____

_____

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Use additional pages if needed

Section D: Recommended Corrective Actions to Prevent Future Incidents *Step 4*

_____

_____

_____

_____

_____

Use additional pages if needed

Section E: Corrective Actions Taken/ Root Causes Addressed *Step 4*

_____

_____

_____

_____

_____

Use additional pages if needed

A-3

Investigation Tool Kit

Incident investigators may have to begin an incident investigation on short notice. It is important to begin the investigation immediately after the incident, or as soon as possible. Viewing the scene immediately after the incident can provide important information to the investigator. As time passes, material evidence is lost. For example, tools and equipment may be moved or even disappear from the scene.

The investigator must ensure that too much time doesn't pass before interviewing witnesses. As time passes, conversations with others and individual emotions can distort witnesses' memories of what they actually saw and heard.

It is helpful to prepare an investigation tool kit in advance, so that the incident investigator does not waste valuable time in responding after an incident occurs.

Exercise/Discussion: Review the sample incident investigators tool kit in Appendix B of OSHA's *Incident Investigations: A Guide for Employers.* What items do you want in your incident investigation toolkit for use in your workplace?

Sample Incident Investigator's toolkit from OSHA's *Incident Investigations: A Guide for Employers*

Sample list of items to use to conduct the investigation:

- ✓ Camera
- ✓ Charged Batteries (for phones, cameras, equipment, etc.)
- ✓ Video / Audio recorder
- ✓ Measuring devices in various sizes
- ✓ Leveling rod
- ✓ Clipboard and writing pad
- ✓ Pens, pencils, markers
- ✓ Graph paper
- ✓ Straight-edge ruler (Can be used as a scale reference in photos)
- ✓ Incident investigation forms
- ✓ Flashlight
- ✓ Strings, stakes, warning tape
- ✓ Photo marking cones
- ✓ Personal protective equipment: Gloves, hat, eyewear, ear plugs, face mask, etc.
- ✓ Magnifying glass
- ✓ High visibility plastic tapes to mark off area
- ✓ First aid kit
- ✓ Latex gloves
- ✓ Sampling [holding] containers with seals (Various types: bags, jars, containers, etc.)
- ✓ Identification tags
- ✓ Variety of tape: Scotch, masking, duct
- ✓ Compass
- ✓ Carpenters ruler
- ✓ Hammer
- ✓ Paint stick (yellow/black)
- ✓ Chalk (yellow/white)
- ✓ Protractor
- ✓ Clinometer

Step 1: Preserve and Document the Scene

The purpose of incident investigation is to determine why an incident happened in order to take corrective action to prevent it from happening again. However, before any analysis can be made regarding *why* the incident happened, it is first important to determine and document exactly *what did* happen. Therefore, the first step in any incident investigation is to preserve and document the scene.

Exercise/Discussion: OSHA recommends beginning an incident investigation immediately. Why is this important?

It may be necessary to secure the scene until the investigation is complete. This can be done through setting up cones or tape, or even stationing a security guard.

Scene safety is important: Prevention of additional incidents or injuries during the investigation is an important goal. Assess the scene for hazards and make sure any that are identified are controlled before entering the scene.

Methods that can be used to document the scene include:

- Personal observations;
- Video;
- Photographs;
- Sketches;
- Initial statements of injured employee and witnesses.

Personal Observations:

Take notes to record personal observations. Use all your senses:

- What do you see?
- What equipment, tools, materials, machines or structures appear to be broken or damaged, struck, or otherwise involved in the event? Look for gouges, scratches, dents or smears.
- If vehicles were involved, are there skid marks?
- Are there fluid spills, stains, contaminated materials or debris?
- What do you observe about the environment?
- Were there any distractions or adverse conditions due to weather?
- What was the time of day?
- Where was the location?
- What were the lighting conditions?
- What do you observe about the terrain? Is it flat, rough, unstable, or ……?
- Who is at the scene? (You will need this information in order to take initial statements and conduct witness interviews.)
- Who is not at the scene?
- Measure distances and positions of anything and everything you believe to be of any value to the investigation.

Video:

It is best to take video recordings as early as possible. The video recorder picks up details and conversations that can add valuable information to the investigation. Tips for recording video include:

- Scan slowly 360 degrees left and right to establish location.
- Narrate what is being recorded. Describe objects, size, direction, location, and any other relevant information.
- If a vehicle was involved, record direction of travel.

Photographs:

- Take notes on each photo you take to include in the written report. Identify the type of photo, date, time location, subject, weather conditions, measurements, and any other relevant information.
- Place an item of known dimensions in the photo if dimensions can’t be measured.
- Identify the person taking the photo.
- Start with distance shots, and continue taking photos as you move closer.

TIPS FOR VIDEO/PHOTO DOCUMENTATION

Note: Interviewees must be aware that they are being video recorded and/or photographed. It is recommended that investigators obtain permission from the interviewee prior to the interview.

Tips for Video Documentation:

- Video the scene as soon as possible; doing this early on will pick up details that may later add valuable information to the investigation
- Scan slowly 360 degrees left and right to establish location
- Narrate what is being taped, and describe objects, size, direction, location, etc.
- If vehicles were involved, record direction of travel, going and coming

Tips for Photograph Documentation:

- Always make notes about the photos taken
- Start by taking distance shots first then move in to take closer photos of the scene
- Take photos at different angles (from above, 360 degrees of scene, left, right, rear) to show the relationship of objects and minute and/or transient details such as ends of broken rope, defective tools, drugs, wet areas, or containers
- Take panoramic photos to help present the entire scene, top to bottom - side to side
- Take notes on each photo; these should be included in the incident investigation file with the photos
- Identify and document the photo type, date/time/location taken, subject, weather conditions, measurements, etc.
- Place an item of known dimensions in the photo to add a frame of reference and scale (e.g., a penny, a pack of cards)
- Identify the person taking the photo
- Indicate the locations where photos were taken on sketches

---OSHA's *Incident (Accident) Investigations: A Guide for Employers* Appendix C

Additional tips for photographs:

- Take photos at different angles to show relationship of objects and details such as ends of broken rope, defective tools, drugs, wet areas, or containers;
- Take panoramic photos to help present the entire scene.

Sketches:

Sketches reconstruct the incident and should show movement through time. Sketches complement information in photos. They also indicate distances among the various elements of the incident scene, which establishes "position evidence." It is important to be as precise as possible when making sketches. You don't have to be a professional illustrator to make a decent sketch, but you must show accurate measurements. The basic components of the sketch are:

- Documentation:
  - Date;
  - Time;
  - Location;
  - Identity of objects;
  - Location/identification of people.
- Spatial relationships and measurements;
- Locations where photographs were taken.

Initial statements

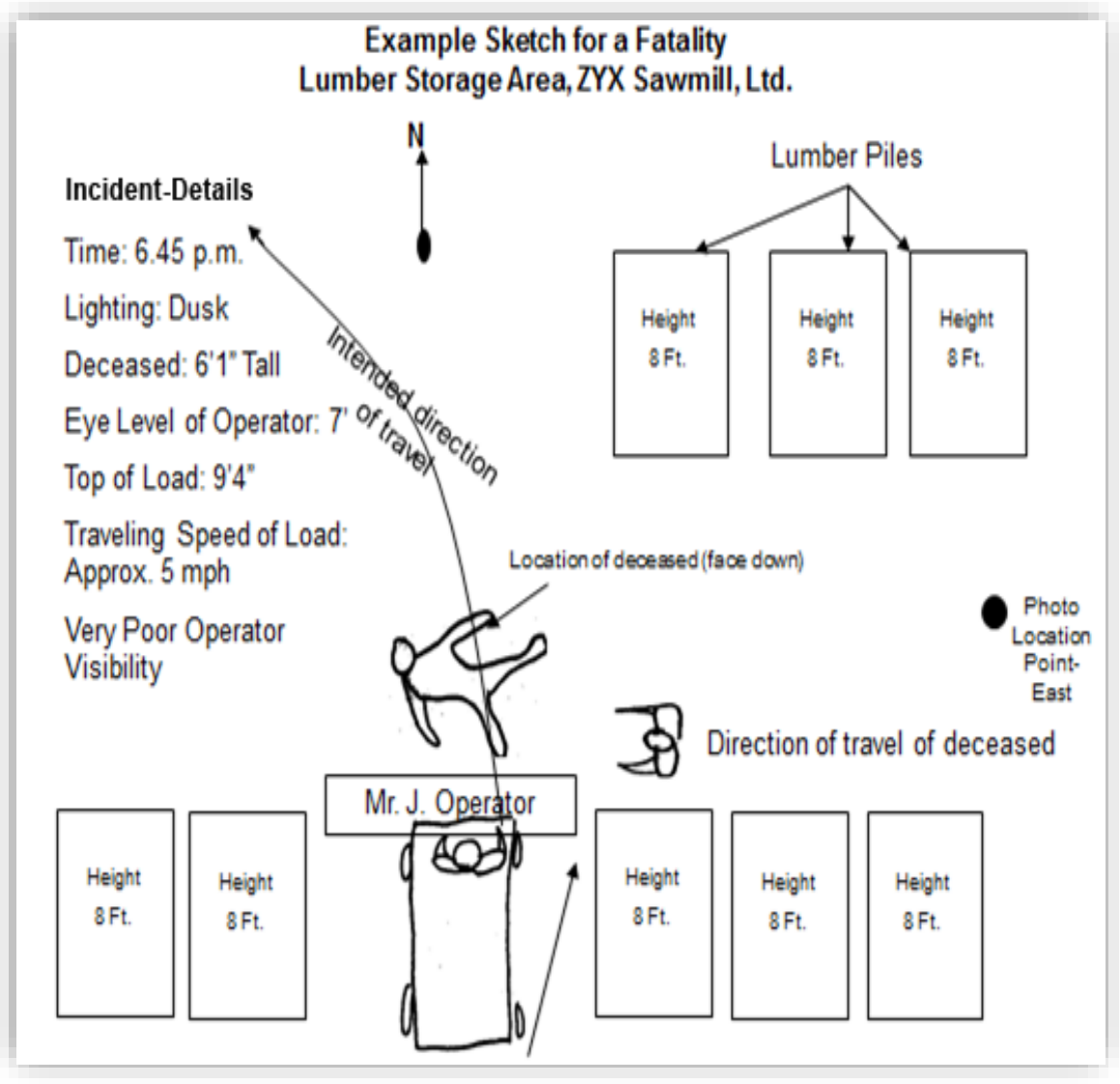
Obtain initial statements from witnesses and others that may have information regarding the incident. If an employee was injured, this employee should also provide an initial statement as well. Document names and ask for a description of the incident. Specifically, ask for:

- What happened;
- What materials, equipment, or articles were involved in the incident;
- Whether anything was moved or disturbed when treating the injured employee or helping them out of the scene?
- Names of any other potential witnesses.

SKETCH THE SCENE TECHNIQUES

1. Make sketches large; at least 8" x 10" and clear, be sure to print legibly
2. Include "Incident Details" (i.e., time, date, injured, location, conditions, etc.)
3. Include measurements (i.e. distances, heights, lengths, etc.) and use permanent points (e.g., telephone pole, building) to clearly present the measurements
4. Indicate directions – N= North; E= East; W= West; S= South
5. Make notes on sketch to provide additional information such as the photo location and/or where people were at the time of the incident

Note: The sketch can be used during interviews to help interviewees identify their location before, during or after the incident



---OSHA's *Incident (Accident) Investigations: A Guide for Employers* Appendix D

Exercise:

DEAN CASE STUDY: SKETCH OF THE SCENE –

Draw a sketch of the scene given the scenario on the next page: Then, compare your sketch to those done by your classmates.

DEAN CASE STUDY:

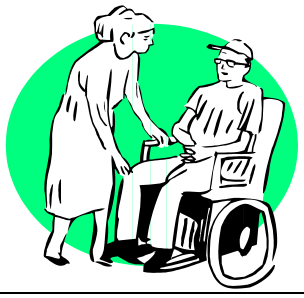
Carol Dean, Certified Nursing Assistant (CNA)- Application Case Study (Page 1)

Carol is 57 and has been a CNA at Resthaven Nursing Home for four years. She really loves her job. She says the residents depend on her - they need her. The job gives her a lot of gratification. The job requires a lot of extra hours because they are usually short of staff.

One Halloween, when Carol was in her 15th hour of a double shift, she was rushing to get to a resident who was calling out. A janitor was working in the area, mopping the floor. They were short of barricades that night and he felt the barricade should be placed at the area where he was working (about 8 feet ahead of the wet area). He did not notice that the mop pail was leaking. Carol did not see a wet spot on the floor and slipped and fell to the floor. She tried to stop her fall, but only hurt her wrist in the process. There was no warning that the floor was wet.

Carol wrenched her back and fractured her wrist from the fall. She will be out for at least a week and on light duty for two months.

Accident investigation findings revealed that the wet floor was created by a leaky mop pail. The janitor had not inspected the bucket for leaks prior to using it, nor has he been trained to do so. While the janitor had been complaining to his supervisor about the lack of barriers, the Administrator had not been notified to purchase more equipment. Accident investigation findings also revealed that Carol had to drive herself to the hospital as the nursing home was short-handed.



Dean - Case Study Interviews

Carol

I'm a certified nursing assistant at Resthaven. I've been there 4 years. My husband says that they take advantage of me, but I really love my work and the residents need me. I work extra hours a lot, particularly these past few weeks, because 2 other CNAs just quit. I really feel stupid about the accident. It was my own fault. I was tired and hurrying to get Mr. Smith's pain pills to him. He was in a lot of pain. Anyway, the floor was slippery from the mopping and I fell. I hurt my wrist and wrenched my back. I had a hard time getting up and was just going to sit down for a while, but Bob, the janitor, told me I should go to the hospital. Mary, the administrator heard about my fall and came by. She said that maybe I should stop by the hospital and get checked out, but that she couldn't spare anyone to take me. I drove myself to the hospital and by the time I got there, I was in a lot of pain. Now I'm just worried about the residents and how they'll get the care they need

Mary, the Administrator

I'm so sorry about Carol hurting herself, because she is my best CNA. All the residents love her. We are so short staffed here – I don't have enough CNAs, so the people on staff have to work extra shifts. The janitor, Bob, is new and Jamie, his supervisor, said that he complains a lot. It was his fault that the bucket was leaking and the wet floor wasn't barricaded. Maybe we need more barricades, but I didn't know anything about that before the accident. I feel bad that Carol had to drive herself to the hospital, but I was expecting an important phone call and couldn't take her. I hope she's able to return to her duties soon.

Bob, the Janitor

I have only been at Resthaven for 2 months, but I'm not happy with the way they run things. I never got any training and they don't have decent equipment for me to do my job right. The buckets and mops are falling apart and there aren't enough barricades to block off wet floors. These aren't the only problems around here. I've complained to Jamie, my supervisor, but it's useless. I'm sorry that Carol fell near where I was mopping. I wish I could have stopped her, but she seemed really distracted and was moving so fast before she fell.

Jamie, maintenance supervisor

I just have too much to do and cannot keep track of everything. I told Bob that we do not have money to buy all new maintenance equipment. He just has to make do. I didn't see the accident, but Carol agreed it was her fault that she fell. I'm supposed to supervise round-the-clock shifts and cannot keep up.

Step 2: Collect Information

Once the scene is documented, the investigation team can begin collecting additional information. This additional information provides additional details for consideration in Step 3, Determine Root Causes.

Sources of information that can be helpful in this step include:

- Witness interviews;
- Equipment manuals;
- Industry guidance documents;
- Company policies and records;
- Maintenance schedules, records, and logs;
- Training records;
  - Dates of training;
  - Names of employees trained;
  - Content of training;
  - Qualifications of instructor;
  - Follow up and refresher training;
- Audit reports and follow up of identified action items;
- Enforcement policies;
- Records of enforcement;
- Previous corrective actions;
  - Recommendations;
  - Actual actions taken;
- Work schedule;
- OSHA logs and previous incident reports;
- Safety committee records;
- Police/emergency services/medical examiners reports (if applicable).

Discussion: Can you think of any other sources of information that are useful in incident investigations?

Witness Interviews

Witness interviews provide critical information to the incident investigator. Interviews should be conducted as soon as possible after the incident. Memory can fade over time, and details may change as the witness replays the incident inside his or her mind or talks about it with other people. The sooner the witness is interviewed, the more accurate and candid his or her statement will be.

However, witnessing a workplace incident can be stressful, or even traumatic depending on the degree of injury. It is important to put the witness at ease. Interviews should be conducted in a quiet place that is free from distractions. Conducting the interview at the scene of the incident can help the witness remember and describe what happened. However, if being near the incident scene is disturbing, the interview should be conducted somewhere else. Be empathetic and do not judge if the witness becomes emotional.

✓	Investigator's DO's	✗	Investigator's DON'Ts
✓	Do explain who you are	✗	Don't argue
✓	Do be specific as to why you're there	✗	Don't ask "yes/no" questions
✓	Do be positive-their knowledge is important	✗	Don't be defensive
✓	Do be diplomatic and understanding	✗	Don't suggest answers
✓	Do be adaptable	✗	Don't accuse
✓	Do express concern and desire to prevent similar incidents	✗	Don't rush
✓	Do ask their opinion	✗	Don't interview in a crowd
✓	Do thank them for their cooperation		

Begin the interview by explaining the purpose: The goal of the interview and the entire investigation is to prevent future incidents from occurring. Witnesses are generally cooperative if they understand that the purpose of the investigation is to prevent injuries and illnesses to either their co-workers or themselves. If they think that the purpose of the interview is to get someone in trouble, they probably won't be very forthcoming.

It is helpful to record the interview and take notes.

However, it is illegal to record someone unless they provide permission, so do not use a recorder unless the witness agrees to be recorded. If you do use one, keep it unobtrusive and off to the side. Note taking is important, however, note taking should not detract from the interview. The very act of making a recording, or taking notes, could influence what the witness says: Recording the interview implies a permanency and a commitment even before the witness may have processed what happened internally. Explain that taking notes and making a recording ensures accuracy and helps keep the record straight.

Ask the witness to describe what happened. Ask for the complete version, and practice "active listening" without interrupting. Once the witness has told their story, ask questions to fill in the gaps. Questions should be specific and direct, and intended to fill in any missing information.

Ask open ended questions. Do not ask leading questions that imply an expected response.

Asking "Was the light red?" may get a different answer than asking "What color was the light?"

Ask "what" rather than "why." Instead of asking "Why did the employee operate a forklift with under-inflated tires?" ask "What are the forklift inspection procedures?" and "what is the procedure to report forklift safety hazards?"

Once the story has been told, repeat back what you heard to check your understanding and make sure you have the right information. This is a good time to write down what the witness said. You can ask the witness to review what you have written and make any corrections. A witness who has just experienced a traumatic event may have had more difficulty expressing himself/herself than normal, and this provides an opportunity for the witness to make sure that the notes match what he/she intended to say. Be tactful if there are any discrepancies.

At the end of the interview, thank the witness for their help in the investigation and ask them for their thoughts on what caused the incident.

***Exercise*:** Work in groups.

Review the Carol Dean case study incident. Make a list of witnesses that you would like to interview, and write down what questions you would like to ask them. Be prepared to report out to the class.

COLLECT INFORMATION CHECKLIST

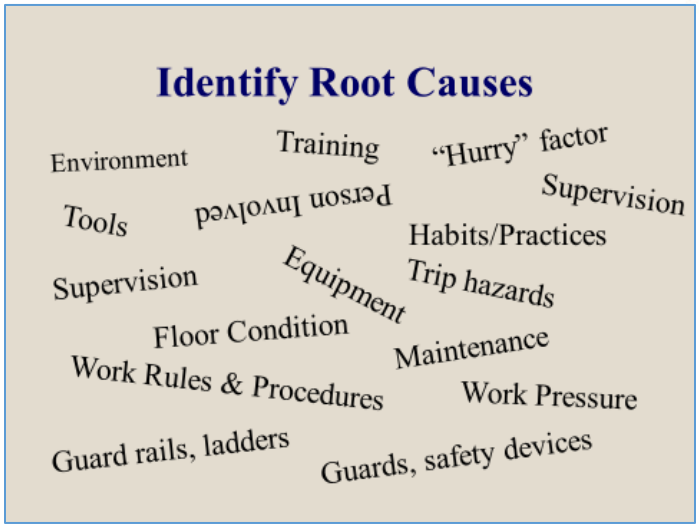
Investigators should be sure their investigation answers the following questions:

WHO?	WHERE?
☐ Who was injured? ☐ Who saw the incident? ☐ Who was working with the employee? ☐ Who had instructed/assigned the employee? ☐ Who else was involved? ☐ Who else can help prevent recurrence?	☐ Where did the incident occur? ☐ Where was the employee at the time? ☐ Where was the supervisor at the time? ☐ Where were fellow workers at the time? ☐ Where were other people who were involved at the time? ☐ Where were witnesses when incident occurred?
WHAT?	**WHY?**
☐ What was the incident? ☐ What was the injury? ☐ What was the employee doing? ☐ What had the employee been told to do? ☐ What tools was the employee using? ☐ What machine was involved? ☐ What operation was the employee performing? ☐ What instructions had the employee been given? ☐ What specific precautions were necessary? ☐ What specific precautions was the employee given? ☐ What protective equipment should have been used? ☐ What protective equipment was the employee using? ☐ What had other persons done that contributed to the incident? ☐ What problem or questions did the employee encounter? ☐ What did the employee or witnesses do when the incident occurred? ☐ What extenuating circumstances were involved? ☐ What did the employee or witnesses see? ☐ What will be done to prevent recurrence? ☐ What safety rules were violated? ☐ What new rules are needed?	☐ Why was the employee injured? ☐ Why and what did the employee do? ☐ Why and what did the other person do? ☐ Why wasn't protective equipment used? ☐ Why weren't specific instructions given to the employee? ☐ Why was the employee in the position? ☐ Why was the employee using the tools or machine? ☐ Why didn't the employee check with the supervisor when the employee noted things weren't as they should be? ☐ Why did the employee continue working under the circumstances? ☐ Why wasn't the supervisor there at the time?
WHEN?	**HOW?**
☐ When did the incident occur? ☐ When did the employee start on that job? ☐ When was the employee assigned on the job? ☐ When were the hazards pointed out to the employee? ☐ When was the employee's supervisor last check on job progress? ☐ When did the employee first sense something was wrong?	☐ How did the employee get injured? ☐ How could the employee have avoided it? ☐ How could fellow workers have avoided it? ☐ How could supervisor have prevented it - could it be prevented?

---OSHA's *Incident (Accident) Investigations: A Guide for Employers* Appendix E

Step 3: Determine Root Causes

At this point, a lot of factual data has been collected. The task now is to turn that data into useful information to make improvements to the safety program. This is where it is important to determine what the root cause of the incident was.



Unfortunately, root causes are not always glaringly obvious. Quite the opposite, in fact. The true root causes are generally not the ones that jump right out to you at the beginning of the investigation. Also, the majority of incidents, if not all, have more than one root cause. Some are more apparent than others, and if the investigator only identifies the root causes that are easy to see, others will be missed.

Many tools are available for determining root causes. The simplest tool is to "Ask 'why' five times:"

My car will not start. (the problem)

1) Why? - The battery is dead. (first why)

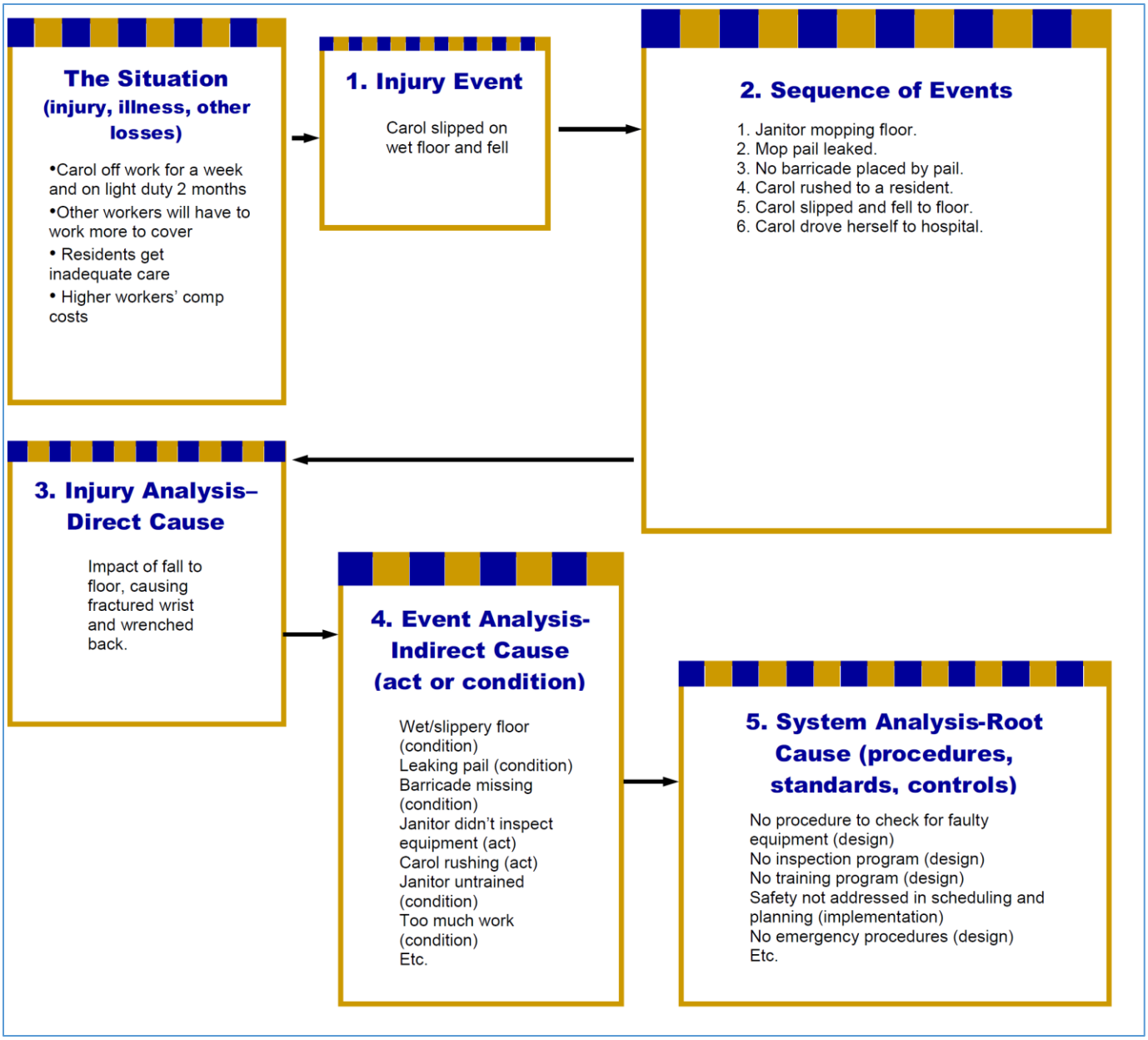
2) Why? - The alternator is not functioning. (second why)

3) Why? - The alternator belt has broken. (third why)

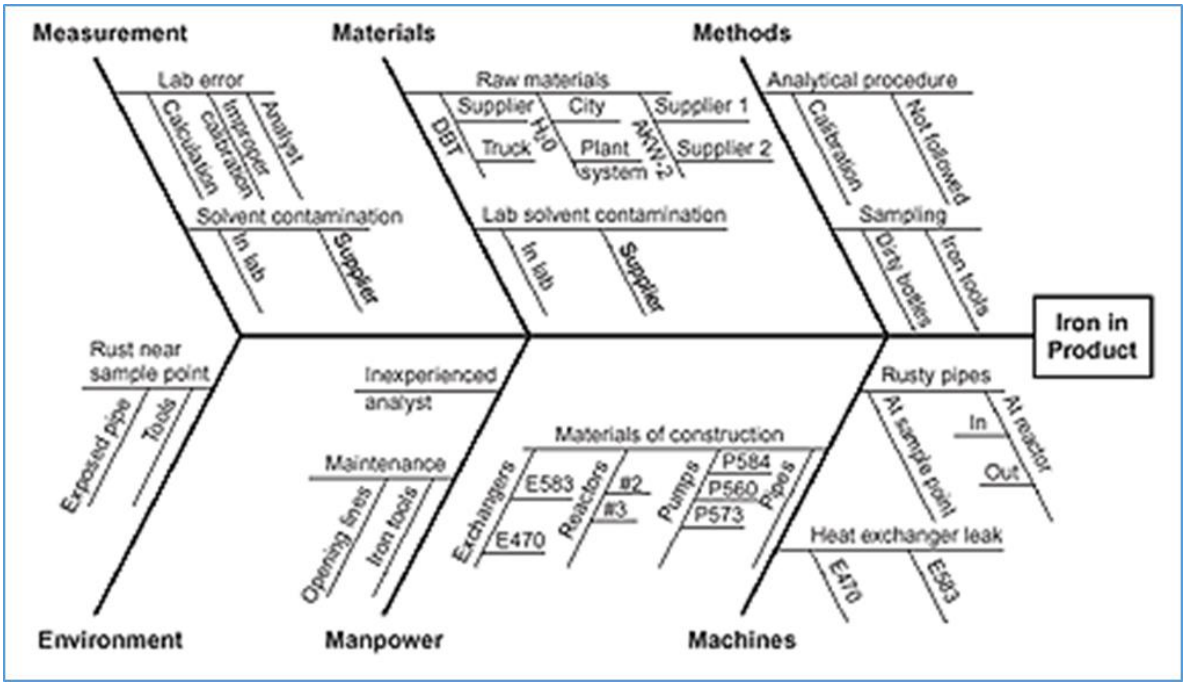
4) Why? - The alternator belt was well beyond its useful service life and has never been replaced. (fourth why)

5) Why? - ***I have not been maintaining my car according to the recommended service schedule.*** (fifth why and the root cause)

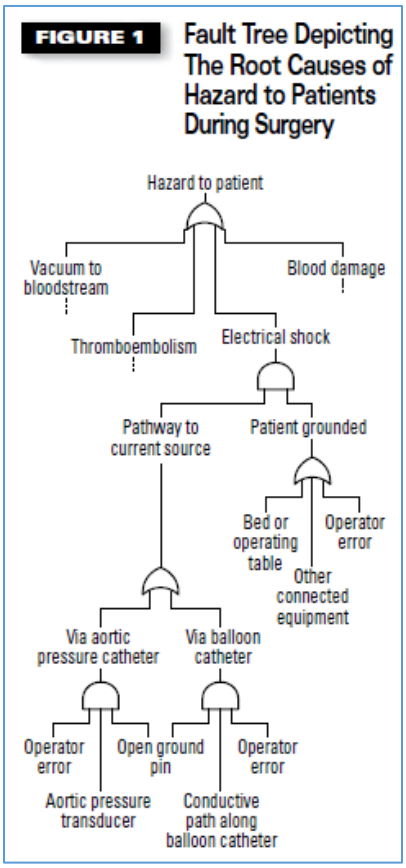
Flow charting is another tool that can help with identifying root causes. Below is a sample flow chart for the Carol Dean incident that we've been reviewing:



A fishbone diagram, or Ishikawa diagram, is a tool used for cause and effect analysis. It is a helpful tool to identify potential causes of a problem to identify root causes.



Source: http://asq.org/learn-about-quality/cause-analysis-tools/overview/fishbone.html

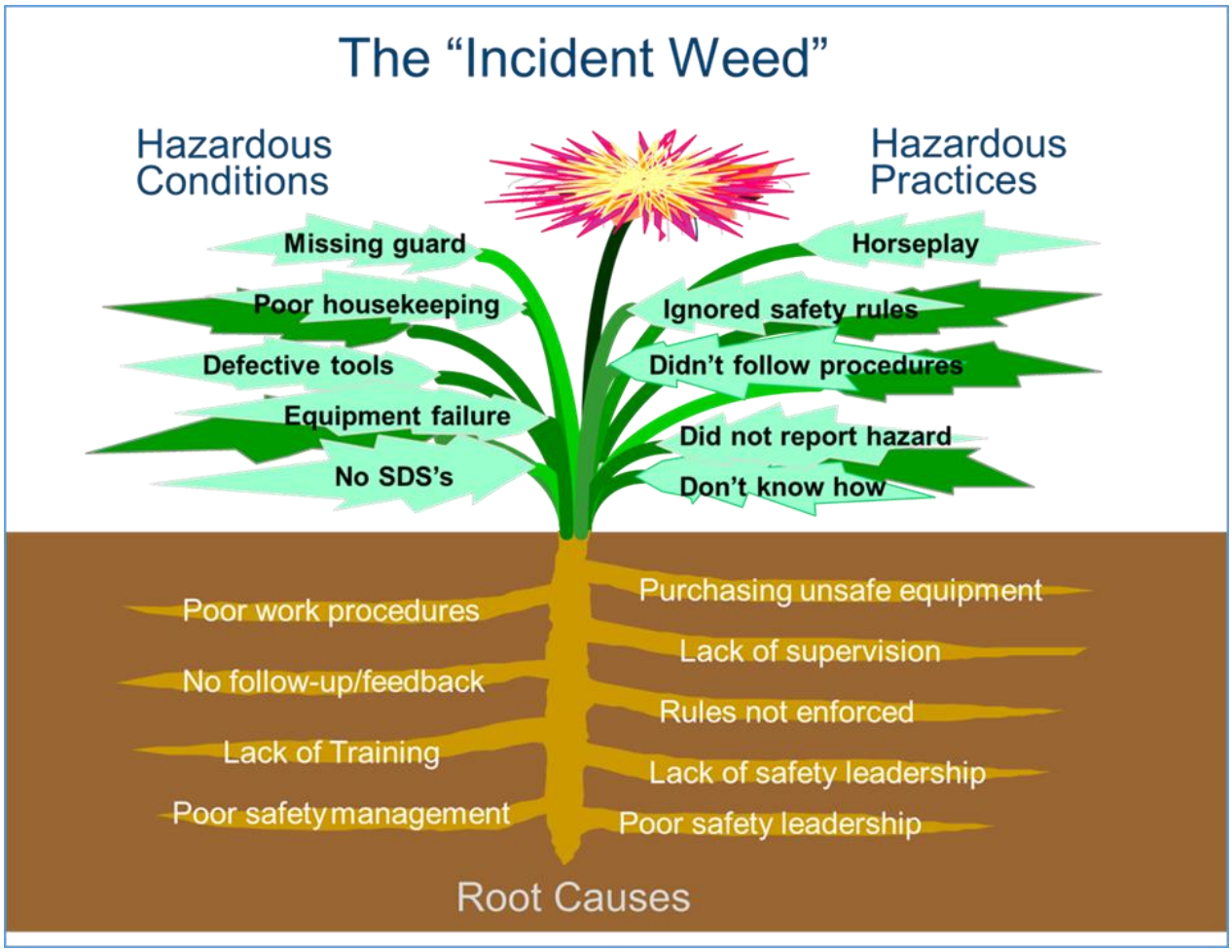


Fault tree analysis is a tool that looks at potential failures within a system. A fault tree analysis looks at what happens to another part of the system when one part or another factor changes. This type of analysis can also be useful in identifying and evaluating potential root causes of an incident as well as other possible outcomes that could have occurred.

Many checklists and other tools, including software, are available as well for use in determining root causes.

Source: http://asq.org/quality-progress/2002/03/problem-solving/what-is-a-fault-tree-analysis.html

Creating a timeline of the incident can be useful in pinpointing where root causes occurred. It helps to work backwards from the incident to determine a sequence of events. For each event identified, ask "Five whys" to determine what root causes could have contributed to the final incident.



Exercise: In groups, create a sequence of events to identify root causes for the following case study. Be prepared to share findings with the class.

CONLIN CASE STUDY:

Mary Alice Conlin - Application Case Study

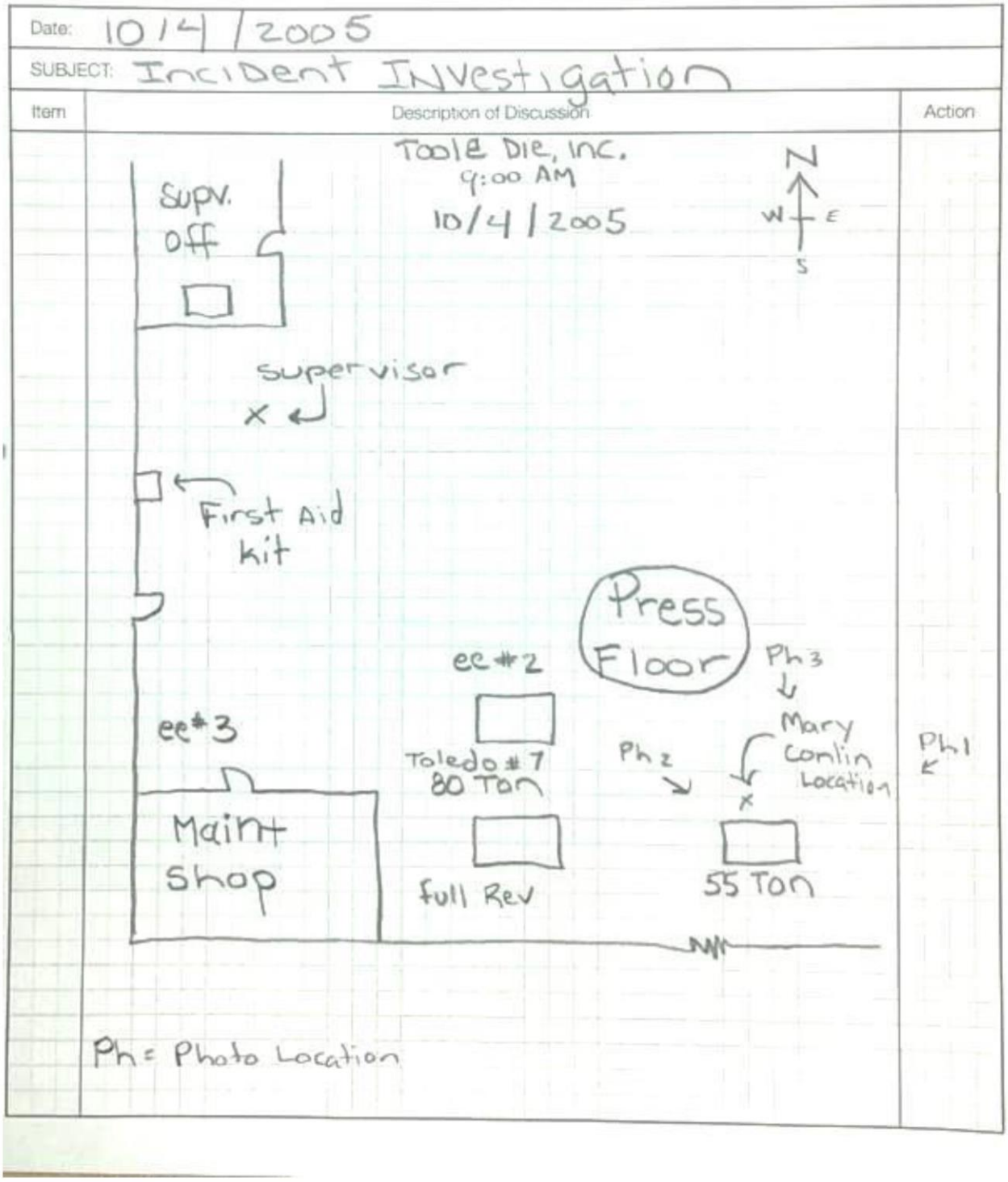
The accident occurred on a Walsh 55-ton full-revolution mechanical power press at Tool and Die, Inc. Mary Alice Conlin, 37 years old, lost three fingers and part of her thumb on the right hand when she reached into the press to extract a part.

The maintenance man did not secure the shield a week before the injury event as he was in a hurry to get to another machine breakdown. Besides, he needed a part to fix this press and had to wait for the part to be ordered.

The press was foot pedal operated with a point of operation guard. The foot pedal was not guarded. The guard had a flip-up plexi-glass shield on the front that was hinged, not fixed in place (secured). The employee (Mary Alice) was removing a piece of metal that was stuck in the die. The guard was flipped open. While removing the scrap part, she accidentally stepped on the foot pedal. The employee lost 3 fingers and part of her thumb on the right hand. She had been a press operator for 3 days.

At approximately 9:00 a.m. on October 5, 2015, employee #2 heard Mary Alice scream and ran to her while shouting for help. Employee #3, the designated first aider, heard the scream. He grabbed his first aid kit and ran to Mary Alice to render first aid treatment. At approximately 9:05 a.m., employee #2 ran to the supervisor's office and the rescue squad was called. Approximately 10 minutes later, the rescue squad arrived and rendered treatment to stabilize Mary Alice who appeared to be in shock. The rescue squad transported Mary Alice to the emergency room at 9:30 a.m.

CONLIN CASE STUDY: SKETCH OF THE SCENE –



Conlin - Case Study Interviews

MARY ALICE CONLIN

This was my first week on the job working as a press operator, although I had been hired a month ago. I was very motivated working in this plant because jobs are hard to get and I have two children to support. I received a one-hour orientation when I was hired one month ago on company rules from the personnel department. I don't remember anything about safety in the orientation. This week, I was assigned to run a press and went to meet Paul, my new supervisor. He gave me a quick walk-around tour of the department. I was directed to place parts into the die, step on the pedal to start the press, remove the parts and check every 10th part against a sample to make sure they were okay. I was on piecework and the more parts I did, the more money I could make. Things went ok the first 2 days, but, the day of the accident, I guess I wanted to make a good impression and was busy making parts when one part jammed. I reached into the area to remove the jammed part. I accidentally stepped on the foot pedal and the press caught my hand. I screamed when I saw my hand. Then, I must have passed out, cause that's all I remember until I woke up in the hospital.

PAUL JOHNSON, THE SUPERVISOR

Mary Alice was a new hire who had been assigned to my department as a press operator. This was her first week in my department. I had given her a tour of our department the first day and she was doing fine. I didn't have time to go through all the safety stuff, and besides, she had already completed safety orientation. I told her to be careful and use common sense. The day of the accident, I was busy working on some production problems. I don't know why she did not have the maintenance people lockout the equipment; I thought she had been trained on this. The next thing I know, Jerry is running into my office to tell me to call 911. I immediately called 911 and 10 minutes later the EMT's arrived and gave her first aid. They then took her to the hospital where she was admitted. I guess I'll have to get a new press operator.

TONY SMITH, THE MAINTENANCE MAN

Sure, I removed the guard. I had to fix the press and the guard was in the way. I did not have a part and my boss had to order it. We had an emergency break- down in another department and I had to get there. I put the guard back, but I didn't have time to secure it. Everyone should know not to stick their hand in the press.

Determine the Sequence of Events. Consider: How did each step contribute to the incident? Then, ask "why" to get to a cause.

Event : _____ Why?_____

Event : _____ Why?_____

Event : _____ Why?_____

Event : _____ Why?_____

Event : _____ Why?_____

Event : _____ Why?_____

Event : _____ Why?_____

Event : _____ Why?_____

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Event : _____ Why?_____

FactSheet OSHA EPA

The Importance of Root Cause Analysis During Incident Investigation

The Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) urge employers (owners and operators) to conduct a root cause analysis following an incident or near miss at a facility.[1] A root cause is a fundamental, underlying, system-related reason why an incident occurred that identifies one or more correctable system failures.[2] By conducting a root cause analysis and addressing root causes, an employer may be able to substantially or completely prevent the same or a similar incident from recurring.

OSHA Process Safety Management and EPA Risk Management Program Requirements

Employers covered by OSHA's Process Safety Management (PSM) standard are required to investigate incidents that resulted in, or could reasonably have resulted in, catastrophic releases of highly hazardous chemicals.[3] Similarly, owners or operators of facilities regulated under EPA's Risk Management Program (RMP) regulations must conduct incident investigations.[4]

During an incident investigation, an employer must determine which factors contributed to the incident, and both OSHA and the EPA encourage employers to go beyond the minimum investigation required and conduct a root cause analysis. A root cause analysis allows an employer to discover the *underlying* or *systemic*, rather than the *generalized* or *immediate*, causes of an incident. Correcting only an immediate cause may eliminate a symptom of a problem, but not the problem itself.

How to Conduct a Root Cause Analysis

A successful root cause analysis identifies all root causes—there are often more than one.

Consider the following example: A worker slips on a puddle of oil on the plant floor and falls. A traditional investigation may find the cause to be "oil spilled on the floor" with the remedy limited to cleaning up the spill and instructing the worker to be more careful.[5] A root cause analysis would reveal that the oil on the floor was merely a symptom of a more basic, or fundamental problem in the workplace.

An employer conducting a root cause analysis to determine whether there are systemic reasons for an incident should ask:

- Why was the oil on the floor in the first place?
- Were there changes in conditions, processes, or the environment?
- What is the source of the oil?
- What tasks were underway when the oil was spilled?
- Why did the oil remain on the floor?
- Why was it not cleaned up?
- How long had it been there?
- Was the spill reported?[6]

It is important to consider all possible "what," "why," and "how" questions to discover the root cause(s) of an incident.

In this case, a root cause analysis may have revealed that the root cause of the spill was a failure to have an effective mechanical integrity program—that includes inspection and repair—that would prevent or detect oil leaks. In contrast, an analysis that focused only on the immediate cause (failure to clean up the spill) would not have prevented future incidents because there was no system to prevent, identify, and correct leaks.

Properly framing and conducting a root cause investigation is important for a PSM or RMP-related incident. Take, for example, an incident involving an overfill and subsequent leak of hydrocarbons from a relief valve system that ignites and kills multiple workers. Prior to this fatal incident, there were multiple flammable releases from the relief valve system, but none ignited. The employer previously performed

incident investigations on the non-lethal incidents and determined that operator error was the cause of the overfills and subsequent leaks. However, a proper root cause investigation would have looked deeper into the incident, and determined that funding cuts—which resulted in a deficient mechanical integrity program and malfunctioning instrumentation—led to a dangerous situation that operators could not have prevented. Had these root causes been previously identified, the employer could have taken action to improve the mechanical integrity program and repair the instrumentation system, preventing the fatal incident.

Benefits of Root Cause Analysis for Employers

Conducting a thorough investigation that identifies root causes will help to prevent similar events from happening again. In this way, employers will reduce the risk of death and/or injury to workers or the community or environmental damage.

By using root cause analysis to prevent similar events, employers can avoid unnecessary costs resulting from business interruption, emergency response and clean-up, increased regulation, audits, inspections, and OSHA or EPA fines. Regulatory fines can become costly, but litigation costs can often substantially exceed OSHA and EPA fines. Employers may find that they are spending money to correct immediate causes of incidents that could have been prevented, or reduced in severity or frequency, by identifying and correcting the underlying system management failure.

Finally, when an employer focuses on prevention by using root cause analysis, public trust can be earned. Employers with an incident free record may be more likely to attract and retain high performing staff. A robust process safety program, which includes root cause analysis, can also result in more effective control of hazards, improved process reliability, increased revenues, decreased production costs, lower maintenance costs, and lower insurance premiums.

Root Cause Analysis Tools

Below is a list of tools that may be used by employers to conduct a root cause analysis. The tools are not meant to be used exclusively. Ideally, a combination of tools will be used.

- Brainstorming
- Checklists
- Logic/Event Trees
- Timelines
- Sequence Diagrams
- Causal Factor Determination

For simpler incidents, brainstorming and checklists may be sufficient to identify root causes. For more complicated incidents, logic/event trees should also be considered. Timelines, sequence diagrams, and causal factor identification are often used to support the logic/event tree tool.

Regardless of the combination of tools chosen, employers should use these tools to answer four important questions:

- **What** happened;
- **How** did it happen;
- **Why** it happened; and
- **What** needs to be corrected.

Interviews and review of documents, such as maintenance logs, can be used to help answer these questions. Involving employees in the root cause investigative process, and sharing the results of those investigations, will also go a long way toward preventing future similar incidents.

OSHA and EPA encourage employers to consult the resources below for more information about how to use these tools.

Resources

- *The Guidelines for Investigating Chemical Process Incidents*, Center for Chemical Process Safety, 2nd Edition, 2003.
- *DOE Guideline-Root Cause Analysis Guidance Document*, U.S. Department of Energy, Washington, DC, February 1992. http://energy.gov/sites/prod/files/2013/07/f2/nst1004.pdf
- *DOE Handbook-Accident and Operational Safety Analysis*, Volume I: Accident Analysis Techniques, July 2012, pp. 2-40–2-86. http://energy.gov/sites/prod/files/2013/09/f2/DOE-HDBK-1208-2012_VOL1_update_1.pdf

- *Quality Basics-Root Cause Analysis for Beginners*, James L. Rooney and Lee N. Vanden Heuvel, Quality Progress, July 2004, pp. 45–53. https://www.env.nm.gov/aqb/Proposed_Regs/Part_7_Excess_Emissions/NMED_Exhibit_18-Root_Cause_Analysis_for_Beginners.pdf
- *Incident [Accident] Investigations, A Guide for Employers, A Systems Approach to Help Prevent Injuries and Illnesses*, U.S. Department of Labor, Occupational Health and Safety Administration (OSHA), December 2015. www.osha.gov/dte/IncInvGuide4Empl_Dec2015.pdf
- OSHA's Incident Investigation Topics Page. www.osha.gov/dcsp/products/topics/incidentinvestigation
- OSHA's On-site Consultation Program offers free and confidential occupational safety and health services to small and medium-sized businesses in all states and several territories, with priority given to high-hazard worksites. On-site consultation services are separate from enforcement and do not result in penalties or citations. To locate the OSHA On-Site Consultation Program nearest you, call 1-800-321-6742 (OSHA) or visit www.osha.gov/dcsp/smallbusiness/index.html
- *The Business Case for Process Safety*, 2nd ed., Center for Chemical Process Safety, 2006. www.aiche.org/ccps/documents/business-case-process-safety. This resource describes how a strong PSM program has helped businesses succeed.
- *Mini Guide to Root Cause Analysis*, Geoff Vorley, Quality Management and Training Limited, Guilford, Surrey, UK, 2008. www.root-cause-analysis.co.uk/images/Green%20RCA%20mini%20guide%20v5%20small.pdf
- *Root Cause Analysis*, Washington State Department of Enterprise Services, Olympia, WA, 2016. www.des.wa.gov/services/Risk/AboutRM/enterpriseRiskManagement/Pages/rootCauseAnalysis.aspx. This resource describes additional root cause tools and training opportunities.
- *How to Conduct an Incident Investigation*, National Safety Council, 2014. http://www.nsc.org/JSEWorkplaceDocuments/How-To-Conduct-An-Incident-Investigation.pdf
- Accident Investigation Basics, Washington State Department of Labor & Industries, 2009. http://www.lni.wa.gov/safety/trainingprevention/online/courseinfo.asp?P_ID=145
- NFPA 921: *Guide for Fire and Explosion Investigations*. http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&code=921

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[1] The statements in this document are intended as guidance only. This document does not substitute for EPA and OSHA statutes or regulations, nor is it a regulation itself. It cannot and does not impose legally binding requirements on the agencies, states, or the regulated community, and the measures it describes may not apply to a given situation based upon the specific circumstances involved. This guidance does not represent final agency action and may change in the future.

[2] *Guidelines for Investigating Chemical Process Incidents*, Center for Chemical Process Safety, 2nd ed., p. 179.

[3] 29 CFR 1910.119.

[4] 40 CFR 68.

[5] *Guidelines for Investigating Chemical Process Incidents*, Center for Chemical Process Safety, 2nd ed., p. 180.

[6] Id.

This is one in a series of informational fact sheets highlighting OSHA programs, policies, or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

U.S. Department of Labor

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DOC FS-3895 10/2016

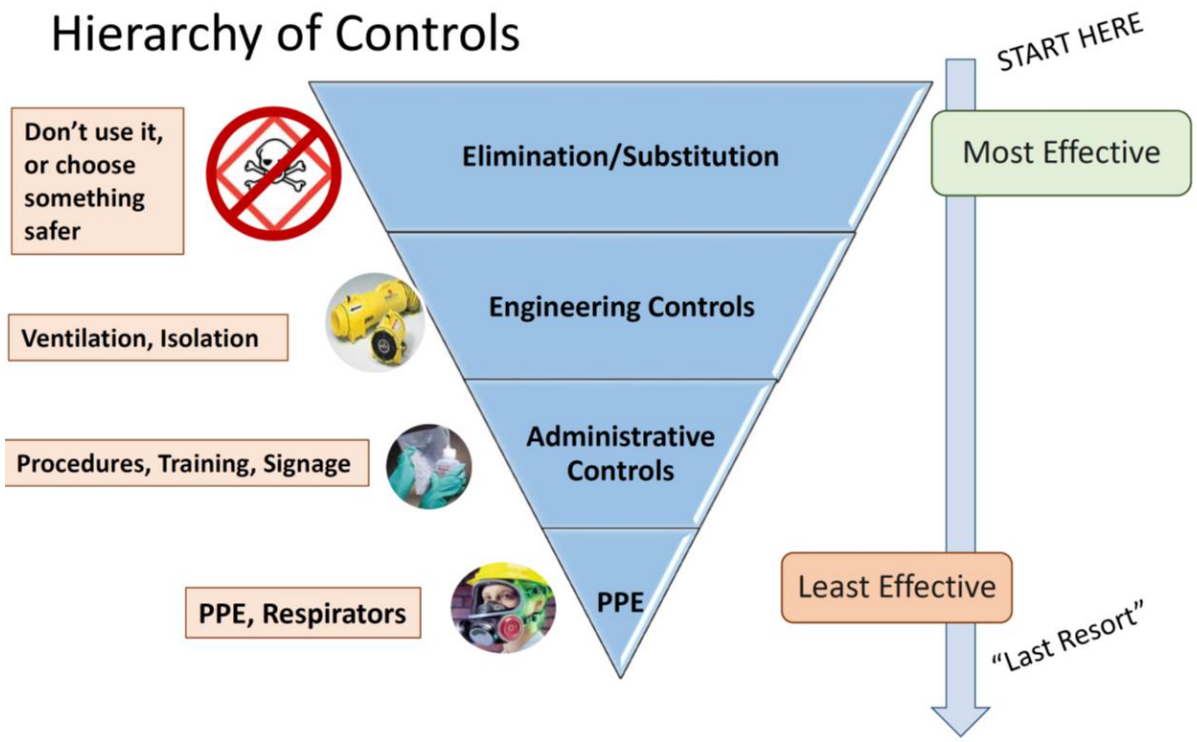
Step 4: Implement Corrective Actions

Once root causes, or workplace hazards, are identified through the incident investigation process, controls must be identified and acted upon.

An incident investigation is generally thought of as a *reactive* safety process, because it is initiated only after an accident has occurred. However, addressing effective control strategies they will eliminate or reduce future incidents, transforming the incident investigation into *a proactive* safety process.

Hierarchy of Controls

A "control" is used to prevent or reduce a hazard in order to prevent or limit impacts to human health and well being. However, not all controls are equally effective, or equally feasible. Traditionally, a hierarchy of controls is used when considering effectiveness of hazard controls. Controls at the top of the hierarchy are more effective than controls lower on the hierarchy.



1. Elimination or Substitution

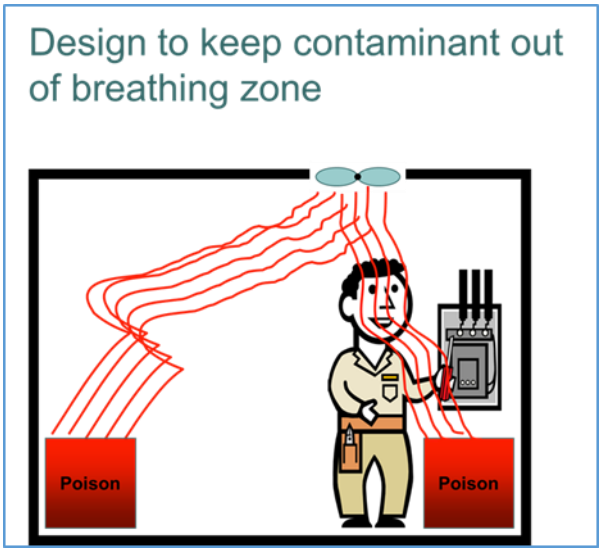
Elimination is the most effective means to control a hazard. If the hazard is gone, it cannot cause injury. Elimination is a simple control when projects are at the design stage. However, for an existing process, elimination of a hazard may require significant change to equipment or work processes, and can become fairly costly disruptive to the point that it is less feasible as an option.

If a hazard cannot be eliminated, it may be possible to at least substitute the hazard with something less hazardous. However, employers must be careful to ensure that the substitution does not also create hazards.

2. Engineering Controls

If the hazard cannot be eliminated, or substituted with something less hazardous, engineering controls are considered next. Engineering controls isolate people from the hazard. Examples of engineering controls include:

- Guards around moving equipment;
- Local exhaust ventilation to remove airborne contaminants;
- An air conditioned room where operating controls are located to protect workers from heat exposure;
- Vibration dampening to reduce noise generation.



Engineering controls effectively protect people from hazards; however, they are often expensive to implement.

When considering engineering controls, it is important to select a control that actually reduces the hazard. A poorly thought out engineering control may fail to reduce the hazard, or as a worst case, actually increase a worker's exposure to the hazard.

Enclosure or isolation is an engineering control that separates workers from the hazard. Examples of enclosures include:

- Placing a "box" around moving parts or machinery;
- Providing a room where operators can monitor processes remotely, away from a hazardous work area;
- A system which completely contains toxic materials throughout an entire work process;
- A glove box to enclose work with dangerous microorganisms, radioisotopes, or toxic substances;
- Complete containment of noise, heat, or pressure-producing materials especially designed for those purposes.

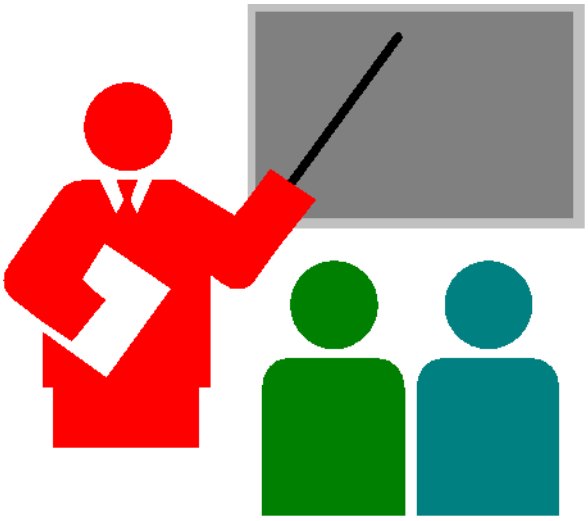
Barriers or local ventilation are examples of controls that are appropriate when the hazard cannot be removed, replaced, or enclosed. This type of control does not eliminate potential worker exposure to the hazard even during normal operations. Examples include:

- Ventilation hoods in laboratory work;
- Machine guarding, including electronic barriers;
- Isolation of a process in an area away from workers;
- Baffles used as noise-absorbing barriers;
- Nuclear radiation shields or heat shields.

Since the actual hazard may still continue to provide a risk, additional controls may also be needed. This may include controls that are lower on the hierarchy, such as administrative controls or PPE.

3. Administrative Controls

Administrative controls change the way people work. Administrative controls document processes that a company follows to eliminate hazards and/or minimize employee exposures;



Examples of administrative controls include:

- Signs;
- Training;
- Job Rotation;
- Work Practices ;
- Procedures/Standard Operating Procedures;
- Established Safe Work Routines.

Administrative controls are less costly than engineering controls, and generally faster to implement. However, they rely on people to following the administrative controls. If that does not happen, the administrative control does not effectively protect workers from the hazard.

4. Personal Protective Equipment

Personal Protective Equipment (PPE) is equipment that is worn by the worker to protect from hazards. Examples of PPE include:

- Hard hats;
- Gloves;
- Safety glasses or goggles;
- Safety shoes;
- Visibility wear;
- Personal Flotation Devices.

29 CFR 1910.132 Personal Protective Equipment and related state standards establish requirements for PPE programs in the workplace. Before providing PPE, an employer must conduct a hazard assessment. PPE is then selected to match the hazards. The hazard assessment must identify specific PPE, including specific ratings for the selected PPE. Employees must then receive training on PPE.

If employees use respirators, the employer must establish a respiratory protection program that includes respirator selection, medical evaluations, employee training, fit testing, and establishment of a written program as mandated in 29 CFR 1910.134 or the related state standard.

Employers may view PPE as a simple and inexpensive solution to a workplace hazard; however, use of PPE brings many additional OSHA requirements into play.

Example:

Incident: A maintenance employee on the third shift went into the vacuum pump room and immediately became very ill. He opened the doors to air out the room. The next morning, on first shift, two employees entered the room and also felt ill. One went to the doctor, who diagnosed carbon monoxide poisoning. Air measurements were taken with the confined space monitor after the employee called from the clinic, which showed that carbon monoxide levels far exceeded the PEL.

Observation: The vacuum pump had overheated and had no oil.

Unsafe conditions:

- Elevated carbon monoxide levels;
- Old equipment;
- Overheating pump;
- Enclosed room without ventilation;
- Equipment had failed;
- Oil level empty;
- Burning oil;

Human factors:

- A technician on the 2nd shift had noticed that the vacuum pump was overheating but did not report it;
- Preventative maintenance records revealed that the last scheduled oil change had not been completed, due to staff shortage;
- The supervisor had purchased a grade of oil that was not rated for vacuum pumps in order to meet cost saving mandates.

Corrective actions:

- Rebuild the vacuum pump;
- Provide ventilation to the vacuum pump room;
- Purchase correct grade of oil;
- Technicians to review PM (preventative maintenance) procedures;
- Maintenance supervisor to implement a process to track completion of PMs;
- Re-write purchasing procedures to eliminate chances of inadvertently purchasing the wrong supplies;
- Implement a procedure for briefings between shifts.

Exercise: Fill out an incident investigation report with corrective actions for the Mary Conlin incident.

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Incident Investigation Report

Name of Employee: _____ Job Title_____

Department_____ Date/Time of Incident: _____

Location of Incident_____

Description of Injury(ies). (If no injury write "none" or "near miss"

Investigation Conducted by:

Name:	Title:

Provide a detailed description of the incident. Include relevant events leading up to, during, or after the incident. Attach pages if needed.

Root Causes: What factors lead to this incident? Consider environmental factors. Work practices, work layout, training, supervision, and other potential causes. Attach pages if needed.

1.	
2	
3	
4	
5	
6	
7	

Recommended Corrective Actions:

Completed by:

_____ _____

Name Date

Reviewed by:

_____ _____

Name Date

Safety Committee Review

Several states, including Oregon and Washington in Region 10, require employers establish employee/employer safety committees. Safety committees can provide extremely valuable input into the effectiveness of the corrective actions that are identified on incident investigation reports.

Example:

Incident: Employee was installing a belt on a piece of equipment. He had to hold two clips open and slip the belt in between. His finger slipped and was caught between the clips.

Corrective Action: Re-train the employee on the procedure.

Safety Committee Review: Why does this incident keep happening? Shouldn't we have a tool to hold the clips open so the employee can keep his fingers out of the way of the clips?

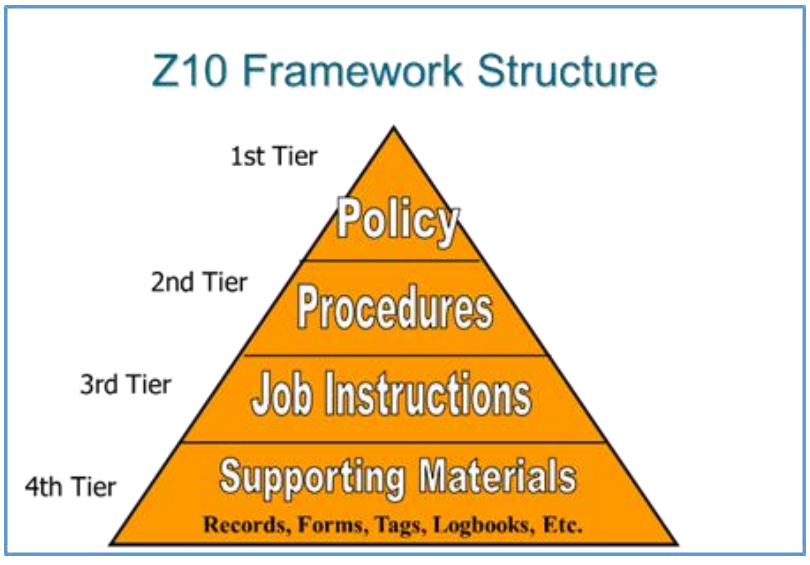
Safety Representative Report at the next monthly meeting: It turns out there is a tool! One of the more senior employees in the shop remembered using it a long time ago to keep the clips open. Now it was being used to prop the door open.

Follow up: Employees began using the tool and there were no further incidents of this type.

Fix the System

Corrective actions may be of limited preventative value if they do not address the root cause(s) of the incident.

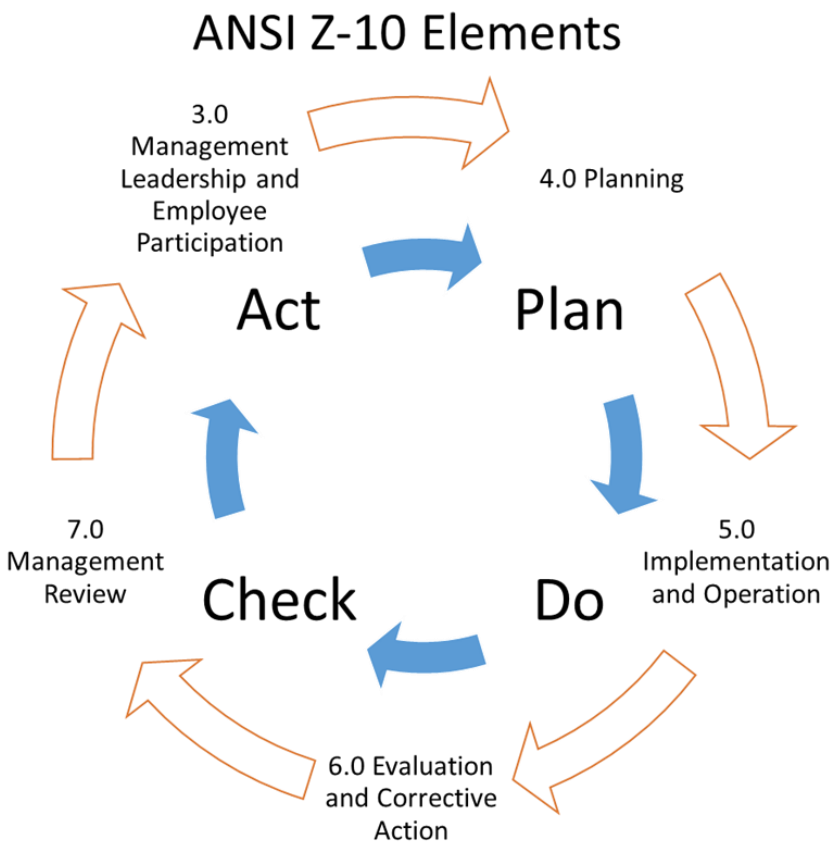
Policies, procedures, and training (or lack of such policies, procedures, and training) influence decisions made by employees and actions that are taken.



Incident investigation findings can provide feedback to safety program administrators on the effectiveness of the employer's Safety and Health Management System. Lessons learned from incident investigation can be used as part of the continuous improvement process that makes policies, programs, plans, processes and procedures more effective.

Safety programs benefit from continuous improvement. Any safety program should include multiple checks in the cycle, such as audits, program evaluations, and program reviews to ensure that the program is working as intended. When hazards are identified and controlled, they should be periodically evaluated to make sure that they effectively control the hazards.

Workplace incidents are opportunities for improvement. Even after root causes are identified and corrected, the program should be evaluated to determine how these root causes came to be.

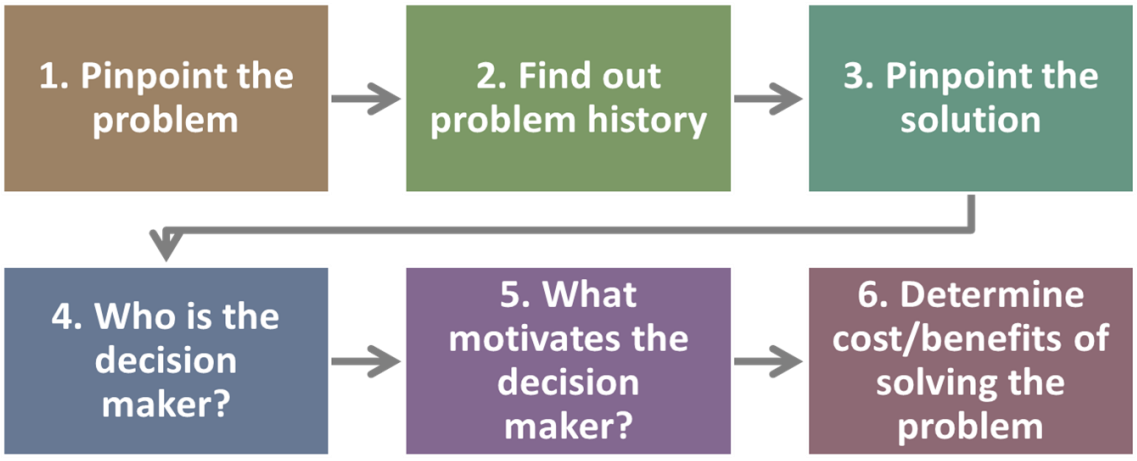


Exercise/Discussion: Based on what you have learned through investigating the Mary Conlin incident, what changes would you make to policies, procedures, and training programs that support the safety program?

Justify Recommendations

The goal of incident investigation is to identify root causes of incidents, and identify corrective actions that can be taken to prevent similar incidents from occurring in the future. However, this result is achieved only when these corrective actions are actually implemented. It is important to have buy in from company stakeholders in order to implement recommendations. Recommendations have to be justified. Some things to consider in building a justification include:

- Pinpoint the problem. What exactly is the problem? What are the specific hazardous conditions and events that were allowed to exist leading to the problem? What program components (such as policies, processes, rules, or training) allowed the conditions and practices to exist?
- What is the history of the problem? Have similar incidents occurred previously? If so, probability for similar incidents is highly likely to certain. What are previous direct and indirect costs for similar incidents? How have similar incidents affected production and morale?
- Pinpoint the specific solution. What are the solutions that would correct the problem? What are the specific engineering, administrative and PPE controls that, when applied, will eliminate or at least reduce exposure to the hazardous conditions? What are the specific system improvements needed to ensure a long term fix?
- Who is the decision maker? Who is the person to approve, authorize, and act on the corrective measures? What are the possible objections that he/she might have? How do you address any objections that may be raised?
- What motivates the decision maker?
    - Legal concerns? If so, emphasize penalties and citations.
    - Financial concerns? Emphasize cost versus benefit.
    - Bad publicity? Emphasize changes to customer perceptions.
    - Ethics? Emphasize employee morale and public relations.



Cost Benefit Analysis

In considering cost versus benefit, it is important to consider the estimated costs and benefits of taking the corrective action, as contrasted with the possible costs and harm that might occur if the hazardous conditions remain. Consider responsibilities that are identified in OSHA regulations and how the employer plans to respond. What message is sent to the workforce as a result of the action, or inaction, taken?

Return on Investment

A Return on Investment (ROI) is cost divided by total investment.

Consider the guardrail installation scenario from Module 1: We determined that the direct and indirect costs combined resulted in a total cost of $84,090 if a fall occurred as a result of the missing guardrail.

The total cost to purchase and install the guardrail is estimated at $1,500. In other words, this is a $1,500 investment to prevent an $84,090 loss.

To calculate a return on investment, first calculate the Cost as Total Cost minus Total Investment

$84,090
- 1,500
$82,590

Then, divide the Cost by Total Investment:

$82,590
$ 1,500
=55.06
=5506%

Hazard Control Plan

Hazard Control is a key element in an employer's health and safety management system. Hazards may be identified through site inspections, job safety analysis, employee reports, incident investigations, or other activities. It is important to establish a process to track implementation of identified controls, and

to evaluate the controls after they are implemented to ensure that they provide the intended protection.

A corrective action tracking log is a useful tool to ensure that the corrective actions identified on incident investigation reports are implemented and evaluated to ensure that they meet the intended result. The tracking log can be reviewed at monthly safety committee meetings or leadership committee meetings to ensure that implementation of the corrective actions continues to move forward. Newly identified hazards are added to the list, and items are removed after they are completed.

Sample Action Item Tracking Log:

Hazard:	**Corrective Action**	**Responsible Person**	**Status (date)**	**Assigned Completion Date**

Key Course Takeaways

- Incidents are preventable.
- Incident investigations must focus on finding the root causes of the incident.
- An effective incident investigation:
    - Uses a systems approach to help prevent future injuries and illnesses;
    - Promotes a positive workforce and allows for everyone to work together;
    - Encourages all parties to "own" the conclusions and recommendations in order to jointly work toward implementing corrective actions in a timely manner.