



Public Education

Accident and Incident Investigation

The Student Workshop Manual





Oregon OSHA Public Education Mission:

We provide knowledge and tools to advance self-sufficiency in workplace safety and health

Consultative Services:

- ◆ Offers no-cost on-site assistance to help Oregon employers recognize and correct safety and health problems

Enforcement:

- ◆ Inspects places of employment for occupational safety and health rule violations and investigates complaints and accidents

Public Education:

- ◆ Provides free training online, workshops, and training tools

Standards and Technical Resources:

- ◆ Develops, interprets, and provides technical advice on safety and health standards
- ◆ Creates booklets, pamphlets, and other materials to assist in the implementation of safety and health rules

Field Offices:

Portland: 503-229-5910

Salem: 503-378-3274

Eugene: 541-686-7562

Medford: 541-776-6030

Bend: 541-388-6066

Pendleton: 541-276-2353



Salem Central Office:

Toll Free number in English: 800-922-2689

Toll Free number in Spanish: 800-843-8086

Website: www.osha.oregon.gov



This class is based on Oregon rules and may not be the same for all states. Consult with www.osha.gov or your state's OSHA entity for more information.

Attending an Oregon OSHA workshop or completing an online course may provide important information and guidance but may not meet all employer training requirements. The following materials should not be considered a substitute for any provisions of the Oregon Safe Employment Act or for any standards issued by Oregon OSHA.

It remains the employer's responsibility to ensure all training requirements are met, including any site-specific information.

For more information, contact Oregon OSHA at:

503-378-3272 (Main Office)
800-922-2689 (English—toll free)
800-843-8086 (Spanish—toll free)
ed.web@oregon.gov

Please Note: This material, or any other material used to inform employers of compliance requirements of Oregon OSHA standards through simplification of the regulations should not be considered a substitute for any provisions of the Oregon Safe Employment Act or for any standards issued by Oregon OSHA.



- ▶ **Introduction**..... 1
 - The Basics..... 2
 - The Six Step Process..... 8
- 1. Step 1 – Securing the Scene**..... 9
- 2. Step 2 – Collecting the Facts**..... 11
 - Photographing the Scene..... 12
 - Sketching the Scene..... 14
 - Taking Video of the Scene..... 15
 - Document Review..... 16
 - Interviewing Techniques..... 17
- 3. Step 3 – Developing the Sequence of Events**..... 23
- 4. Step 4–Determining the Cause**..... 28
 - Weed out the Cause of Injuries and Illness..... 29
 - Steps in Cause Analysis..... 30
 - Exercise: Digging up the Roots..... 31
- 5. Step 5 – Recommending Improvements**..... 32
 - Engineering and Management Controls..... 34
- 6. Step 6 – Writing the Report**..... 36
 - The Seven Elements of a Safety Program..... 37
- 7. Appendix – Reference Materials**..... 38
 - A – Average Cost for Disabling Claims..... 40
 - B – Summary of Accident Investigation Rules..... 41
 - C – Incident/Accident Analysis Plan..... 43
 - D – Incident/Accident Team Makeup..... 45
 - E – Direct Causes of Injury..... 48
 - F – Sample Accident Investigators Kit..... 49
 - G – Sketching Techniques..... 50
 - H – Forms of Energy..... 51
 - I – Accident Types and Examples..... 52
 - J – Sample Accident Report Form..... 53
 - K– Accident Investigation Checklist..... 55



What to Expect From our Workshop

This workshop is one part of a *blended learning program*, which also includes our online Accident Investigation course. To participate in our online course please visit the Oregon OSHA Public Education website: <https://osha.oregon.gov/Pages/topics/accident-investigation.aspx>

The intent of this workshop is to help you gain the basic skills necessary to conduct an effective accident investigation at your workplace. We will work through the three primary tasks of the accident investigator, discuss employer responsibilities, and learn how to write an accident report.

The three primary tasks of the accident investigator are to:

- ◆ Gather useful information
- ◆ Analyze the facts surrounding the accident
- ◆ Write the accident report

Most of the information about conducting an accident investigation will come directly from the workshop as we discuss issues, answer basic questions, and complete group activities. If you have prior experience in accident investigation, we hope you will participate actively so others may benefit from your valuable input.

Ultimately, we want you to leave this workshop with the skills to conduct an accident investigation and properly complete an accident investigation report with confidence. Experience will give you the expertise to fine-tune those skills.



The Basics

Accident Investigation Definitions

Accident:	An unexpected incident or exposure that results in an injury or illness to an employee or property damage.
Incident:	Often referred to as a near miss, this is an event that could have resulted in personal harm or property damage.
Lost-time injury:	When an employee gets injured while carrying out a work task for the employer and unable to come in for their next shift or a longer stretch of time.
Hazard:	Things or objects that have the potential to harm or cause illness.
Physical Exposure:	An exposure which you must come into contact with to cause an injury or illness.
Environmental Exposure:	You must be in the general area to be affected, examples include: loud noises, chemicals fumes, etc..
Direct cause:	The result of the condition and/or behavior. The final event which produces an accident.
Surface cause:	Hazardous conditions and unsafe employee/management behaviors that caused the accident.
Root cause:	The underlying reason the surface cause exists.
Personal Protective Equipment (PPE):	Equipment worn to minimize exposure to a variety of hazards. An example of PPE includes gloves or hard hats.
Unsafe conditions:	Unsafe equipment/tools which directly cause the accident.
Unsafe actions:	Harmful behaviors which contributed to the accident, this can include gaps in safety training for staff.
System weaknesses:	Underlying inadequate or missing programs, plans, policies, processes, and procedures that contributed to the accident.



Identify the Proper Steps of Conducting an Accident Investigation

The purpose of investigating accidents is to determine the following information –

- ◆ The cause of the accident
- ◆ What changes need to be implemented
- ◆ If this affects other work areas and locations
- ◆ What policies and procedures may need to be changed

Where do workplace injuries come from?

- ◆ Unpreventable acts account about 2% of all workplace accidents
- ◆ Hazardous conditions account for less than 10% of all workplace accidents
- ◆ Hazardous practices account for the majority (approximately 98%) of all workplace accidents

The unsafe practices should not be confused for blaming employees, this error rate. Unsafe practices often come down to employee training, equipment issues, work volume, time crunches, etc..

Numbers according to SAIF Loss Control Approach

"Actions or conditions which are unsafe but perhaps have not been recognized as being unsafe or actions which have been recognized as unsafe but which are common occurrences."

"The responsibility for correction of unsafe work practices and conditions in the workplace lies with YOU."





What's the difference between an accident and an incident?

The two key conditions must exist before an accident occurs are:

H _____ and E _____

Unpreventable acts: Only _____ % of all workplace accidents are thought to be unpreventable. Heart attacks and other events that could not have been known by the employer are examples of unpreventable events. Employers may try to place most of their injuries into this category. They justify these beliefs with such comments as: "He just lifted the box wrong and strained his back. What could we do?" Unfortunately, they are excuses for not looking into the "root cause" of the injury.

System failure: Safety management system failures account for at least _____ % of all workplace accidents. System failures refer to inadequate design or performance of safety programs that provide training, resources, enforcement, and supervision.

No-fault accident analysis

Often accident investigators confuse accident investigation with criminal investigation, where blame is the end result. When this occurs, it obstructs the investigative process because witnesses may fear punishment. A no fault analysis looks for deeper causes within the safety management system of an organization.



Laying the Foundation

Accidents can be a time of confusion and high emotions. Having a written accident analysis plan which establishes what to do and when to do it can reduce decision making time. Include in your plan:

- ◆ Who should be notified of an accident
- ◆ Who is authorized to notify outside agencies (police, fire, etc.)
- ◆ Who is assigned to conduct investigations (include training they will need)
- ◆ Who receives and acts on investigation reports
- ◆ Expectation of time frames for conducting the investigation and follow-up actions such as correction of the unsafe condition or action



It is important to secure the scene, however, before securing the scene if you have to wait to secure the scene due to emergency responders providing aid, begin making initial observations.

Always make sure the scene is safe before you enter.

It is important to act quickly and start taking pictures or video as soon as possible as material evidence can be displaced while emergency responders tend to the injured. Also, witnesses memories may change over time, impacted by conversations with other witnesses and the passing of time can make details fade. Finally, securing the scene also includes making the area safe until the root cause can be determined and safety controls have been implemented.



Reporting to Oregon OSHA:

If the accident results in a serious injury or a fatality, you are required to report it to Oregon OSHA. The reporting timelines are as follows:

- ◆ Fatality/serious injury*: 8 hours
- ◆ Catastrophe**: 8 hours
- ◆ All in-patient hospitalizations: 24 hours
- ◆ Amputations and avulsions that include bone or cartilage loss, and the loss of an eye: 24 hours

* Fatalities and some serious injuries are investigated by Oregon OSHA.

When does the clock start? As soon as the employer knows one or more of the above conditions have occurred. Do not wait to report, call 24 hours a day, 7 days a week.

** A catastrophe consists of 2 or more fatalities or 3 or more employees hospitalized from the same event.

To better understand the Oregon OSHA reporting rules, take our [online class](https://osha.oregon.gov/edu/courses/Pages/recordkeeping-and-reporting-online-course.aspx).
<https://osha.oregon.gov/edu/courses/Pages/recordkeeping-and-reporting-online-course.aspx>

Call your OSHA Field Office to report:

Portland: 503-229-5910

Salem: 503-378-3274

Eugene: 541-686-7562

Medford: 541-776-6030

Bend: 541-388-6066

Pendleton: 541-276-2353



Salem Central Office:

Toll Free number in English: 800-922-2689

Toll Free number in Spanish: 800-843-8086

Web site: www.osha.oregon.gov



The object of every investigation is to prevent it from happening again. Therefore, accident investigation is not about placing blame, but about finding the facts

The Six-Step Process

The basic steps for conducting an accident investigation are:

Gather Information	Step 1	Securing the scene
	Step 2	Collecting facts about what happened
Analyze the Facts	Step 3	Developing the sequence of events
	Step 4	Determining the cause
Implement Solutions	Step 5	Recommending improvements
	Step 6	Writing the report

Throughout this workbook we'll look into each of these six sections more closely, breaking down the process within each step.

The rules behind accident investigation can be found on Oregon OSHA's website at: <https://osha.oregon.gov/OSHARules/div1/437-001-0760.pdf>



Step 1 - Securing the Scene

Securing the scene is one of the most important aspects of accident investigation, it ensures others will not get injured and helps you to investigate what caused the accident. After all injured people have been cared for, it's time to secure the scene:

- ◆ Cordon off the area
- ◆ Turn off or block equipment
- ◆ Notify affected people
- ◆ Survey the scene for:
 - ◆ Accident victims
 - ◆ Involved machines, vehicles, and equipment
 - ◆ Objects broken, damaged, or struck
 - ◆ Tracks or skid marks from equipment
 - ◆ Surface defects
 - ◆ Fluid spills/stains
 - ◆ Contaminated materials
 - ◆ Debris
 - ◆ Distractions
 - ◆ Safety devices used, not used, or failed
 - ◆ Position of equipment
 - ◆ Terrain (rocky, wet, slippery, frozen, cluttered, etc.)
 - ◆ Witnesses to the accident and their locations' at the time
 - ◆ Time of day, lighting, and weather



Also, as you document the scene, note anything which you may wish to collect and submit for sampling.



Securing the Scene

Your primary goal in this step is to secure the accident scene to ensure no one else gets hurt then to safeguard the evidence.



When is it appropriate to begin the investigation?

What are effective methods to secure an accident scene?

Securing an accident scene is critically important, however the victim is always the first consideration. If you have to wait to secure the scene until medical attention has been provided, you can still begin noting initial observations.



Step 2 - Collecting the Facts

Here's what we'll cover:

The various methods for collecting and documenting:

- ◆ Direct cause of injury—The result of the condition and/or behavior
- ◆ Hazardous conditions and unsafe employee/management behaviors (surface causes) that produced the accident
- ◆ System weaknesses (root causes) that produced the surface causes for the accident

We'll also cover:

- ◆ Putting together your investigators kit
- ◆ Obtaining initial statements
- ◆ Reviewing documents
- ◆ Capturing the scene



The investigator's kit:

Time is of the essence when an accident occurs. Don't lose an opportunity to gather important facts because you don't have a pencil or camera at hand. Create an investigator's kit and have it ready.

Here's what your kit may include:

- ◆ Camera
- ◆ Tape measure
- ◆ Clipboard, paper, pencil
- ◆ First aid kit
- ◆ Flashlight
- ◆ Personal protective equipment appropriate to your business
- ◆ Report forms
- ◆ Paper/plastic bags with ties
- ◆ Sketching/Drawing Template
- ◆ Warning/barricade tape
- ◆ Video Equipment (optional)
- ◆ A duffle bag to store these items

Be sure to test your equipment on a regular basis and make sure to have extra batteries on hand.

Your **smartphone** can be a handy tool to use for photos and video.



Documenting and Gathering Information

The most effective strategy is to *document as much as possible*, even if you question relevancy. It's easy to discard clues or leads if they prove not useful to the investigation.

While at the scene its important to make a note of all your observations. With clipboard in hand, take notes and try to involve all the senses. What do you see? What equipment, tools, materials, machines, structures appear to be broken, damaged, struck or otherwise involved in the accident? Look for gouges, scratches, dents, and smears.

If vehicles are involved, check for tracks and skid marks. Look for irregularities on surfaces. Are there any fluid spills, stains, contaminated materials, or debris? What about the environment? Were there any distractions or adverse conditions caused by weather?



Photographing the scene

Workshop attendees have commented that they often wish they had taken more pictures. Here are a few things to keep in mind as you visually document the scene:

- ◆ Start with distance shots, then move in closer
- ◆ Take photos at different angles to show the relationship of objects and details
- ◆ Take panoramic photos to help present the entire scene
- ◆ For close pictures, place an item of known dimensions in the photo to show scale, such as a ruler or dollar bill



Take notes for each photo. Identify the type of photo, date, time, location, subject, weather conditions, such as temperature or precipitation, measurements, and importance of the photo. Your notes should be included in the appendix of the report along with your photos. Finally, identify the person taking the photo.

Optional: you can video the scene after providing help for injured persons

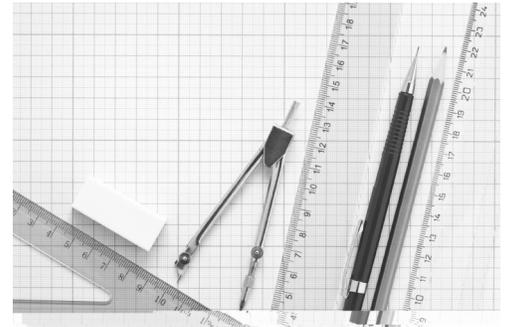


Sketching the Scene

Accident scene sketches are crucial because they compliment the information in photos.

They are also good for indicating distances between the elements of the scene.

It's important to be as precise and inclusive as possible when making sketches. Sketching templates, for example, have several common figures available to trace.



Each sketch should include this information:

- ◆ Basic scene information: date, time, location, identity of objects, victims, etc.
- ◆ Positions: measurements that establish position of evidence, equipment, and where people were standing
- ◆ Location: where each photo was shot in relationship to the scene
- ◆ Indication where north is on your sketch
- ◆ Add the statement "not to scale"

Sketch in every element of the scene, here are a few pointers.

- ◆ Make sketches large and clear
- ◆ Print legibly
- ◆ Indicate directions
- ◆ Always tie measurements to a permanent point, such as a telephone pole or building
- ◆ Mark where people and equipment was located
- ◆ Include a key to explain any acronyms, symbols, or any special indicators, such as color



Taking Video at the Scene

If you have equipment or the smartphone option, begin video recording the scene as soon as emergency responders are providing care to the accident victim, without impeding their work. The video will pick up details and conversations that can add valuable information to your investigation. Be sure to check with your supervisor to see what your company policy is regarding video recording.



Some important points to remember when video recording the scene include:

- ◆ Get the lay of the land by standing back a distance and zooming into the scene
- ◆ Capture the entire scene 360 degrees to establish location by panning the camera slowly in a circle
- ◆ Narrate what is being filmed: describe objects, size, direction, location, etc.
- ◆ If a vehicle was involved, record the direction of travel both coming and going
- ◆ Discuss with your company management about capturing the witness descriptions on camera, staff may need to sign a waiver
- ◆ Review the video when possible to note any information you may have missed

Some additional video tips to keep in mind:

- ◆ Be careful with the zoom function; upon later review, it can be difficult to tell what is being captured if you're too close
- ◆ Shoot from a few different angles to capture different aspects of the scene
- ◆ If you're going to be recording for long stretches, consider using a tripod to reduce shaking and fatigue
- ◆ Transfer the digital video to your work computer for storage so it remains on file for further review
- ◆ Have plenty of storage devices like memory cards, discs, or tapes on hand along with an extra battery
- ◆ When recording, make sure the auto focus function has been turned on to increase the clarity of video



Reviewing Documents

You can get a lot of information from reviewing relevant documents and records. Some documents and records you might want to review include:

- ◆ Oregon OSHA form 300 and DCBS form 801
- ◆ Maintenance records - to determine the maintenance history of the tools, equipment or machinery involved in the accident and manuals
- ◆ Training records for the past 36 months and refresher classes - to determine the quantity and quality of the training received by the victim and others
- ◆ Employee handbook and standard operating procedures (SOP) - to determine the formally established steps in the procedures
- ◆ Job hazard analysis (JHA) - to determine if any hazards had been identified
- ◆ Safety programs and safety policies, plans, rules - such as your emergency program, to determine their presence and adequacy, discipline procedures, and emergency medical plan
- ◆ Work schedules - to determine if the victim might have been fatigued or otherwise overworked
- ◆ Safety committee minutes - to determine the history of any discussion of related hazardous conditions, unsafe behaviors, quarterly inspection reports, and follow up status
- ◆ Copies of accident investigations
- ◆ Personnel records of victim(s) and others involved
- ◆ Names of crew members and other witnesses along with the organizational chart, and names of others who do similar work
- ◆ Safety inspection results along with PPE requirements for the task



What type of helpful information might you find in safety committee meeting minutes:



Collecting the Facts

One of the biggest challenges facing an investigator is to determine what is *relevant* to what happened, *how* it happened, and *why* it happened.

Identifying the facts that answer these questions is the purpose of an effective investigation.

Once the scene has been secured, it's important to begin collecting the facts from as many sources as possible.

Be careful with preconceived notions of what happened. If you think you know what happened, you may subconsciously disregard important evidence.



List methods to document the accident scene and collect facts about what happened:

<hr/>	<hr/>

What documents will you be interested in reviewing and why?

<hr/>	<hr/>



Interviews should occur as soon as possible, once the emergency is being addressed.

Initial Statements

Get initial statements from the witnesses, these include a quick overview of what they saw, others persons that could give you more information about materials, equipment used at the time of the accident, and anything that may have been moved or disturbed while tending to the accident victim. If time does not allow for initial statements, conduct a full investigative interview.



Interviewing Overview

When is it best to interview and why?

Who should we interview and why?

Where should we conduct the interview?



Conducting Interviews

The purpose of the collecting facts is to gain an accurate and comprehensive picture of what happened by capturing all pertinent facts, interpretations, and opinions. Your job, as the interviewer, is to construct a story using the various accounts of the accident, and other evidence.



Remember to keep the goal of the interview in mind —

***To determine the cause of the accident
so that similar events will not occur.***

Ensure that interviewees understand this as well.

When conducting your interviews try to make your witnesses as comfortable as possible. If you can, conduct your interviews in private. Try to find an office or meeting room where you can talk comfortably and without interruptions. Keep in mind too that, for some traumatic events, the scene can provide a distraction or emotional trigger. Because investigations can lead to policy changes and/or administrative action, don't promise confidentiality.

Approach the investigation with an open mind. If you have preconceived ideas about the individuals or the facts, it will be obvious to the interviewees. It's important to let the individual you're interviewing talk. Ask background information first (name, job, etc.). Then ask the witness to tell you what happened.

Do:	◆ Be friendly
	◆ Understanding
	◆ Ask one question at a time
	◆ Remain open minded
	◆ Ask open ended questions
	◆ Put aside enough time

Don't:	◆ Ask leading questions
	◆ Interrupt
	◆ Put witnesses on the defensive
	◆ Rush
	◆ Promise confidentiality
	◆ Make expressions (facial, verbal of approval or disapproval)



Who to Interview?

Compiling a witness list is very important, some people you may want to interview include:

- ◆ Witnesses: gather all of the details of what occurred; Witnesses are those that were present during any part of the accident
- ◆ The victim: determine which actions the victim took leading up to and including the accident
- ◆ Co-workers and others doing the similar work or those who work near the victim: establish if the safety procedures for the job were being followed when the accident occurred, and to what the normal practices are for the task the victim was completing
- ◆ Direct supervisor: understand the background information on the victim and to get procedural information about the task that was being performed
- ◆ Management: discuss policies and procedures specific to the victims job to determine if all were followed, also plan to talk to the victims direct supervisor to discuss performance and any concerns or discipline
- ◆ Safety committee members: determine if there is a history of this safety issue
- ◆ Training department: gather information on the quantity and quality of training the victim and others have received for the task specific to the accident
- ◆ Personnel department: collect information on the victim's and others' work history, discipline, and appraisals
- ◆ Maintenance personnel: understand the background and maintenance on involved equipment/machinery
- ◆ Police: if they responded to the scene or filed a report
- ◆ The victim's spouse and family: they may have insight into the victim's state of mind or any issues that might be affecting them the day of the accident
- ◆ Other persons: anyone else with any information related to the accident





Interviewing Tips and Points to Remember

- ◆ Prepare your questions ahead of time
- ◆ Introduce yourself and state the purpose of the interview
- ◆ Ask clarifying questions
- ◆ No group interviews, conduct them one on one
- ◆ Listen, let the witness speak freely
- ◆ Do not argue, be considerate and calm
- ◆ Have witnesses verify the accuracy of your sketch and note their location at the time of the accident
- ◆ Avoid yes or no questions by asking: who, what, where, when, why and how questions
- ◆ If not recoding the interview, take notes as carefully and casually as possible
- ◆ Write down impressions and judgments immediately after the interview
- ◆ Recap and summarize main points of the interview
- ◆ Accidents happen fast, witnesses may only recall a few key points
- ◆ Arrange for a quiet room with a table and chairs to foster a relaxed atmosphere
- ◆ Allow yourself time to take and review notes at the end of each interview
- ◆ Get exact facts: time, sequence of events, and what was seen and heard



Sample Questions to Consider:

- ◆ Who has provided you the training or instruction on this process/procedure?
- ◆ How was the job or process different on the day of the accident?
- ◆ How are workers held accountable for safety?
- ◆ How is information about safety and health shared with you?
- ◆ What effort does the company take to ensure employees are held accountable for working safely?
- ◆ Is there a history of prior accidents or near misses?



Cooperation, not intimidation, is key to a successful interview.

Effective Interviewing Techniques:

What should we say?

Why?

What should we do?

Why?

What should we not say?

Why?

What should we not do?

Why?



Step 3 - Developing the Sequence of Events

The next two steps help you organize and analyze the information gathered so that you may accurately determine the surface and root cause(s).

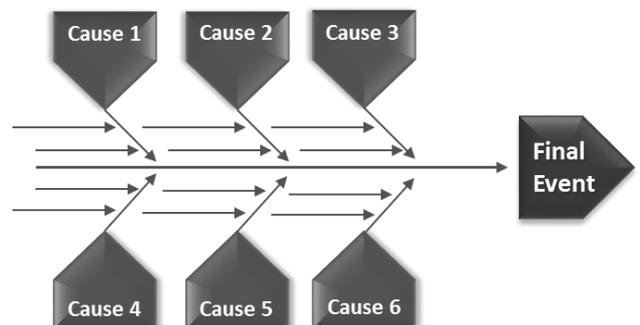
An accident is the final event in an unplanned process

In this step, we take the information gathered in step 2, *Collecting the Facts*, to determine the events prior to, during, and after the accident. Once the sequence of events have been developed, you can then study each factor/action to determine unsafe conditions (things or circumstances which directly caused the accident) and unsafe actions.

- ◆ Actions taken or not taken that contributed to the event
- ◆ System weaknesses, such as underlying inadequate or missing programs
- ◆ Plans, policies, processes, and procedures that contributed to the accident

When we understand that an accident is actually the final event in an unplanned process, we'll naturally want to know what the preceding events/factors were.

The key is to take the information gathered and arrange it so that we can accurately determine what initial conditions and/or actions turned the planned work process into an unsafe environment.



The Fishbone Theory used to analyze cause.

There are many schools of thought about how to do that. Some point to a single cause, whereas others root out multiple causes. Whichever method is used at your workplace, the important thing is to identify the sequence of events, the causes that led up to the final accident, and the root cause(s) that created the unsafe condition/action.



Developing the Sequence of Events (Continued)

Each event in the unplanned accident process identifies:

- » **Actor** – An individual or object that directly influenced the flow of the sequence of events:
 - An actor *initiates a change* by performing or failing to perform an action.
 - An actor may participate in the process or merely observe the process.
- » **Action** – Something that is done by an actor. Failure to act should be thought of as an act in itself.
 - Actions may or may not be observable.
 - An action may describe something that is done or not done.

When describing events, first indicate the actor, then tell what the actor does. Remember, the actor is the doer, not the person or object having something done to them. For instance, take a look at the statement below:

Stacy unhooked the harness from the anchor.

In this example, Stacy is the actor and unhooking is the action. The harness and anchor, although objects, are not actors because they are not performing an action. Rather, something is being done to them.

Circle the actor and action:

- 1) Beverly slipped on a banana peel.
- 2) As Beverly lay on the floor, a brick fell on her head.
- 3) Sam discovered Beverly unconscious on the floor and immediately began initial first aid procedures.





Team Exercise - What Happened Next?

Use the information gathered about the accident your instructor described in the interview exercise to construct a sequence of events.



Instructions: Identify the events leading up to and including the injury event. Be sure that you include only one actor and one action in each event. Decide where you want to start the sequence, then merely ask, "What happened next?"

Event 1:	_____

Event 2:	_____

Event 3:	_____

Event 4:	_____

Event 5:	_____

Event 6:	_____

Event 7:	_____

Event 8:	_____

Event 9:	_____



Developing the Sequence of Events

Below is an example of the sequence of events that was prepared for a serious injury investigation conducted by Oregon OSHA:

1. At approximately 9:00 AM Employee #1 was standing at the in-feed side of the table saw.
2. Employee #1 was cutting a piece of maple, measuring approximately 3/4 x 1/4 x 5' 0" long, into three lengths.
3. Employee #1 had made two cuts and was making the final 1/4 cut.
4. Employee #1 placed the board on the table saw and, with the 10 inch blade, ran the board through its entire length.
5. Employee #1 reached over to remove the off cut (waste).
6. Employee #1 lightly touched the off cut with his hand when the piece, 3/4 x 1/4 x approx. 5' long, hit the spinning blade.
7. The blade was spinning at 3500 rpm and caused the piece to shoot toward employee #1.
8. The piece cut through employee #1's leather belt and waistband and went into his abdomen to a depth of approximately 4 1/2 inches.
9. Employee #1 fell backward and, as he was falling to the floor, was able to pull the piece from his abdomen.
10. Employee #2, a cabinet maker in the next room, heard the saw and the cries of the victim.
11. Employee #2 and ran to employee #1.
12. After assessing the employee #1's wound, employee #2 called to the shop supervisor who was only a short distance away.





Developing the Sequence of Events

Sequence of events continued...

13. The supervisor, after seeing the injury, called 911 then attempted to make the victim comfortable until the ambulance arrived.
14. Paramedics stabilized the victim and transported him to Providence Hospital, where he underwent surgery for the injury.

This example is brief and there may be other related factors/causes that indirectly contributed to the accident.

However, it does give you sufficient descriptive detail to paint a mental picture of the actors and acts that occurred immediately prior to and including the accident.

Remember, once the sequence of events are developed, you can then study each factor/action to determine:

- ◆ **Unsafe conditions:** things and situations that directly caused the accident
- ◆ **Unsafe actions:** actions taken or not taken that contributed to the accident
- ◆ **System weaknesses:** underlying inadequate or missing programs, plans, policies, processes, and procedures that contributed to the accident

We'll talk more about these in the next section, Determining the Cause.



Step 4 - Determining the Cause

Most accidents have more than one cause. If you address as many of the causes as possible, you're more likely prevent future accidents.

Multiple cause theory -

Behind every accident there are many contributing factors, causes, and sub-causes. These factors combine in a random fashion causing accidents. We must find the fundamental root causes and remove them to prevent a recurrence.

(Dan Petersen, Safety Management: A Human Approach, ASSE , p. 10-11)



What may be the cause(s) of the accident according to the multiple causation theory?

What might be the solution to prevent the accident from recurring?

What are the strengths & weaknesses of this approach?

WEED OUT THE CAUSES OF INJURIES AND ILLNESSES

DIRECT CAUSES OF INJURIES/ILLNESS

BURNS **STRAINS** **CUTS**

SURFACE CAUSES

BROKEN TOOLS
LACK OF TIME
HORSEPLAY
CREATE A HAZARD
TOO MUCH WORK

SURFACE CAUSES

IGNORE A HAZARD
FAILS TO REPORT INJURY
FAILS TO TRAIN
FAILS TO INSPECT

INADEQUATE TRAINING
NO DISCIPLINE PROCEDURES
NO POLICY TO INVOLVE EMPLOYEES
NO INSPECTION PROCESS

TRAINING NOT IMPLEMENTED
EMPLOYEE INPUT NOT ENCOURAGED
DISCIPLINE NOT ADMINISTERED
INSPECTIONS NOT DONE

ROOT CAUSES OF THE ACCIDENT



Steps in Cause Analysis

1. Analyze the injury event to identify and describe the direct cause of injury.
Examples:

Event 1: Laceration to right forearm resulting from contact with rotating saw blade.

Event 2: Contusion from head striking against/impacting concrete floor.

2. Analyze events occurring just prior to the injury event to identify those conditions and behaviors that caused the injury (primary surface causes) for the accident.

Examples:

Event 1: An unguarded saw blade (condition or behavior?).

Event 2: Working at elevation without proper fall protection (condition or behavior?).

3. Analyze conditions and behaviors to determine other specific conditions and behaviors (contributing surface causes) that contributed to the accident.

Examples:

Event 1: Supervisor not performing weekly area safety inspection (condition or behavior?).

Event 2: Fall protection equipment missing (condition or behavior?).

4. Analyze each contributing condition and behavior to determine if weaknesses in carrying out safety policies, programs, plan, processes, procedures and practices (inadequate implementation) exist.

Examples:

Event 1: Safety inspections are being conducted inconsistently.

Event 2: Safety is not being adequately addressed during new employee orientation.



Exercise - Digging up the Roots

1. Enter the direct cause of injury within the top rectangle below from the previous exercise.
2. List one *hazardous condition* and *unsafe behavior* from the sequence of events your group developed.
3. Determine contributing surface causes for the hazardous condition and unsafe behavior.
4. Determine implementation and design root causes for contributing surface causes.

Direct Cause of Injury: <hr style="border: none; border-top: 1px solid black;"/>	
Hazardous Condition: <hr style="border: none; border-top: 1px solid black;"/> Contributing Conditions: <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/>	Unsafe Behavior: <hr style="border: none; border-top: 1px solid black;"/> Contributing Conditions: <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/>
Design Root Causes: <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/>	Implementation Root Causes: <hr style="border: none; border-top: 1px solid black;"/> <hr style="border: none; border-top: 1px solid black;"/>



Step 5 - Recommending Improvements

Accident causes are addressed by recommending *controls* and *safety system improvements*. Controls eliminate or reduce the direct and surface cause(s) of an accident. Safety system improvements address the root cause, specifically, missing or inadequate safety system policies and procedures that contributed to the accident.

Types of controls

Controls are used to eliminate or reduce the direct and surface cause(s) that contributed to an accident.

1. Engineering controls
2. Management/Administrative controls
3. Personal Protective Equipment (PPE)



Engineering Controls: physical fixes that eliminate the unsafe condition itself without relying on human behavior for effectiveness. This can include:

- ◆ *Redesigning* the unsafe condition so it no longer poses a risk.
- ◆ *Enclosing* the unsafe condition.
- ◆ *Substituting* with a different item.
- ◆ *Replacing* the item for a safer version.

The basic concept behind engineering controls is that, to the extent feasible, the work environment and the job itself should be designed to eliminate hazards or reduce exposure to hazards.

Engineering controls are based on the following broad principles:

1. If feasible, *design the facility, equipment, or process to remove the hazard and/or substitute something that is not hazardous or is less hazardous.*
 - ◆ Redesigning, changing, or substituting equipment to remove the source of excessive temperatures, noise, or pressure;
 - ◆ Redesigning a work station to relieve physical stress and remove ergonomic hazards; or
 - ◆ Designing general ventilation with sufficient fresh outdoor air to improve indoor air quality and generally to provide a safe, healthful atmosphere.



Types of controls (*Continued*)

Personal protective equipment (PPE): should be used in conjuncture with the other controls. When exposure to hazards cannot be engineered completely out of normal operations or maintenance work, and when safe work practices and administrative controls cannot provide sufficient additional protection from exposure. PPE on it's own is not recommended as the only control because it only provides a barrier between the worker and the unsafe condition and depend on the workers actions to be successful.

PPE includes such items as:

- ◆ Face shields
- ◆ Steel-toed shoes
- ◆ Safety glasses
- ◆ Hard hats
- ◆ Knee Guards
- ◆ Leather aprons
- ◆ Mesh gloves
- ◆ Life jackets
- ◆ Respirators
- ◆ Hearing protection
- ◆ Safety goggles
- ◆ Harness
- ◆ Gloves
- ◆ Welding Shields
- ◆ Visibility vest
- ◆ Heat protection

Between requiring guards and PPE you might reduce or eliminate the unsafe condition, but it is entirely dependent on proper actions and diligent management.

Note: Many tasks require the use of PPE in accordance with Safety Data Sheets (SDS) and Oregon OSHA requirements.

Interim Measures:

When a hazard is recognized, the preferred correction or control cannot always be accomplished immediately. However, in virtually all situations, interim measures can be taken to eliminate or reduce worker risk. These can range from taping down wires that pose a tripping hazard to actually shutting down an operation temporarily. The importance of taking these interim protective actions cannot be overemphasized. There is no way to predict when a hazard will cause serious harm, and no justification to continue exposing workers unnecessarily to risk.

Surface causes are symptoms of a weak safety system. Missing or inadequate *safety system components* are often the root causes for workplace accidents. Because Every effort should be made to improve your safety management system. Safety system improvements can include: improving your safety policy to clearly establish safety responsibility and accountability, including safety checklists in your work processes, and a safety inspection process which includes both employees and management.



Types of controls (*Continued*)

Additional Engineering Controls:

1. If feasible, *design the facility, equipment, or process to remove the hazard.*
2. If removal is not feasible, *enclose the hazard to prevent exposure in normal operations.*
 - ◆ Complete enclosure of moving parts of machinery;
 - ◆ Complete containment of toxic liquids or gases;
 - ◆ Glove box operations to enclose work with dangerous microorganisms, radioisotopes, or toxic substances; and
 - ◆ Complete containment of noise, heat, or pressure-producing processes.
3. Where complete enclosure is not feasible, establish *barriers or local ventilation to reduce exposure* to the hazard in normal operations. Examples include:
 - ◆ Ventilation hoods in laboratory work;
 - ◆ Machine guarding, including electronic barriers;
 - ◆ Isolation of a process in an area away from workers, except for maintenance work; and
 - ◆ Baffles used as noise-absorbing barriers.

Management/Administrative Controls: can eliminate or reduce the frequency and duration of exposure to unsafe conditions by addressing workers actions.

- ◆ Managing work practices includes changes in work procedures and practices as in developing and implementing Job Hazard Analysis (JHA).
- ◆ Managing work schedules includes shift job rotations, breaks, and locations to reduce exposure.

Since administrative controls address workers actions (the things they do or don't do), they tend to only reduce the exposure to the unsafe condition.



Team Exercise: Recommending Corrective Action

Purpose: In this exercise you'll develop and recommend immediate actions to correct the surface causes of an accident.

Instructions: Using the hierarchy of control strategies as a guide, determine corrective actions that will eliminate or reduce one of the hazardous conditions or unsafe behaviors identified on page 30. Write your recommendations below.

Recommendations: _____

Improvement Strategies to Fix the System:

Make improvements to policies, programs, plans, processes, and procedures in one or more of the following elements of the safety and health management system:

- | | | |
|--------------------------|----------------------------------|---------------|
| 1. Management Commitment | 4. Hazard Identification/Control | 7. Evaluation |
| 2. Accountability | 5. Incident/Accident Analysis | |
| 3. Employee Involvement | 6. Training | |

Making System Improvements might include some of the following:

- Writing a comprehensive safety and health plan including the above elements.
- Improving a safety policy to clearly establish responsibility and accountability.
- Changing training plan so that the use of checklists are taught.
- Revising purchasing policy to include safety consideration as well as cost.
- Changing the safety inspection process to include all supervisors and employees.



Step 6 - Writing the Report

As you write your report, remember your primary objective as an investigator is to uncover the causes that contributed to the accident. The accident report isn't about placing blame, your challenge is to be as objective and accurate as possible. Your findings and how you present them will shape perceptions and the corrective actions taken by management. We'll now look further into what the report includes and delve into each section.



What's in the report?

- ◆ Background
- ◆ Findings
- ◆ Summary
- ◆ Recommendations
- ◆ Description of the Accident
- ◆ Causes of the Accident
- ◆ Review and Follow-Up Actions
- ◆ Attachments

Background: The introduction of the report, it contains information and background about the victim, the company, the time and date the accident occurred, the location of the accident, and a general description of the specific work that was performed at the scene.

Description of the Accident: Tells the story of the events leading up to the accident, during the accident, and action taken after. It's important the narrative paint a clear picture answering what, where, why and how the accident happened.

Findings: Summarizes what the investigator found based on collected evidence and describes the unsafe conditions, unsafe actions, and system weaknesses. This also includes a list of violations or hazardous work practices and/or conditions. The findings are proven by evidence and documented in the report. This can include observations, documents (or the lack of needed documents), statements, interviews, photos, drawings, etc.. The findings section also describes: direct cause(s), surface cause(s), and root cause(s).



The Report is a standalone document and should answer all of the questions.

Direct Cause(s): Findings describe the unsafe conditions and/or actions that exist or occur immediately prior to the injury.

Surface Cause(s): Describe those conditions and actions that were in place or occurred at some point prior to the injury accident. These can include: conditions, activities, practices, and actions.

Root Cause (Implementing): System weaknesses (root causes) that produced the surface causes for the accident.

Recommendations: Describes corrective actions and effective recommendations, as well as ways to get rid of or reduce both surface and root causes. They also include estimated expenses for carrying out corrective actions and safety improvements. As you write the recommendations section, consider both short-term and long-term corrections.

Summary/Conclusion: This section contains a brief review of causes of the accident and recommendations for corrective actions. In your review, it's important to include the costs and benefits of corrective action(s). Including the above bottom line information will ensure your recommendations are understood.

Review and Follow-up Actions: This section describes action taken and/or repairs. It also describes the persons responsible for carrying out the corrective actions and safety system improvements.

Attachments: Contains photos taken throughout the investigation, videos, sketches, notes, and relevant documents.





The primary reason accident investigations fail to help eliminate similar accidents is that some report forms address only correcting surfaces causes. Root causes are often ignored. Let’s take a look at one format for ensuring an effecting report.

Sample Report:

Number _____ Date _____

Prepared by _____

SECTION I. BACKGROUND

Victim: _____

Witnesses (1) _____ Address _____ Phone (H) _____ (W) _____

Job Title _____ Length of Service _____

Witnesses (2) _____ Address _____ Phone (H) _____ (W) _____

Job Title _____ Length of Service _____

Accident Date _____ Time of Accident _____ Work shift _____

Date Accident Reported _____ Time Accident Reported _____ (a.m./p.pm)

WHERE Department _____ Location _____ Equipment _____

SECTION II. DESCRIPTION OF THE ACCIDENT (Describe the sequence of relevant events prior to, during, and immediately after the accident. Attach separate page if necessary)

Events prior to: _____

Injury event: _____

Events after: _____

SECTION III. FINDINGS AND JUSTIFICATIONS (Attach separate page if necessary)

Surface Cause(s) (Unsafe conditions and/or behaviors at any level of the organization)

Justification: (Describe evidence or proof that substantiates your finding.)

Root Cause(s) (Missing/inadequate Programs, Plans, Policies, Processes, Procedures)

Justification: (Describe evidence or proof that substantiates your finding.)



Sample Report Continued:

SECTION IV. RECOMMENDATIONS AND RESULTS (Attach separate page if necessary)

Corrective actions. (To eliminate or reduce the hazardous conditions/unsafe behaviors that directly caused the accident)

Results. (Describe the intended results and positive impact of the change.)

System improvements. (To revise and improve the programs, plans, policies, processes, and procedures that indirectly caused/allowed the hazardous conditions/unsafe behaviors.)

Results. (Describe the intended results and positive impact of the change.)

SECTION V. SUMMARY (Estimate costs of accident. Required investment and future benefits of corrective actions)

SECTION VI: REVIEW AND FOLLOW-UP ACTION (Describe equipment/machinery repaired, training conducted, etc. Describe system components developed/revised. Indicate persons responsible for monitoring quality of the change. Indicate review official.)

Corrective Actions Taken:	Responsible Individual:	Date Closed:
_____	_____	_____
_____	_____	_____

System improvements made:	Responsible Individual:	Date Closed:
_____	_____	_____
_____	_____	_____

Person(s) monitoring status of follow-up actions: _____

Reviewed by _____ **Title** _____

Date _____ **Department** _____

SECTION VII. ATTACHMENTS (Photos, sketches, interview notes, etc.)

The report is an open document until all actions are complete. For accident investigation to be effective, management must consider the findings and develop an action plan for taking corrective action and making system improvements. Finally, periodic evaluation of the quality of accident investigation and report is critical to maintaining an effective program.

Accident Investigation

Appendix



**Oregon 2007 and 2012
Average Cost For Disabling Claims**
(Partial List)

Event or Exposure Leading to Injury:	Number of Claims Closed:		Average Cost of Claim:	
	2007	2012	2007	2012
1. Overexertion	6,015	4,921	\$19,130	\$19,670
2. Bodily Reaction	3,126	2,476	\$16,780	\$19,680
3. Fall on Same Level	2,755	2,355	\$17,740	\$21,220
4. Struck by an Object	2,376	1,800	\$14,650	\$15,640
5. Repetitive Motion	1,856	1,668	\$22,190	\$25,050
6. Fall to Lower Level	1,668	1,183	\$29,700	\$32,440
7. Struck Against an Object	995	660	\$11,150	\$14,170
8. Caught in Equipment	993	654	\$16,830	\$21,530
9. Highway Accident	698	512	\$22,410	\$27,250
10. Assault by Person(s)	377	464	\$16,970	\$17,000

The above numbers have been provided by the Oregon Workers Compensation Division for the years of 2007 & 2012.

Summary of accident investigation rules

437-001-0052 Reporting an Occupational Fatality, Catastrophe, or Accident.

Employers shall inform the Administrator (or designee) of all fatalities or catastrophes within 8 hours, and accidents or injuries resulting in a hospital admission with medical treatment other than first aid within 24 hours after the employer receives notification.

437-001-0053 Preserving Physical Evidence at the Scene of an Accident.

(1) Employers, their representatives, or others shall not disturb the scene of a fatality or catastrophe other than to conduct the rescue of injured persons or mitigate an imminent danger until authorized by the Administrator (or designee), or directed by a recognized law enforcement agency.

(2) In order to preserve physical evidence at the scene of a fatality or catastrophe, the Administrator is authorized to limit the number of employer representatives or employee representatives accompanying the compliance officer during the documentation of the scene. The employer representative and employee representative must be provided an opportunity to document the scene prior to disturbance or removal of physical evidence.

(3) If an employer, their representative or others disturb the scene of a fatality or catastrophe other than to conduct the rescue of injured person(s) or mitigate an imminent danger before authorized by the Administrator or directed by a recognized law enforcement agency, a minimum penalty of \$200 may be assessed.

437-001-0170 Determination of Penalty - Failure to Report an Occupational Fatality, Catastrophe, or Accident.

Failure to report an occupational fatality, catastrophe, or accident: a penalty of not less than \$250, nor more than \$7,000 shall be assessed.

OAR 437-001-0765 (8) Accident investigation.

The safety committee must evaluate all accident and incident investigations and make recommendations for ways to prevent similar events from occurring.

OAR 437-001-0760 (3) Investigations of Injuries.

Each employer shall investigate or cause to be investigated every lost time injury.

The employer shall promptly install any safeguard or take any corrective measure indicated or found advisable.

At the request of Oregon OSHA:

- ◆ Furnish all pertinent evidence and names of known witnesses to an accident.
- ◆ Give general assistance in producing complete information which might be used in preventing a recurrence of such accident.
- ◆ Preserve and mark for identification, materials, tools, or equipment necessary to the proper investigation of an accident.

When to stop analyzing the incident

Excerpt - CPL 2.113 - Fatality Inspection Procedures

H. FATALITY/CATASTROPHE INVESTIGATIONS

2. Fatalities and catastrophes shall be thoroughly investigated to attempt to determine the cause of the events, whether a violation of OSHA safety or health standards related to the accident has occurred and any effect the standard violation has had on the occurrence of the accident.

J. POTENTIAL CRIMINAL INVESTIGATIONS

1. Section 17(e) of the Act provides criminal penalties for an employer who is convicted of having willfully violated an OSHA standard, rule or order when the violation caused the death of an employee.

2. Early in investigations the Area Director shall make an initial determination whether there is potential for a criminal violation, based on the following criteria.

a. A fatality has occurred.

b. There is evidence that an OSHA standard has been violated and that the violation contributed to the death.

c. There is reason to believe that the employer was aware of the requirement of the standard and knew it was in violation of the standard.

Instances when OR-OSHA investigators found the employer violated safety standards related to employee training and emergency evacuation procedures:

Some maintenance electricians in the melting plant were not adequately trained in the proper safety adjustment procedures for the electronic flow sensors installed in the cooling water system. The employer had installed electronic flow sensors approximately 18 months earlier, to replace mechanical switches with a history of malfunctions. Ten of the plant's 13 licensed electricians had received training on the new sensors, but the remaining three – including the individual who happened to respond when the furnace shut down during the night of the explosion – had not. **Proposed penalty: \$5,000.**

Employees working in the melting department who are responsible for setting up or operating the furnaces were not adequately trained for safe operation of the furnaces. While the employer's own safety and health procedures require that all employees newly assigned to a department receive very detailed safety training relating to the department and their specific duties, none of the melting plant personnel at the time of the explosion had ever received the training. **Proposed penalty: \$5,000.**

Exits were not maintained free of obstructions or impediments to full instant use in the event of an emergency. When the explosion occurred, employees used designated evacuation routes to leave the facility. A gate in a cyclone fence that blocked one of those routes was locked, so that two employees had to climb the fence. **Proposed penalty: \$1,500.**

Example accident analysis plan

1.0 General Policy

_____ considers employees to be our most valued asset and as such we will ensure that all incident and accidents are analyzed to correct the hazardous conditions, unsafe practices, and improve related system weaknesses that produced them. This incident/accident analysis plan has been developed to ensure our policy is effectively implemented.

_____ will ensure this plan is communicated, maintained and updated as appropriate.

2.0 Incident/Accident Reporting

2.1 Background. We can't analyze incidents and accidents if they are not reported. A common reason that they go unreported is that the incident/accident analysis process is perceived to be a search for the "guilty party" rather than a search for the facts. We agree with current research that indicates most accidents are ultimately caused by missing or inadequate system weaknesses. Management will assume responsibility for improving these system weaknesses. When we handle incident/accident analysis as a search for facts, the all employees are more likely to work together to report incidents/accidents and to correct deficiencies, be they procedural, training, human error, managerial, or other. Consequently, our policy is to analyze accidents to primarily determine how we can fix the system. We will not investigate accidents to determine liability. A "no-fault" incident/accident analysis policy will help ensure we improve all aspects of our manufacturing process.

2.2 Policy All employees will report immediately to their supervisor, any unusual or out of the ordinary condition or behavior at any level of the organization that has or could cause an injury or illness of any kind.

Supervisors will recognize employees immediately when an employee reports an injury or a hazard that could cause serious physical harm or fatality, or could result in production downtime. (See recognition program procedures)

2.3 _____ will ensure effective reporting procedures are developed so that we can quickly eliminate or reduce hazardous conditions, unsafe practices, and system weaknesses.

Example accident analysis plan *(Continued)*

3.0 Preplanning

Effective incident/accident analysis starts before the event occurs by establishing a well thought-out incident/accident analysis process. Preplanning is crucial to ensure accurate information is obtained before it is lost over the time following the incident/accident as a result of cleanup efforts or possible blurring of people's recollections.

4.0 Incident/Accident Analysis

4.1 All supervisors are assigned the responsibility for analyzing incidents in their departments. All supervisors will be familiar with this plan and properly trained in analysis procedures.

4.2 Each department supervisor will immediately analyze all incidents (near hits) that might have resulted in serious injury or fatality. Supervisors will analyze incidents that might have resulted in minor injury or property damage within 4 hours from notification.

4.3 The supervisor will complete and submit a written incident/minor injury report through management levels to the plant superintendent. If within the capability/authority of the supervisor, corrective actions will begin immediately to eliminate or reduce the hazardous condition or unsafe work practice the might result in injury or illness.

5.0 Management Responsibilities

5.1 When our company has an incident/accident such as a fire, release, or explosion emergency, management will:

1. Provide medical and other safety/health help to personnel;
2. Bring the incident under control, and
3. Investigate the incident effectively to preserve information and evidence.

5.2 To preserve relevant information the analyst will:

1. Secure or barricade the scene;
2. Immediately collect transient information;
3. Interview personnel.

6.0 Incident/Accident Analysis Team

6.1 Background: It is important to establish incident/accident analysis teams *before* an event occurs so that the team can quickly move into action if called on. The makeup of the team is another important factor affecting the quality of the analysis. We will appoint competent employees who are trained, and have the knowledge and skills necessary to conduct an effective analysis. Doing so will show management's commitment to the process.

6.2 Incident/Accident Analysis Team Makeup

Although team membership may vary according to the type of incident, a typical team analyzing an incident/accident may include:

1. A third-line or higher supervisor from the section where the event occurred;
2. Personnel from an area not involved in the incident;
3. An engineering and/or maintenance supervisor;
4. The safety supervisor;
5. A first-line supervisor from the affected area;
6. Occupational health/environmental personnel;
7. Appropriate wage personnel (i.e., operators, mechanics, technicians); and,
8. Research and/or technical personnel.

Team Member:	Department:	Shift:	Phone:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

6.3 The incident/accident analysis team leader

The incident/accident analysis team leader will:

1. Control the scope of team activities by identifying which lines of analysis should be pursued, referred to another group for study, or deferred;
2. Call and preside over meetings;
3. Assign tasks and establish timetables;
4. Ensure that no potentially useful data source is overlooked; and,
5. Keep site management advised of the progress of the analysis process.

7.0 Determining the facts

A thorough search for the facts is an important step in incident/accident analysis. During the fact-finding phase of the process, team members will:

1. Visit the scene before the physical evidence is disturbed;
2. Sample unknown spills, vapors, residues, etc., noting conditions which may have affected the sample; (Be sure you sample using proper safety and health procedures)
3. Prepare visual aids, such as photographs, field sketches, missile maps, and other graphical representations with the objective of providing data for the analysis.
4. Obtain on-the-spot information from eyewitnesses, if possible. Interview with those directly involved and others whose input might be useful, should be scheduled soon thereafter. The interviews should be conducted privately and individually; so that the comments of one witness will not influence the responses of others.
5. Observe key mechanical equipment as it is disassembled. Include as-built drawings, operating logs, recorder charts, previous reports, procedures, equipment manuals, oral instruction, change of design records, design data, records indicating the previous training and performance of the employees involved, computer simulations, laboratory tests, etc.
6. Determine which incident-related items should be preserved. When a preliminary analysis reveals that an item may have failed to operate correctly, was damaged, etc., arrangements should be made to either preserve the item or carefully document any subsequent repairs or modifications.
7. Carefully document the sources of information contained in the incident report. This will be valuable should it subsequently be determined that further study of the incident or potential incident is necessary.

8.0 Determining the Cause

It is critical to establish the root cause(s) of an incident/accident so that effective recommendations are made to correct the hazardous conditions and unsafe work practices, and make system improvements to prevent the incident from recurring. The incident/accident analysis team will use appropriate methods to sort out the facts, inferences, and judgments they assemble. Even when the cause of an incident appears obvious, the investigation team will still conduct a formal analysis to make sure any oversight, or a premature/erroneous judgment is not made. Below is one method to develop cause and effect relationships.

1. Develop the chronology (sequence) of events which occurred before, during, and after the incident. The focus of the chronology should be solely on what happened and what actions were taken. List alternatives when the status cannot be definitely established because of missing or contradictory information.
2. List conditions or circumstances which deviated from normal, no matter how insignificant they may seem.
3. List all hypotheses of the causes of the incident based on these deviations.

9.0 Making Recommendations — Corrective Actions and System Improvements

Usually, making recommendations for corrective actions and system improvements follow in a rather straightforward manner from the cause(s) that were determined. A recommendation for corrective action and system improvement will contain three parts:

1. The recommendation itself, which describes the actions and improvements to be taken to prevent a recurrence of the incident.
2. The name of the person(s) or position(s) responsible for accomplishing actions and improvements.
3. The correction date(s).

10.0 Follow-up System

To make sure follow-up and closure of open recommendations, _____ will develop and implement a system to track open recommendations and document actions taken to close out those recommendations. Such a system will include a periodic status report to site management.

11.0 Incident After Action – Review and Approval

Appropriate operating, maintenance and other personnel will review all incident/accident analysis reports. Personnel at other facilities will also review the report to preclude a similar occurrence of the incident.

Plan Reviewed By: _____ Date: _____

_____ Date: _____

_____ Date: _____

_____ Date: _____

Plan Approved By: _____ Date: _____

Sample Incident/Accident

Essential Items:

1. Camera, film, and batteries
2. Tape measure—preferably 100 foot
3. Clipboard & writing paper
4. Graph paper
5. Straight-edge ruler. Can be used as a scale reference in photos.
6. Pens & pencils
7. Accident investigation forms
8. Flashlight with fresh batteries

Additional Helpful Items:

1. Accident investigators checklist
2. Sturdy gloves
3. High visibility plastic tape to mark off area
4. First aid kit
5. Audio or video recorder with extra memory or tapes
6. Identification tags
7. Tape, bags, and specimen containers to secure items
8. Compass for sketching the scene & identifying north
9. Paint stick or chalk (yellow/black) to mark the scene
10. Protractor to sketch the scene
11. Tarp (to keep the scene and/or investigators dry)
12. Investigators template (available online in varying styles)
13. Personal protective equipment appropriate to your business

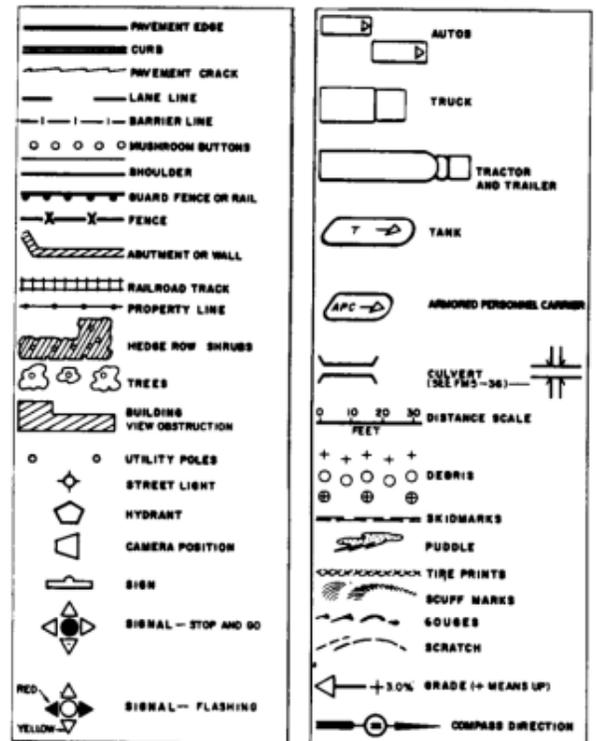


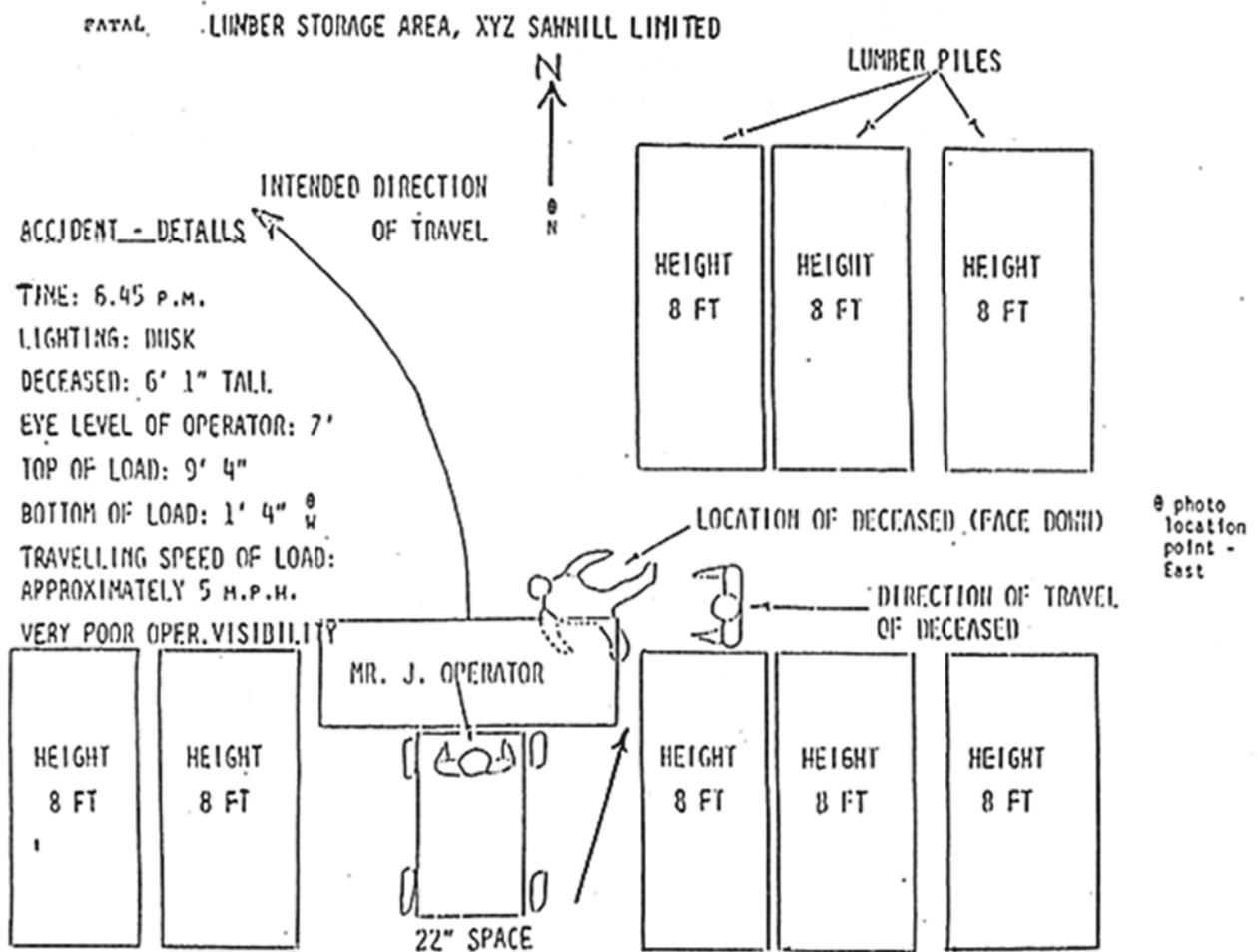
Diagram Symbols for Sketches

Your **smartphone** can be a handy tool to use for photos and video.

Be sure to test your equipment on a regular basis and make sure to have extra batteries on hand.

Sketching Techniques

1. Make sketches large, preferably on an 8"x10" paper
2. Make sketches clear with labels of items
3. Include measurements
4. Print legibly, all printing should be on the same plane (see below example, graph paper can help with this)
5. Indicate directions— specifically which way is north
6. Always tie the measurements to a permanent point I.E. a telephone pole
7. Make copies of the sketch to use when interviewing people, they can indicate where they were and what they were doing when the accident happened.



FORMS OF ENERGY THAT DESCRIBE THE DIRECT CAUSE OF INJURY

<p>1. Mechanical Energy - components that cut, crush, bend, shear, pinch, wrap, pull, and puncture as a result of rotating, transverse, or reciprocating motion. Example: A box crusher causing injury.</p>
<p>2. Electrical Energy - low voltage electrical hazards (below 440 volts) and high voltage electrical hazards (above 440 volts). Example: Getting electrocuted from an ungrounded circuit</p>
<p>3. Chemical Energy - corrosive, toxic, flammable, or reactive (involving a release of energy ranging from "not violent" to "explosive" and "capable of detonation"). Toxics include poisonous plants, dangerous animals, biting insects and disease carrying bacteria, etc. Example: Ingesting a poisonous pesticide due to residue from spaying.</p>
<p>4. Kinetic (Impact) Energy - collision of objects in relative motion to each other including impact of a moving object against a stationary object, falling objects, flying objects, and flying particles. Example: A pallet falling and striking an employee as it hits the ground.</p>
<p>5. Potential (Stored) Energy - sudden unexpected movement due to gravity, pressure, tension, or compression. Example: a pressurized tank valve exploding off and hitting someone.</p>
<p>6. Thermal Energy - extreme or excessive heat, extreme cold, sources of flame ignition, flame propagation, and heat related explosions. Example: An oil fryer spits hot oil on an employees bare skin causing burns.</p>
<p>7. Acoustic Energy - excessive noise and vibration. Example: Loud machinery causing hearing damage over time.</p>
<p>8. Radiant Energy - relatively short wavelength energy forms within the electromagnetic spectrum including the potentially harmful characteristics of radar, infra-red, visible, microwave, ultra-violet, x-ray, and ionizing radiation. Example: An x-ray technician doesn't wear PPE and is over exposed to radiant energy.</p>
<p>9. Atmospheric/Geological/Oceanographic Energy - atmospheric weather circumstances such as wind and storm conditions, geological structure characteristics such as underground pressure or the instability of the earth's surface, and oceanographic currents, wave action, etc. Example: A large wave catches a boat worker unaware and pushes them into the boat.</p>

*Adapted from: Nelson & Associates, 3131 E. 29th Street, Suite E , Bryan, Texas 77802,
Tel 409/774-7755, Fax 409/774-0559 -- www.hazardcontrol.com © Copyright 1997*

Accident Types and Examples

Struck By: A person is forcefully struck by an object. The force of contact is provided by the object. Example: a pedestrian is struck by a moving vehicle.

Struck Against: A person forcefully strikes an object. The person provides the force. Example: a person strikes a leg on a protruding beam.

Contact By: Contact by a substance or material that by its very nature is harmful and causes injury. Example: a person is contacted by steam escaping from a pipe.

Contact With: A person comes in contact with a harmful material. The person initiates the contact. Example: a person touches the hot surface of a boiler.

Caught On: A person or part of his/her clothing or equipment is caught on an object that is either moving or stationary. This may cause the person to lose his/her balance and fall, be pulled into a machine, or suffer some other harm. Example: a person snags a sleeve on the end of a hand rail.

Caught In: A person or part of him/her is trapped, stuck, or otherwise caught in an opening or enclosure. Example: a person's foot is caught in a hole in the floor.

Caught Between: A person is crushed, pinched or otherwise caught between either a moving object and stationary object or between two moving objects. Example: a person's finger is caught between a door and its casing.

Fall to Surface: A person slips or trips and falls to the surface he/she is standing or walking on. Example: a person trips on debris in the walkway and falls.

Fall to Below: A person slips or trips and falls to a surface level below the one he/she was walking or standing on. Example: a person trips on a stairway and falls to the floor below.

Exertion: Someone over-exerts or strains him or herself while doing a job. Examples: a person lifts a heavy object; repeatedly flexes the wrist to move materials, and; a person twists the torso to place materials on a table. Interaction with objects, materials, etc., is involved.

Bodily Reaction: Caused solely from stress imposed by free movement of the body or assumption of a strained or unnatural body position. A leading source of injury. Example: a person bends or twists to reach a valve and strains back.

Exposure: Over a period of time, someone is exposed to harmful conditions. Example: a person is exposed to levels of noise in excess of 90 dba for 8 hours.

SAMPLE ACCIDENT INVESTIGATION REPORT

Number _____ Date _____

Prepared by _____

SECTION I. BACKGROUND

Victim: _____

Witnesses (1) _____ Address _____ Phone (H) _____ (W) _____

Job Title _____ Length of Service _____

Witnesses (2) _____ Address _____ Phone (H) _____ (W) _____

Job Title _____ Length of Service _____

Accident Date _____ Time of Accident _____ Work shift _____

Date Accident Reported _____ Time Accident Reported _____ (a.m./p.m)

WHERE Department _____ Location _____ Equipment _____

SECTION II. DESCRIPTION OF THE ACCIDENT (Describe the sequence of relevant events prior to, during, and immediately after the accident. Attach separate page if necessary)

Events prior to: _____

Injury event: _____

Events after: _____

SECTION III. FINDINGS AND JUSTIFICATIONS (Attach separate page if necessary)

Surface Cause(s) (Unsafe conditions and/or behaviors at any level of the organization)

Justification: (Describe evidence or proof that substantiates your finding.)

Root Cause(s) (Missing/inadequate Programs, Plans, Policies, Processes, Procedures)

Justification: (Describe evidence or proof that substantiates your finding.)

Although we have provided this sample form, your company may use whichever form they wish as long as it covers the criteria noted in this workbook.

SECTION IV. RECOMMENDATIONS AND RESULTS (Attach separate page if necessary)

Corrective actions. (To eliminate or reduce the hazardous conditions/unsafe behaviors that directly caused the accident)

Results. (Describe the intended results and positive impact of the change.)

System improvements. (To revise and improve the programs, plans, policies, processes, and procedures that indirectly caused/allowed the hazardous conditions/unsafe behaviors.)

Results. (Describe the intended results and positive impact of the change.)

SECTION V. SUMMARY (Estimate costs of accident. Required investment and future benefits of corrective actions)

SECTION VI: REVIEW AND FOLLOW-UP ACTION (Describe equipment/machinery repaired, training conducted, etc. Describe system components developed/revised. Indicate persons responsible for monitoring quality of the change. Indicate review official.)

Corrective Actions Taken:	Responsible Individual:	Date Closed:
_____	_____	_____
_____	_____	_____

System improvements made:	Responsible Individual:	Date Closed:
_____	_____	_____
_____	_____	_____

Person(s) monitoring status of follow-up actions: _____

Reviewed by _____ **Title** _____

Date _____ **Department** _____

SECTION VII. ATTACHMENTS (Photos, sketches, interview notes, etc.)

Although we have provided this sample form, your company may use whichever form they wish as long as it covers the criteria noted in this workbook.

Accident Investigation Checklist

(Employees Initial Next to Items as Completed)

Notification

- _____ Time and date of accident
- _____ Time and date of notification
- _____ Time and date of arrival on site

Documenting the Accident Scene

- _____ Observation notes
- _____ Sketches/diagrams
- _____ Measurements
- _____ Photos/videotape
- _____ Records/review

Worker Identification

- _____ Name
- _____ Age
- _____ Home address and phone
- _____ Occupation
- _____ Experience
- _____ Training in this job
- _____ Familiarity with equipment
- _____ How supervised
- _____ PPE used
- _____ Mental/physical disabilities
- _____ Nature of injuries

Supervision

- _____ Name
- _____ Age
- _____ Experience as supervisor
- _____ Experience in job worker was doing
- _____ Personal knowledge of worker
- _____ Method of supervision
- _____ Knowledge of rules
- _____ How accident happened
- _____ How accident could have been prevented
- _____ Supervisors direction from management

First Aid

- _____ Were services available?
- _____ Was treatment given?
- _____ Name of first aid attendant: _____

Other Party

- _____ Instructions
- _____ Experience in industry
- _____ Experience in job
- _____ Supervision
- _____ Training
- _____ Knowledge of rules
- _____ Familiarity with equipment

Worksite Equipment/Machinery

- _____ General condition
- _____ Make and model number
- _____ Manufacturers information
- _____ Suitability of equipment
- _____ Layout of operation

Worksite Environment

- _____ General condition
- _____ Lighting
- _____ Ventilation
- _____ Wind
- _____ Temperature
- _____ Weather conditions
- _____ Terrain
- _____ Noise

Persons With Information

- _____ Name
- _____ Work and residence address
- _____ Recollection of accident
- _____ Hearsay

Employer

- _____ Name and address of office
- _____ Condition of company safety program

Oregon OSHA Consultation Services



What are Oregon OSHA consultation services?

Oregon OSHA consultation provides many no-cost, confidential services, including:

- Safety, health, and ergonomic hazard assessments
- Recommendations to control and eliminate hazards
- Written program evaluation
- Industrial hygiene services, such as noise monitoring
- Hands-on training on health and safety topics
- Safety and health program assistance

Oregon OSHA Consultants WILL NOT:

- Issue citations for violations of OSHA standards
- Provide other businesses with information about your Oregon OSHA participation, hazards, or business processes
- Guarantee that your workplace will "pass" an Oregon OSHA inspection

What will the consultant want to see?

- If you request a *comprehensive* consultation, the consultant will conduct an evaluation of the physical worksite, then review your records, written programs, and your safety and health management plan.
- If you request a *specific* consultation, the consultant can focus on a specific operation, machine, or process at your worksite. You are in charge!

What are my obligations if I request an Oregon OSHA consultation?

When you request an Oregon OSHA consultation, you will receive a report listing the hazards identified along with our recommendations for corrections. Oregon OSHA encourages you to correct the hazards to make your worksite a safe place for your employees. However, if a consultant identifies an "imminent danger" situation, the employer must take immediate action to protect all employees.

The Benefits for You

Improving your safety and health program can result in fewer accidents, lower injury and illness rates, decreased workers' compensation costs, increased employee morale, and lower product losses. A consultation will include:

- Personal, professional, and relevant assistance specific to your business
- Guidance on effective safety meetings and safety committees
- Answers to questions about Oregon OSHA standards
- A 30- or 60-day exemption from a standard inspection

How can your organization learn more?

Oregon OSHA consultants are available to present program information at safety-related forums such as meetings, trainings, business seminars, or safety/health conferences. Schedule a consultation or contact us for more information by:

- Visit our website: www.oregona.org
- Consultation link
- Calling our toll-free number 800-922-2689

What other services does Oregon OSHA provide?

Do you have a safety or health question?

Ask our technical experts:

Phone: 503-378-3272 or 800-922-2689

tech.web@oregon.gov

Educational workshops and other training:

Phone: 503-947-7443 or 888-292-5247, Option 2

ed.web@oregon.gov

Resource Center and AV Library:

Phone: 503-947-7453 or 800-922-2689

tech.web@oregon.gov

Upcoming conferences information:

Phone: 503-378-3272 or 888-292-5247, Option 1

oregon.conferences@oregon.gov

Oregon
OSHA

A Division of the
Department of Consumer
and Business Services



In Compliance with the Americans with Disabilities Act (ADA),
this publication is available in alternative formats by calling the
Oregon OSHA Public Relations Manager at (503) 378-3272 (V/TTY)