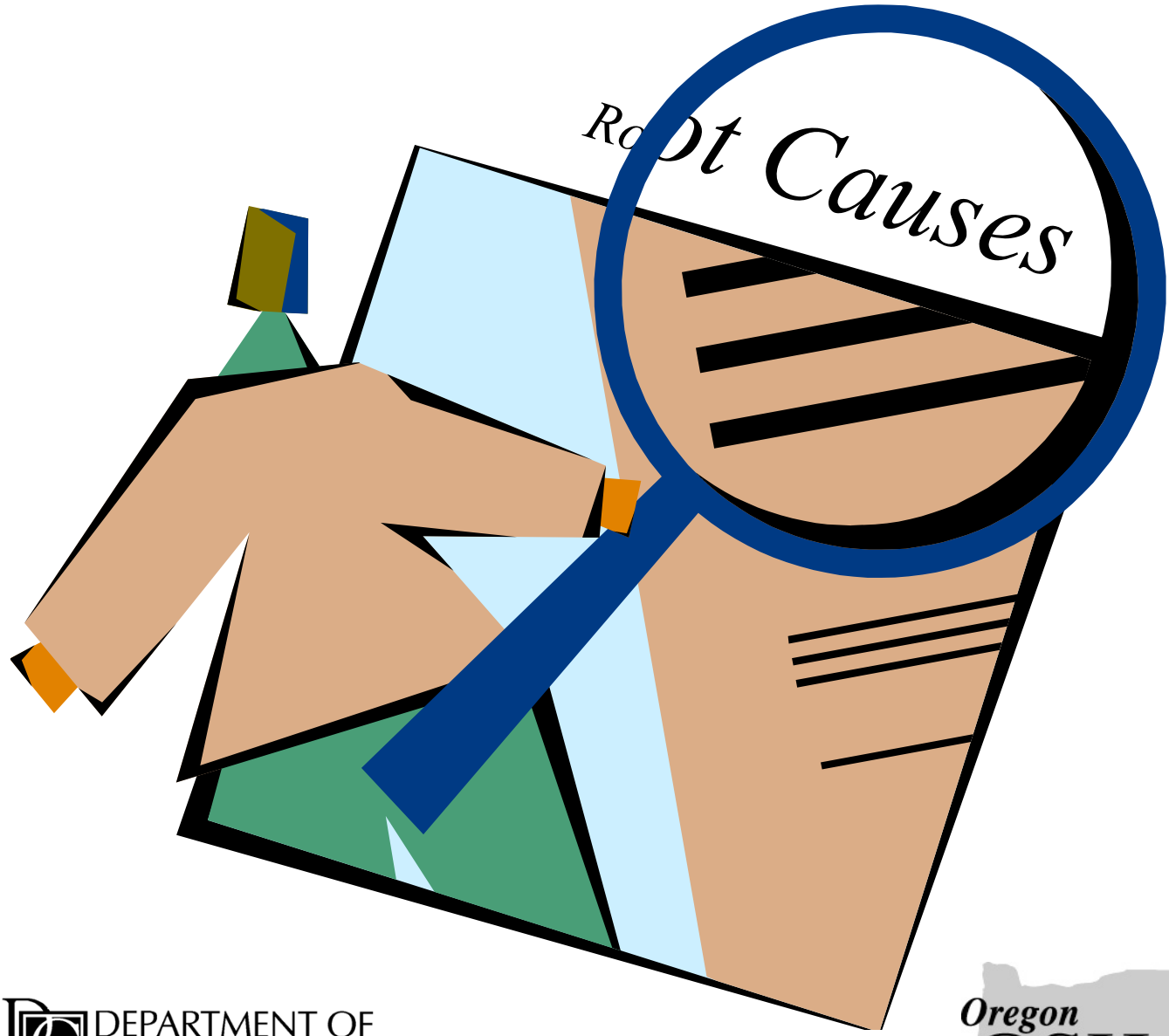
Accident Investigation



Presented by the Public Education Section
Oregon OSHA
Department of Consumer and Business Services

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 and Conferences:

- Presents educational opportunities to employers and employees on a variety of safety and health topics throughout the state

Standards and Technical Resources:

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

Questions?
Call us

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Introduction

The three primary tasks of the accident investigator are to gather useful information, analyze the facts surrounding the accident, and write the accident report. The intent of this workshop is to help you gain the basic skills necessary to conduct an effective accident investigation at your workplace. Only experience will give you the expertise to fine-tune those skills.

Most of the information about conducting an accident investigation will come directly from the class 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 knowing how to conduct an accident investigation and properly complete an accident investigation report with confidence using our systematic approach.

Objectives

After attending this workshop you should be able to:

1. Describe the primary reasons for conducting an accident investigation.
2. Discuss employer responsibilities related to workplace accident investigations.
3. Conduct the six step accident investigation procedure

Form investigation teams

Team Leader _____

Member _____

Member _____

Member _____

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.

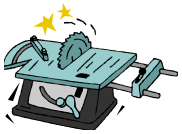
The basics

What's the difference between an <u>incident</u> and an <u>accident</u>?

_____

What two key conditions must exist before an accident occurs?

H_____ and E_____



What causes the most accidents?

- **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 acts. 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

If someone deliberately sets out to produce loss or injury, that is called a crime, not an accident. Yet many accident investigations get confused with criminal investigations… Whenever the investigative procedures are used to place blame, an adversarial relationship is inevitable. The investigator wants to find out what actually happened while those involved are trying to be sure they are not going to be punished for their actions. The result is an inadequate investigation. (Kingsley Hendrick, Ludwig Benner, Investigating Accidents with STEP, p 42. Marcel Dekker, Inc. 1987.)

The six-step process

*Accident investigation is "**fact-finding**" not "fault-finding."*

What are the basic steps for conducting an accident investigation?

Gather information

Step 1 - **Secure the accident scene**

Step 2 - **Collect facts about what happened**

Analyze the facts

Step 3 - **Develop the sequence of events**

Step 4 - **Determine the causes**

Implement Solutions

Step 5 - **Recommend improvements**

Step 6 - **Write the report**

The first two steps in the procedure help you gather accurate information about the accident.

Step 1: Secure the accident scene

Your primary goal in this step is to gather accident information that can give critical clues into the causes associated with the accident. To do that you must first **secure the accident scene**.

When is it appropriate to begin the investigation?

_____

_____

_____

What are effective methods to secure an accident scene?

_____

_____

_____

Step 2: Collect facts about what happened

In this step, you will use various tools and techniques to collect pertinent **facts about the accident** to determine the:

- Direct cause of injury.
- 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.

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

_____ _____

_____ _____

_____ _____

What documents will you be interested in reviewing? Why?

_____ _____

_____ _____

_____ _____

Interviewing

When is it best to interview? Why?

_____

_____

Who should we interview? Why?

_____

_____

Where should we conduct the interview?

_____

_____

Cooperate, don't intimidate

What are effective interviewing techniques?

What should we say?	Why?

What should we do?	Why?

What should we <u>not</u> say?	Why?

What should we <u>not</u> do?	Why?

Team Exercise: Cooperation is the Key

Purpose. Gaining as much information as possible about an accident is extremely important. Interviewing witnesses is both a science and an art, and can make the difference between a failed or a successful accident investigation. This exercise will help you gain a greater awareness of those interviewing techniques that will help ensure your success as an investigator. Remember, you must communicate a message of cooperation, not intimidation.

Instructions. Your instructor will describe an accident. Your team and the instructor are located at the scene of the accident and your job now is to ask follow-up questions to gather information about the accident.

Use the space below for your notes.

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

Step 3: Develop the sequence of events

An accident is the final event in an accident process

In this step, we take the information gathered in step 2 to determine the events prior to, during, and after the accident. Once the events are clearly understood, we can then continue to examine each event for hazardous conditions and/or unsafe behaviors. Accident "investigations" to place blame may not place adequate emphasis on this step. But, developing the sequence of events is critical in the accident "analysis" process to fix the system.

Each event in the unplanned accident process identifies <u>one</u>:

Actor - Individual or object

- 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 – Behavior the actor accomplishes

- Actions may or may not be observable.
- An action may describe something that is done or not done.

Circle the actor and action.

1. **"Beverly slipped on a banana."**

   _____

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 __ _____

_____

Event __ _____

_____

Event __ _____

_____

Event __ _____

_____

Event __ _____

_____

Event __ _____

_____

Event __ _____

_____

Event __ _____

_____

Event __ _____

_____

Step 4: Determine the causes

W. H. Heinrich's Domino Theory

"The occurrence of an injury invariably results from a completed sequence of factors, the last one of these being the accident itself. The accident in turn is invariably caused or permitted directly by the unsafe act of a person and/or a mechanical or physical hazard." (W.H. Heinrich, *Industrial Accident Prevention*, 1931)

Do you agree with this theory? Why or why not?

Multiple Cause Theory

Behind every accident there are many contributing factors, causes, and subcauses. 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 solutions to prevent the accident from recurring?

_____

_____

_____

What are the strengths of this approach?

_____

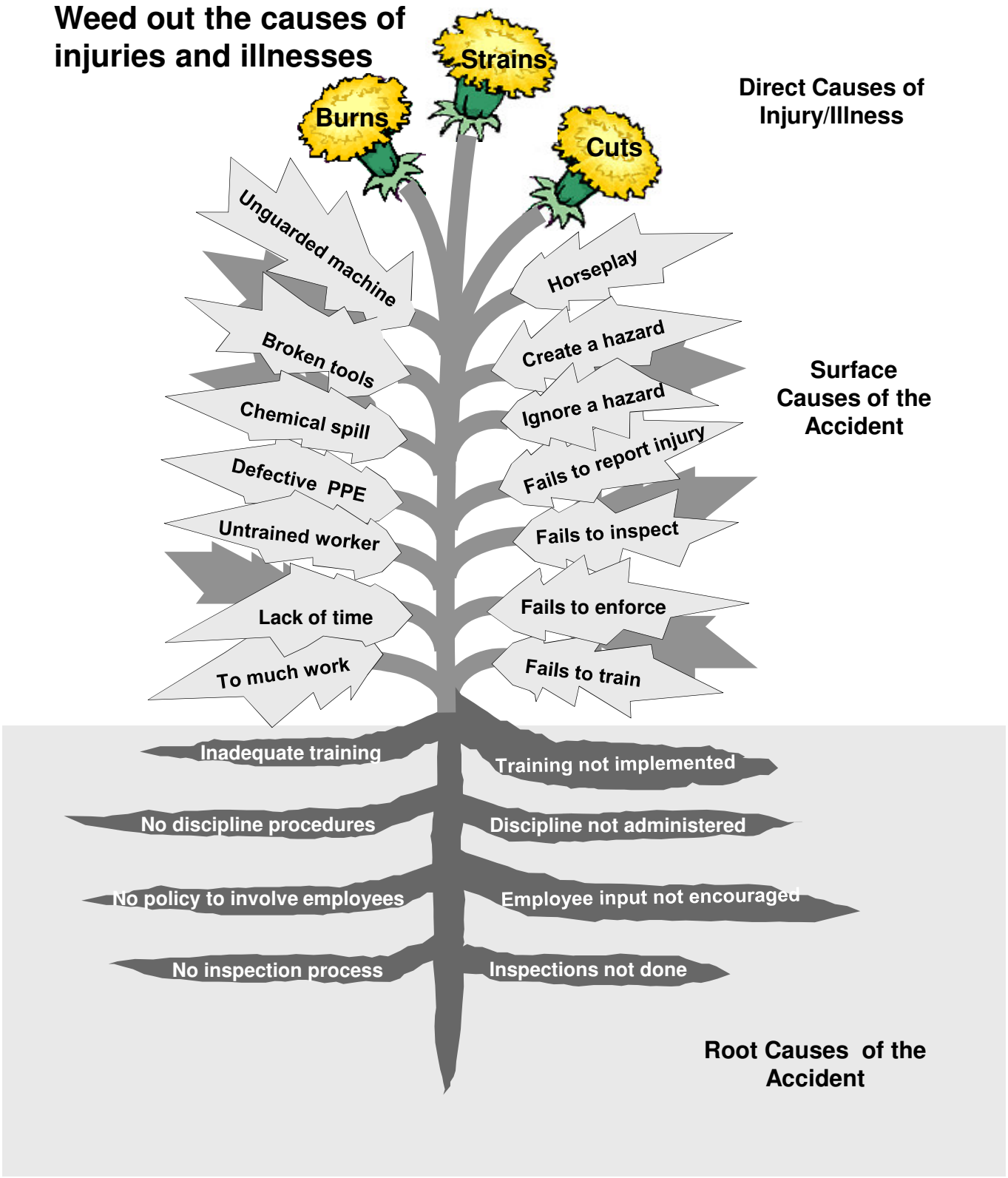
_____

Weaknesses?

_____

_____

Accident Investigation



Steps in cause analysis

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

Examples:

- Laceration to right forearm resulting from contact with rotating saw blade.
- 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 x. Unguarded saw blade. (condition or behavior?)
- Event x. 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:

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

- Safety inspections are being conducted inconsistently.
- Safety is not being adequately addressed during new employee orientation.

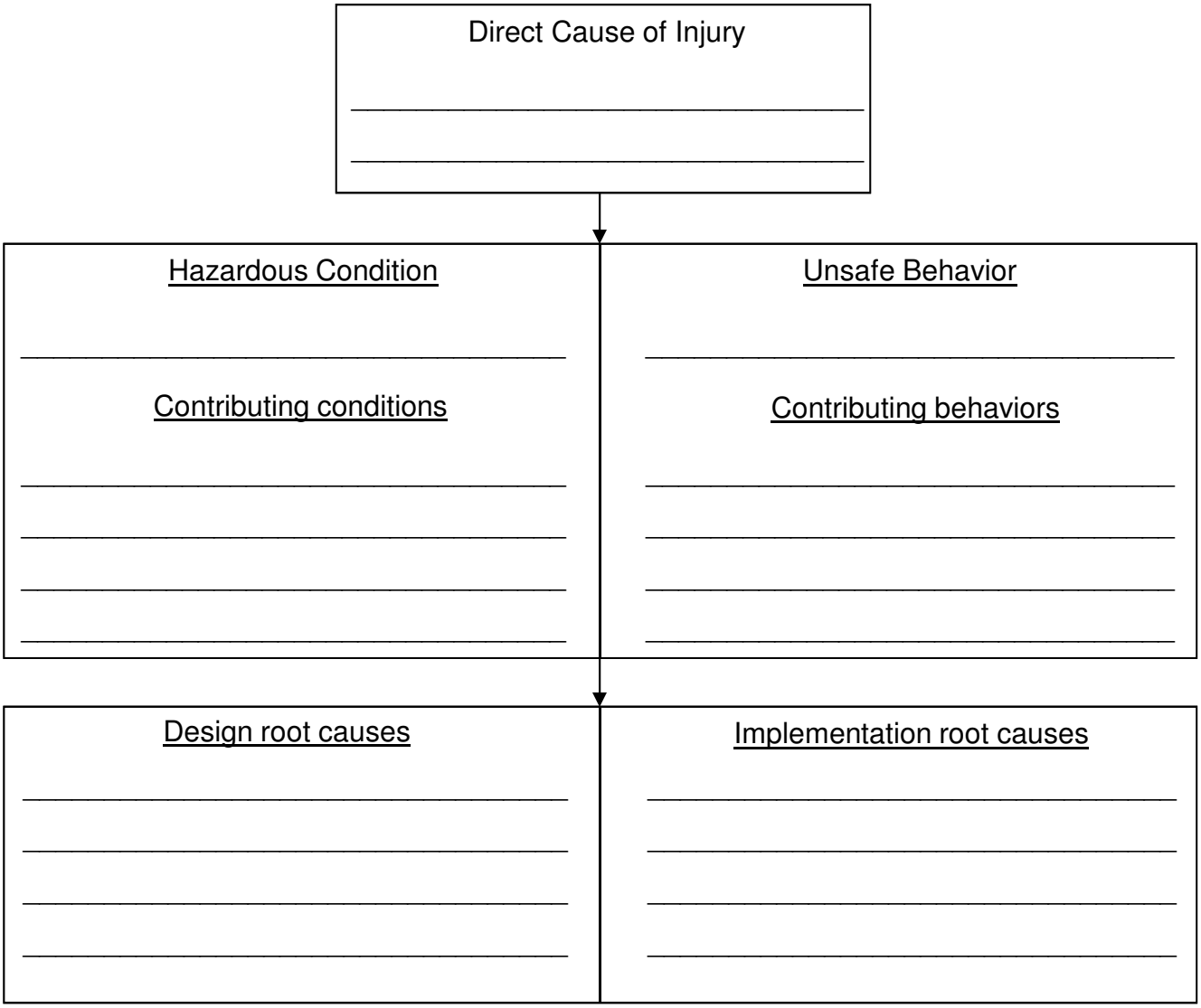
5. Determine implementation flaws to determine the underlying design weaknesses.

Examples:

- Inspection policy does not clearly specify responsibility by name or position.
- No fall protection training plan or process in place.

Exercise: Digging up the roots

1. Enter the direct cause of injury within the top rectangle below.
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.



The last two steps will help you develop and propose solutions that correct hazards and design long-lasting system improvements.

Step 5: Recommend corrective actions & Improvements

The Hierarchy of Controls

1. Engineering Controls - Remove or reduce the hazard

- Eliminates or reduces the severity of the hazard itself through initial design and redesign, enclosure, substitution, replacement and other engineering changes.
- Major strengths: Eliminates the hazard itself. Does not rely solely on human behavior for effectiveness.
- Major weakness: May not be feasible if controls present long-term financial hardship.

2. Management Controls - Remove or reduce the exposure

- Reduce the duration, frequency, and severity of exposure to hazards primarily through (1) changes and work procedures and practices, and (2) scheduling, job rotation, breaks.
- Major weakness: Relies on (1) appropriate design and implementation of controls and (2) appropriate employee behavior.

3. Personal protective equipment (PPE) - Put up a barrier

- Equipment for personal use that presents a barrier between worker and hazard.
- Major weakness: Relies on (1) appropriate design and implementation of controls (2) appropriate employee behavior.

Team Exercise: Recommending Corrective actions

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 12. Write your recommendation(s) below.

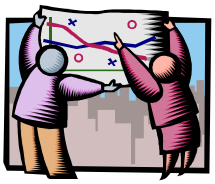
Recommendation: _____

_____

_____

_____

_____



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
2. Accountability
3. Employee Involvement
4. Hazard Identification/Control
5. Incident/Accident Analysis
6. Training
7. Evaluation

Making system improvements might include some of the following:

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

Team Exercise: Fix the system…not the blame

Purpose: In this exercise you'll develop and recommend one improvement to make sure the case study accident does not recur.

Instructions. Develop and write a recommendation to improve one or more policies, plans, programs, processes, procedures, and practices identified as design weaknesses.

Recommendation: _____

_____

_____

_____

_____

_____

Step 6: Write the report

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

SAMPLE ACCIDENT INVESTIGATION REPORT

Number _____ Date _____

Prepared by _____ _____

SECTION I. BACKGROUND

WHO Victim: _____

Witnesses (1) _____ Address _____ Phone (H) _____ (W) _____
Job Title _____ Length of Service _____

Witnesses (2) _____ Address _____ Phone (H) _____ (W) _____
Job Title _____ Length of Service _____

WHEN Date _____ Time of day _____ Work shift _____
Date Accident Reported _____

WHERE Department _____ Location _____ Equipment _____

SECTION II. DESCRIPTION OF THE ACCIDENT PROCESS. (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.)
_____

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 ACTIONS: (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!

When the accident investigator completes the report, he or she will give it to someone who must do something with it. That's the job of the decision-maker. 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.

Reference Materials

2007 Average Cost For Disabling Claims (Partial List)

Event or Exposure Leading to Injury (Partial list)	CLAIMS CLOSED	AVERAGE COST($)
1. Overexertion	***6015***	***$19,130***
2. Bodily reaction	***3126***	***$16,780***
3. Fall on same level	2755	$17,740
4. Struck by an object	2376	$14,650
5. Repetitive Motion	1***856***	***$22,190***
6. Fall to lower level	1668	$29,700
7. Struck against an object	995	$11,150
8. Caught in equipment	993	$16,830
9. Highway accident	698	$22,410
10. Assaults by person(s)	377	$16,970

Ergonomic injuries (sprains, strains & tears) total 47.5% of all accepted disabling claims

Accident Investigation Checklist

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 attendent

Other Party

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

Worksite Equipment/Machinery

_____ General condition
_____ Make and model number
_____ Manufacturers information
_____ Maintenance 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

SUMMARY OF RULES RELATED TO ACCIDENT INVESTIGATION

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.

At what point does the analysis stop?

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.

N. PRE-CITATION REVIEW

1. The Area Director or Assistant Area Director shall review all fatality/catastrophe investigation case files to ensure that the case has been properly developed in accordance with the Assistant Secretary's memo of March 24, 1995, "Enforcement Litigation Strategy", and in particular, Section III.B, titled "Case Selection and Development for Litigation."

OR-OSHA investigators found that the employer violated safety standards related to employee training and emergency evacuation procedures. Specifically:

Some maintenance electricians in the melting plant were not adequately trained in the proper safe 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 remelt 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.**

"Fix The System" Incident/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.

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 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.
7. 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.
8. 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 Recommending 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 Communicating Results

11.1 To prevent recurring incidents we will take two additional steps:

1. Document findings; and
2. Review the results of the analysis with appropriate personnel.

11.2 Incident documentation will address the following topics:

1. Description of the incident (date, time, location, etc.);
2. Facts determined during the analysis (including chronology as appropriate);
3. Statement of causes; and
4. Recommendations for corrective and preventive action (including who is responsible and correction date).

12.0 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 _____

Plan approved by _____ Date _____

Sample Incident/Accident Analysis Team Kit

Essential

1. Camera, film, flash, fresh batteries.
2. Tape measure - preferably 100 foot.
3. Clipboard and writing pad.
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, fresh batteries.

Helpful

1. Accident investigator's checklist.
2. Magnifying Glass.
3. Sturdy gloves.
4. High visibility plastic tapes to mark off area.
5. First aid kit.
6. Cassette recorder and spare cassette tapes.
7. Identification tags.
8. Scotch tape.
9. Masking tape.
10. Specimen containers.
11. Compass.
12. Ten 4-inch spikes.
13. Hammer.
14. Paint stick (yellow/black).
15. Chalk (yellow/white)
16. Protractor.
17. Video camera with tape.
18. Investigator's template. (Traffic Institute, PO Box 1409, Evanston IL 60204, Stock # 1000)
19. Tarp

SKETCHING TECHNIQUES

1. Make sketches large; preferably 8" x 10".

2. Makes sketches clear. Include information pertinent to the investigation.

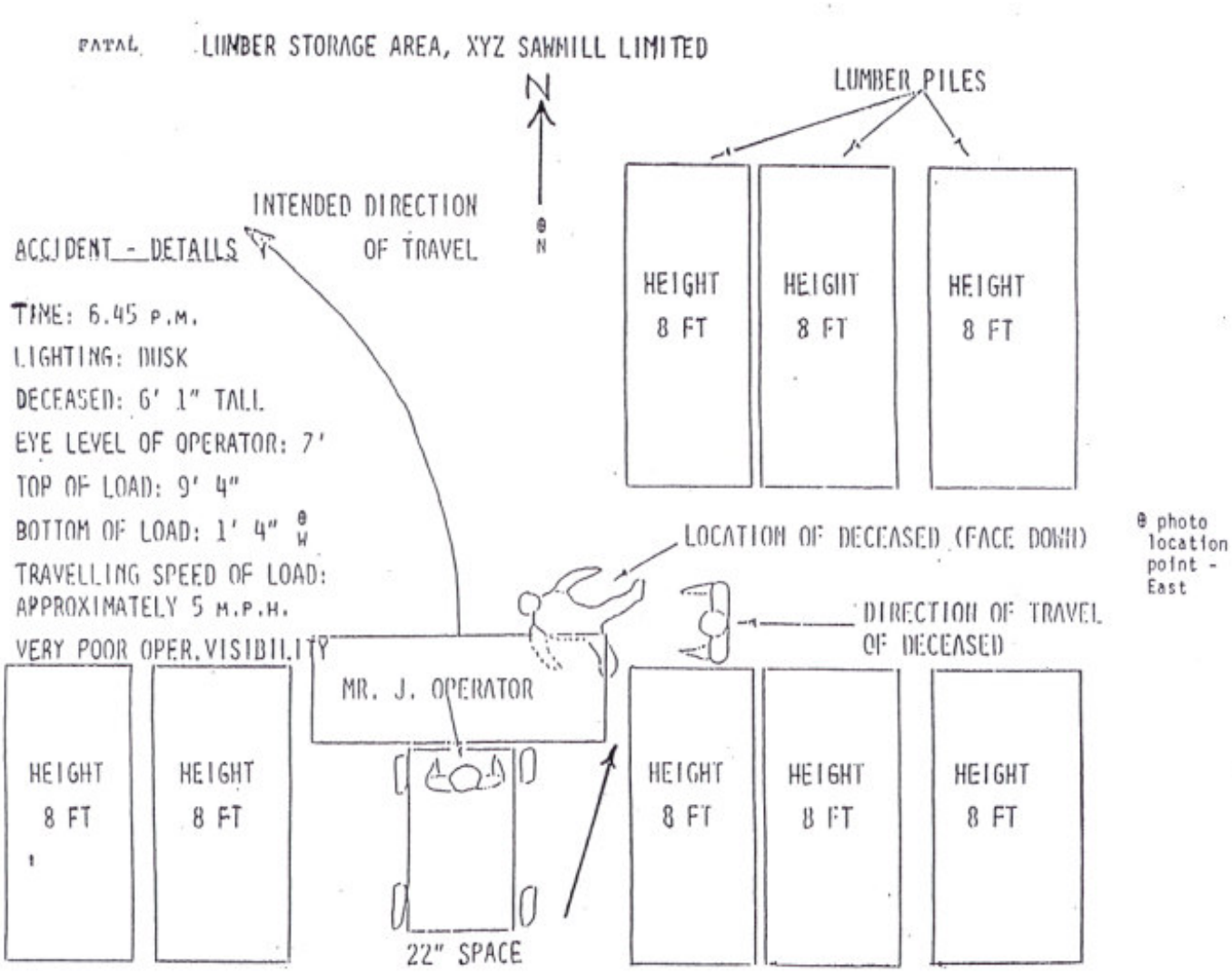
3. Include measurements.

4. Print legibly. All printing should be on the same plane.

5. Indicate directions, i.e. N,E,S,W.

6. Always tie measurements to a permanent point, e.g. telephone pole, building.

7. Use sketches when interviewing people. You can mark where they were standing. Also, it can be used to pinpoint where photos were taken.



FORMS OF ENERGY THAT DESCRIBE THE DIRECT CAUSE OF INJURY

1. MECHANICAL ENERGY - components that cut, crush, bend, shear, pinch, wrap, pull, and puncture as a result of rotating, transverse, or reciprocating motion.

2. ELECTRICAL ENERGY - low voltage electrical hazards (below 440 volts) and high voltage electrical hazards (above 440 volts).

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.

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.

5. POTENTIAL (STORED) ENERGY - sudden unexpected movement due to gravity, pressure, tension, or compression.

6. THERMAL ENERGY - extreme or excessive heat, extreme cold, sources of flame ignition, flame propagation, and heat related explosions.

7. ACOUSTIC ENERGY - excessive noise and vibration.

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.

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.

ACCIDENT TYPES

STRUCK-BY. A person is forcefully struck by an object. The force of contact is provided by the object. Example -- a pedestrian is truck 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.

CONTROLLING HAZARDS

Engineering Controls

Hazard + Exposure = Accident

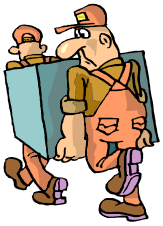
Engineering controls consist of substitution, isolation, ventilation, and equipment modification. These controls focus on the source of the hazard, unlike other types of controls that generally focus on the employee exposed to the hazard. The basic concept behind engineering controls is that, to the 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 process to use less toxic chemicals;
   - 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.

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;
   - Baffles used as noise-absorbing barriers; and



Management Controls

Hazard + Exposure = Accident

Any procedure which significantly limits daily exposure by control or manipulation of the work schedule or manner in which work is performed is considered a means of management control.

Management controls may result in a reduction of exposure through such methods as changing work habits, improving sanitation and hygiene practices, or making other changes in the way the employee performs the job. The use of personal protective equipment is not considered a means of management control.

1. Some of these **general practices** are very general in their applicability. They include housekeeping activities such as:
   - Removal of tripping, blocking, and slipping hazards;
   - Removal of accumulated toxic dust on surfaces; and
   - Wetting down surfaces to keep toxic dust out of the air.
2. Other safe work practices apply to specific jobs in the workplace and involve **specific procedures** for accomplishing a job. To develop these procedures, you conduct a job hazard analysis.
3. Measures aimed at reducing employee exposure to hazard by **changing work schedules**. Such measures include:
   - Lengthened rest breaks,
   - Additional relief workers,
   - Exercise breaks to vary body motions, and
   - Rotation of workers through different jobs

Why are engineering controls considered superior to management controls?

_____

_____

_____

Personal Protective Equipment (PPE)

Hazard + Exposure = Accident

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, personal protective clothing and/or equipment may be required.

PPE includes such items as:

Face shields	Steel-toed shoes	Safety glasses	Hard hats
Knee guards	Leather aprons	Mesh gloves	Life jackets
Respirators	Ear muffs	Safety goggles	Harness

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.

What might be some of the drawbacks of reliance solely on PPE to protect workers?

_____

_____

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