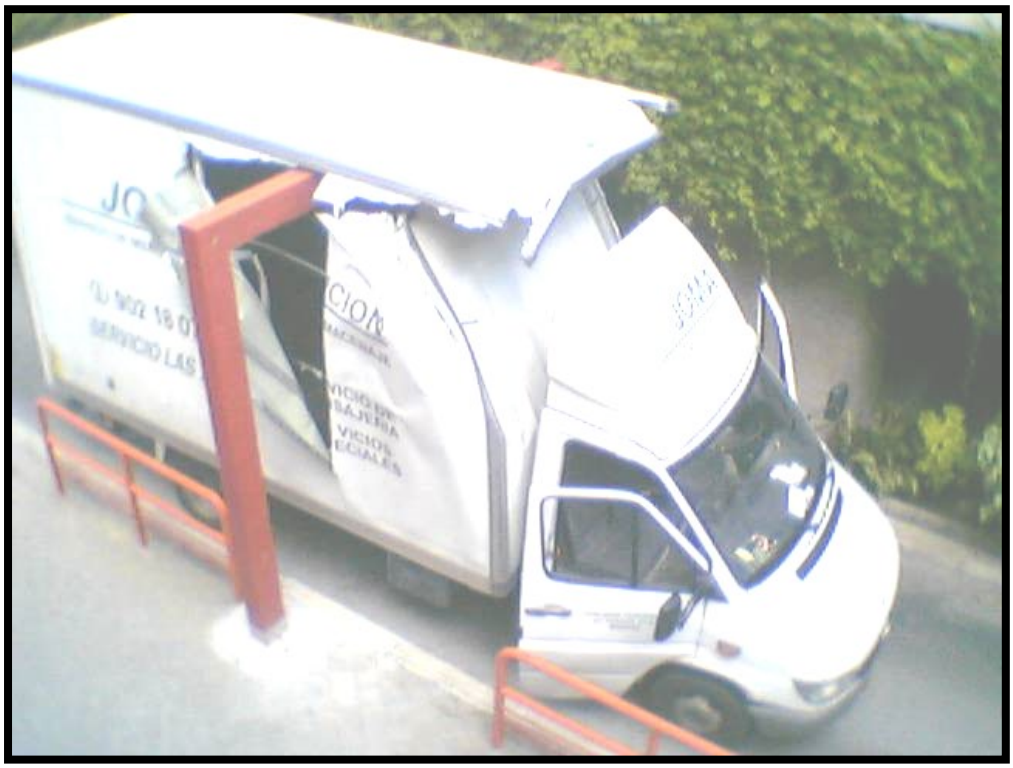
Root Cause Analysis



Accident prevention must be planned

Department of Consumer and Business Services

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

Oregon OSHA

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 safety and health assistance to help Oregon employers recognize and correct safety and health problems in their workplaces.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, new-business assistance, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

Enforcement

- Offers pre-job conferences for mobile employers in industries such as logging and construction.
- Provides abatement assistance to employers who have received citations and provides compliance and technical assistance by phone.
- Inspects places of employment for occupational safety and health rule violations and investigates workplace safety and health complaints and accidents.

Appeals, Informal Conferences

- Provides the opportunity for employers to hold informal meetings with Oregon OSHA on workplace safety and health concerns.
- Discusses Oregon OSHA's requirements and clarifies workplace safety or health violations.
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

Standards & Technical Resources

- Develops, interprets, and provides technical advice on safety and health standards.
- Provides copies of all Oregon OSHA occupational safety and health standards.
- Publishes booklets, pamphlets, and other materials to assist in the implementation of safety and health standards and programs.
- Operates a Resource Center containing books, topical files, technical periodicals, a video and film lending library, and more than 200 databases.

Public Education & Conferences

- Conducts conferences, seminars, workshops, and rule forums.
- Presents many workshops that introduce managers, supervisors, safety committee members, and others to occupational safety and health requirements, technical programs, and safety and health management concepts.

Questions? Call us:

Salem Central Office:
Toll Free number in English: 800-922-2689
Toll Free number in Spanish: 800-843-8086
Website: osha.oregon.gov

Field Offices:

Portland	503-229-6193
Salem	503-373-7819
Eugene	541-686-7913
Medford	541-776-6016
Bend	541-388-6068
Pendleton	541-276-2353

Root Cause Analysis

Purpose

How to apply powerful analysis tools to reduce job injuries and illnesses.

THE BIG PICTURE

Problem	**What is the problem?**
Analysis	**Why did this happen?**
Solution	**What should we do?**

Review - Accident Investigation Process

Gather information

- Secure the accident scene
- Collect facts about what happened

Analyze the facts

- Develop the sequence of events
- Determine the causes
- Recommend improvements

This Workshop

Implement Solutions

- Write the report

Review - Practice

Check the injuries that could happen to these workers:

- ❑ Death
- ❑ Broken bones
- ❑ Head and face injuries
- ❑ Back injuries
- ❑ Cuts

GROUP EXERCISE –

Which things, people, programs, or equipment would you fix so these won't happen again?

_____

_____

_____

_____

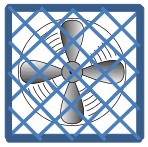
_____

_____

_____

Review - Practice

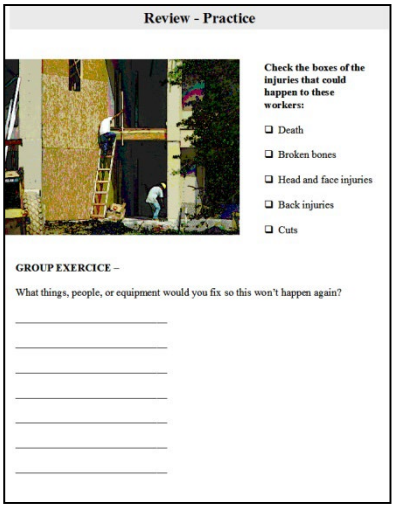
THE CONTROLS



Engineering
Positive: Eliminates the hazard.
Negative: More expensive (initially).

Administrative
Positive: Increases awareness about the danger.
Negative: The hazard is not eliminated – people can forget about the danger.

Personal Protective Equipment (PPE)
Positive: Fast protection against noise, particles, falls, etc.
Negative: The hazard is not eliminated – may limit physical movement, visibility.


Review - Practice

Check the boxes of the injuries that could happen to these workers:

- ❑ Death
- ❑ Broken bones
- ❑ Head and face injuries
- ❑ Back injuries
- ❑ Cuts

GROUP EXERCICE –

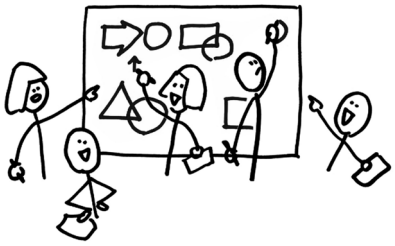
What things, people, or equipment would you fix so this won't happen again?

CONTROLS

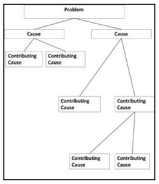
Review each of the fixes on the prior page. Which controls did you select?

- ❑ Engineering Control
- ❑ Administrative Control
- ❑ Personal Protective Equipment

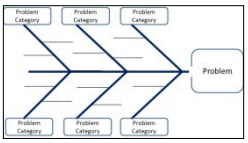
Root Cause Analysis Tools



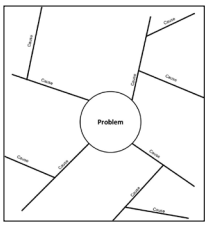
Fault Tree Analysis



Fishbone Diagram



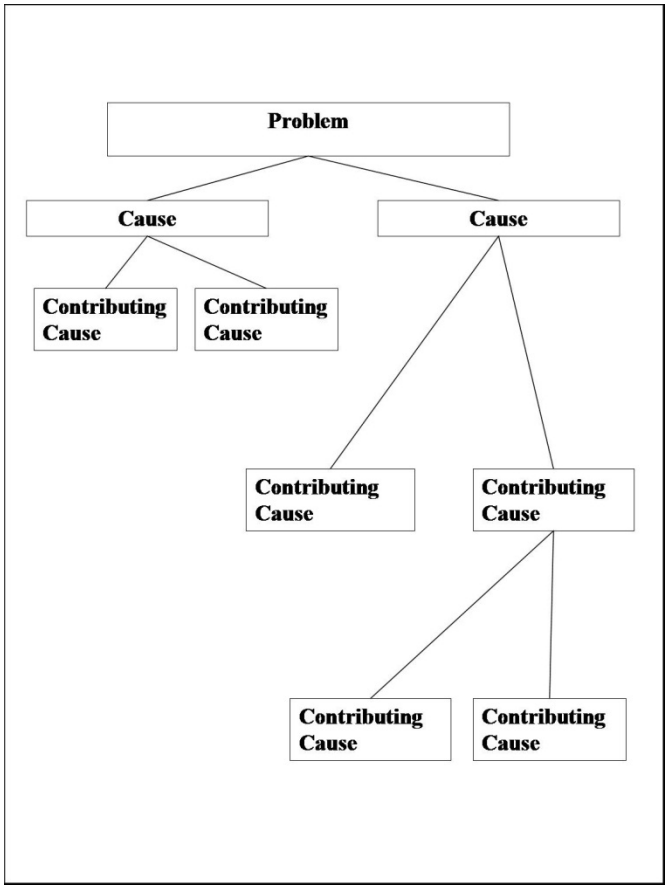
Mindmapping



5 Whys

Why?
Why?
Why?
Why?
Why?

Fault Tree Analysis – Description



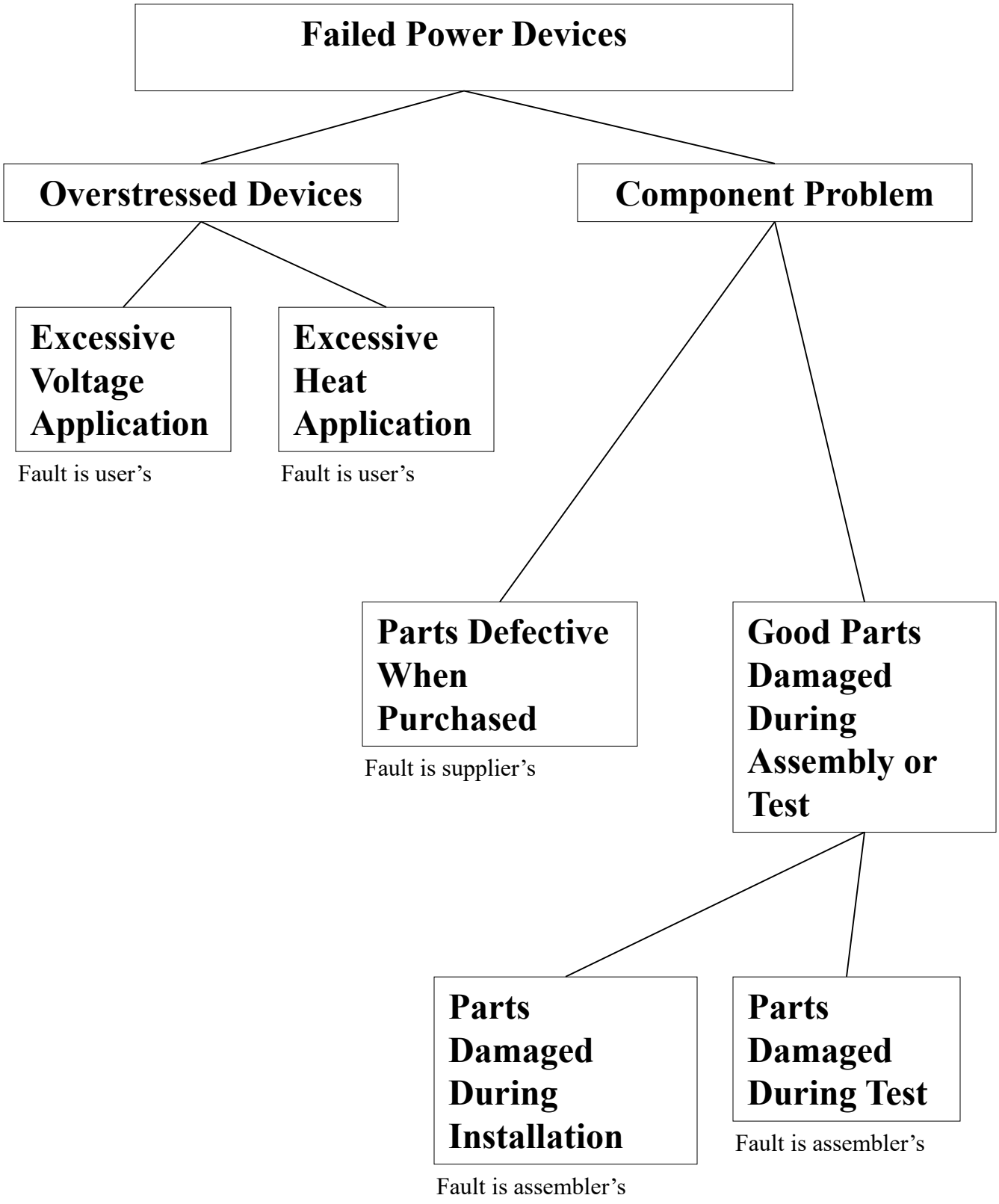
DESCRIPTION: Analyzes the effects of initiating faults and events on a system. Visual tool.

HOW IT WORKS:
The main problem, accident, incident, is stated at the top of the tree and then analyzed to produce a series of lower-level events.

ADVANTAGES:
- Helps understand the logic of what caused the top event.
- Helps prioritize the contributors to the top event.
- Allows for external contributors to the top event.

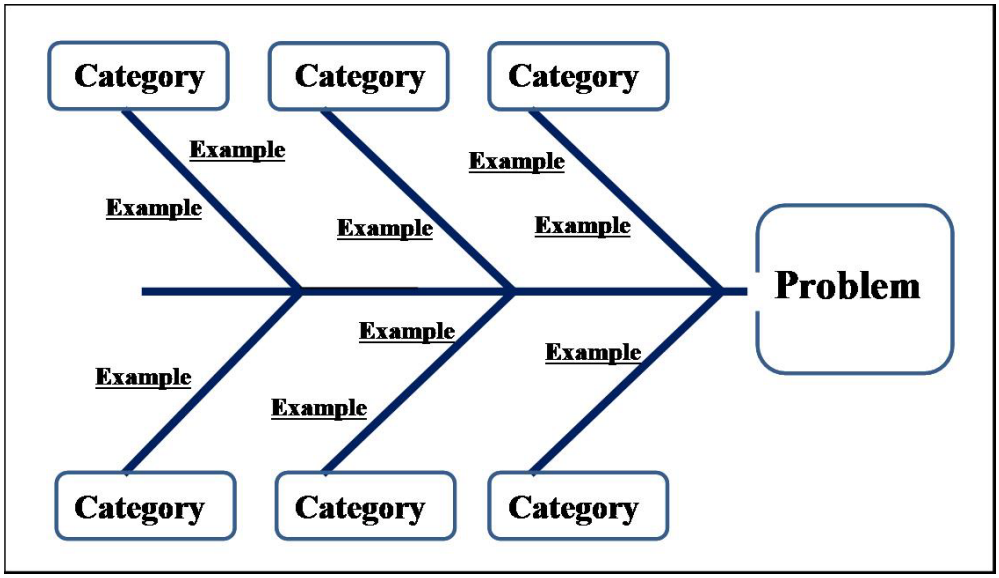
DISADVANTAGES:
- People using it need to know the whole process.
- May not find all possible initiating faults.

Fault Tree Analysis – Example



Fishbone Diagram (Ishikawa Diagram) - Description

Japanese reads from right to left.
ナ タ サ カ ア ←



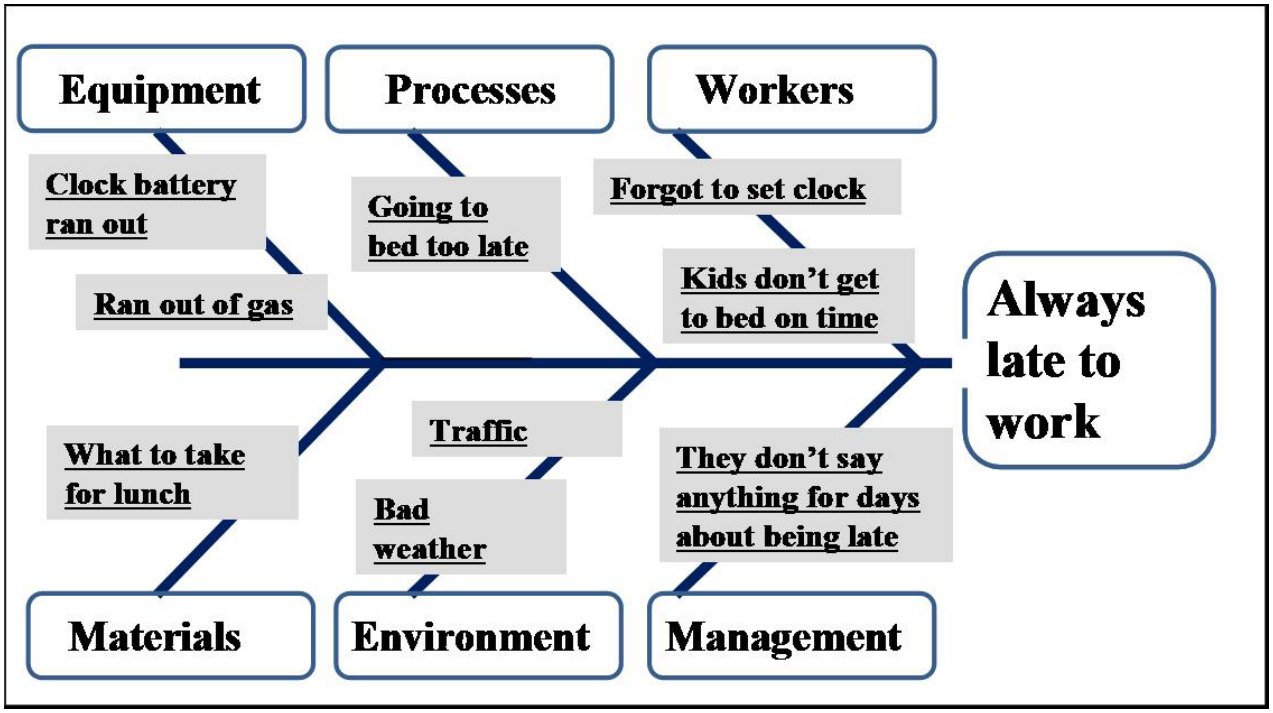
DESCRIPTION: Created by Kaoru Ishikawa to show the causes of an event. Visual tool.

HOW IT WORKS:
The main problem is stated in the box to right of the Fishbone. Causes are grouped into major categories to identify the sources of the problem.

ADVANTAGES:
Breaks down root causes that contribute to a particular event.

DISADVANTAGES:
May not identify the full flow of contributing causes compared to the Fault Tree.

Fishbone Diagram (Ishikawa Diagram) – Example



Workers: Anyone involved with the process.

Management: Anyone with control over the process and the workers.

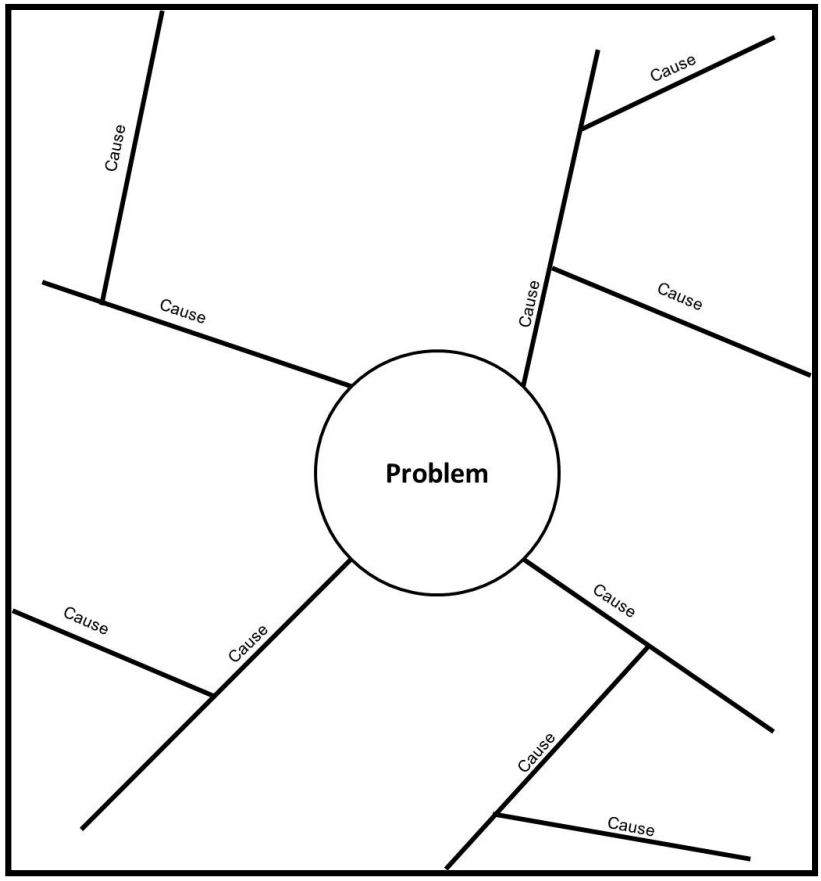
Processes: How the process is performed and the requirements for doing it, such as policies, procedures, rules, and laws.

Environment: Work conditions, temperature, noise, dust, etc., and the culture in which the process operates.

Equipment: Equipment, tools, devices, required to accomplish the job.

Materials: Raw materials, parts, chemicals, etc. used to produce the final product.

Mindmapping – Description



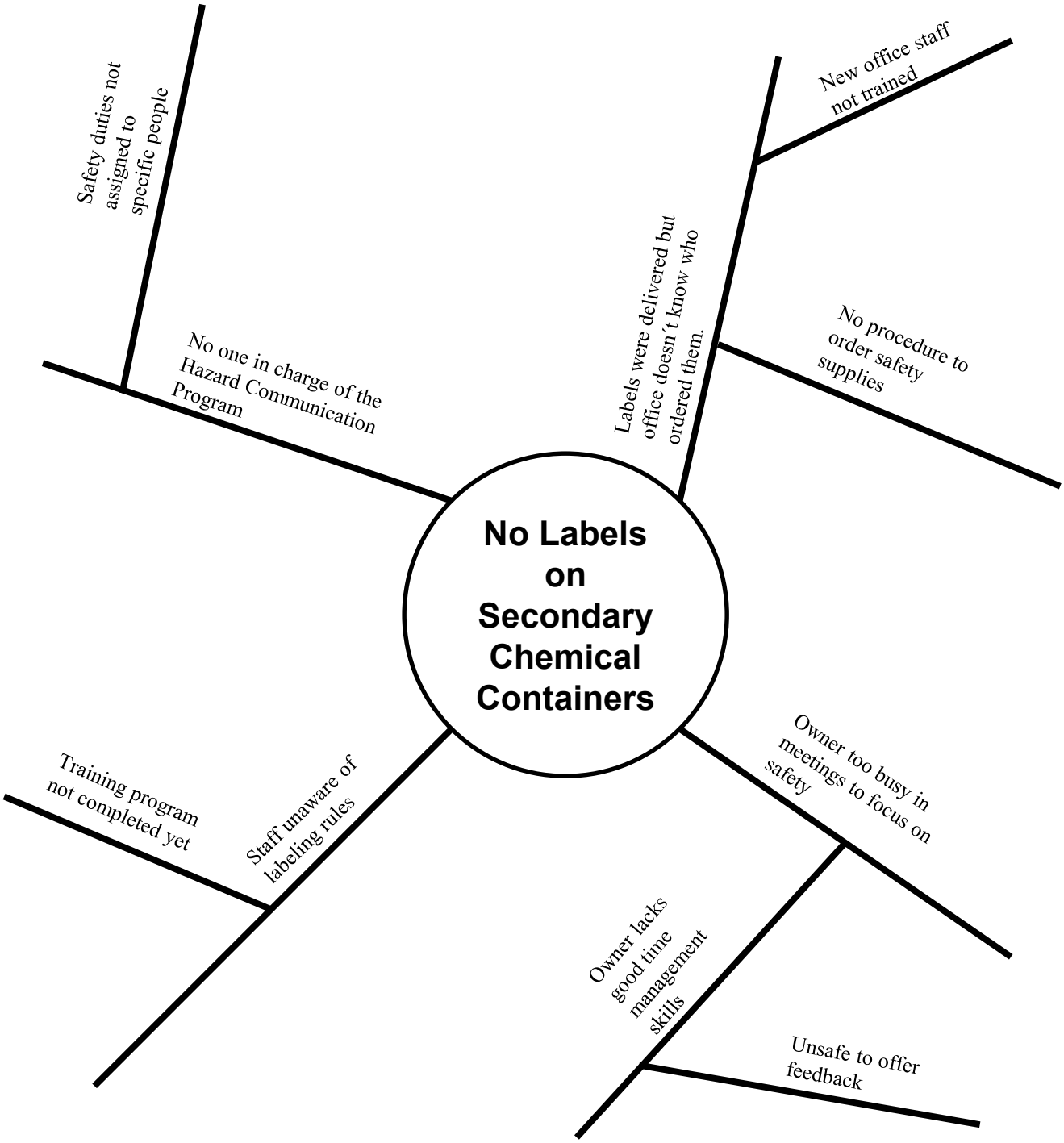
DESCRIPTION: A diagram used to represent ideas related to a central key word. Visual tool.

HOW IT WORKS:
The main problem is stated in the center circle. Lines drawn outward from the circle are direct and indirect causes of the main problem.

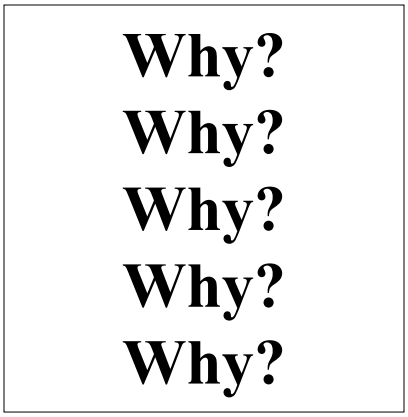
ADVANTAGES:
Uses the brain's natural ability to categorize ideas in a rapid, but rather unorganized manner. Helps intuitive thinkers identify contributing causes. Helps organize random ideas to solve problems.

DISADVANTAGES:
Logical thinkers may have problems using this intuitive method of problem solving.

Mindmapping – Example



Five Whys – Description



DESCRIPTION: A question and answer process to determine root causes of problems.

HOW IT WORKS:
The main problem, accident, incident, is stated. A minimum of 5 “whys?” are asked and answered. Each subsequent question and answer reaches deeper levels of causes until the root cause(s) are reached.

ADVANTAGES:
Identifies missing, or ineffective processes that “allow” the problem, accident, or incident to occur. Focus is "people do not fail, processes do".

DISADVANTAGES:
Requires that the people answering each question keep an open mind and avoid assumptions which may lead to answers unrelated to the main problem.

(For best results, the facilitator needs to be aware that when answers reach issues that appear beyond the scope of the group, such as lack of time or money, the facilitator instead should ask “why did the process fail?”)

Five Whys – Example

Why?
Why?
Why?
Why?
Why?

Chris fell off the ladder and broke his hip.

Why?

Because Chris didn't notice that one of the steps of the ladder was broken.

Why?

Because no one had trained Chris on how to inspect a ladder.

Why?

Because the owners thought if workers had any safety questions, they would ask somebody.

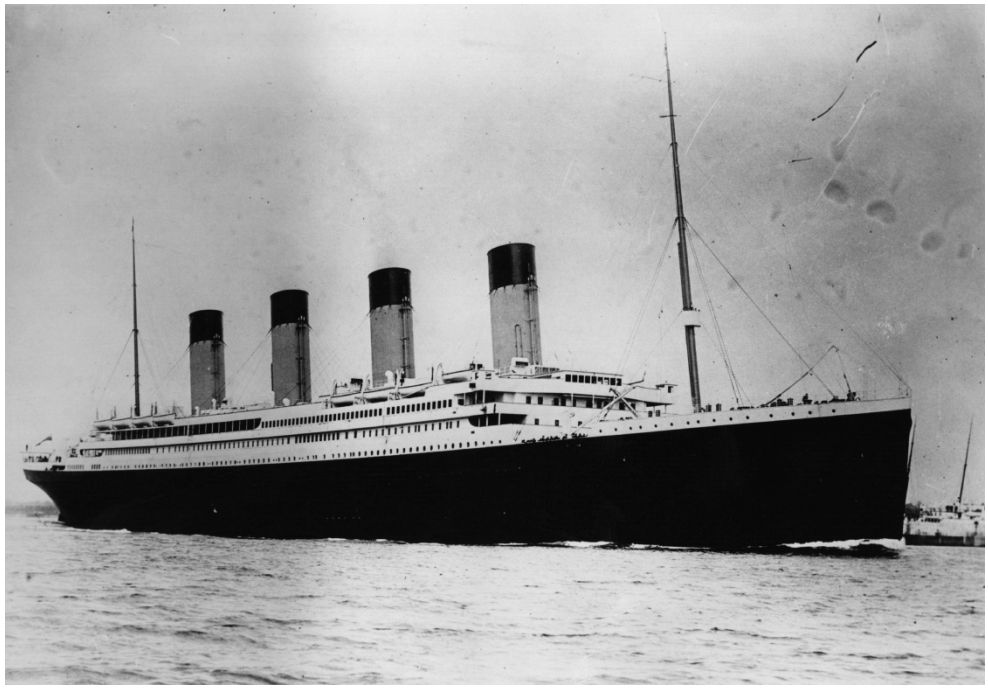
Why?

Because the company never developed a ladder safety program.

Why?

Because no one had been put in charge of company safety.

The Titanic

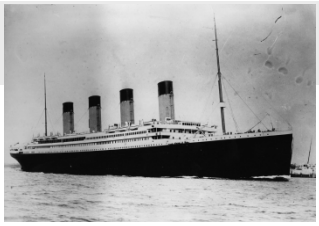


The Crew

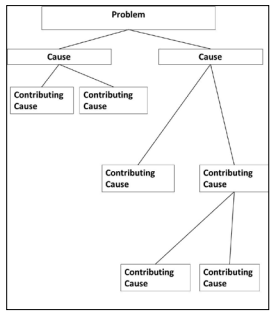
Titanic – The facts

- Ship was designed with watertight compartments.
- Ship was designed NOT to sink if up to 3 of its 16 compartments flooded.
- The ship's steel plates were held together with bolts and rivets, not the more modern welding.
- Ship was launched without enough lifeboats for the number of people.
- Prior to sailing, the crew was told that icebergs were moving south into the shipping lanes.
- The ship was cruising at almost top speed to reach America in record time.
- The crew watching for icebergs were not provided with binoculars.
- April 14, 1912 Titanic struck an iceberg at 11:40 PM.
- The collision caused five compartments to begin flooding.
- Over the next two and half hours, the ship filled with water.
- Some passengers and crew were evacuated on life boats that were only partially filled.
- At 2:20 AM, the Titanic sank.
- 710 people survived.
- 1514 people died.

Your turn!

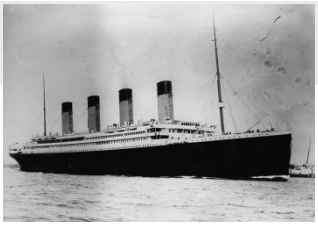


Fault Tree Analysis

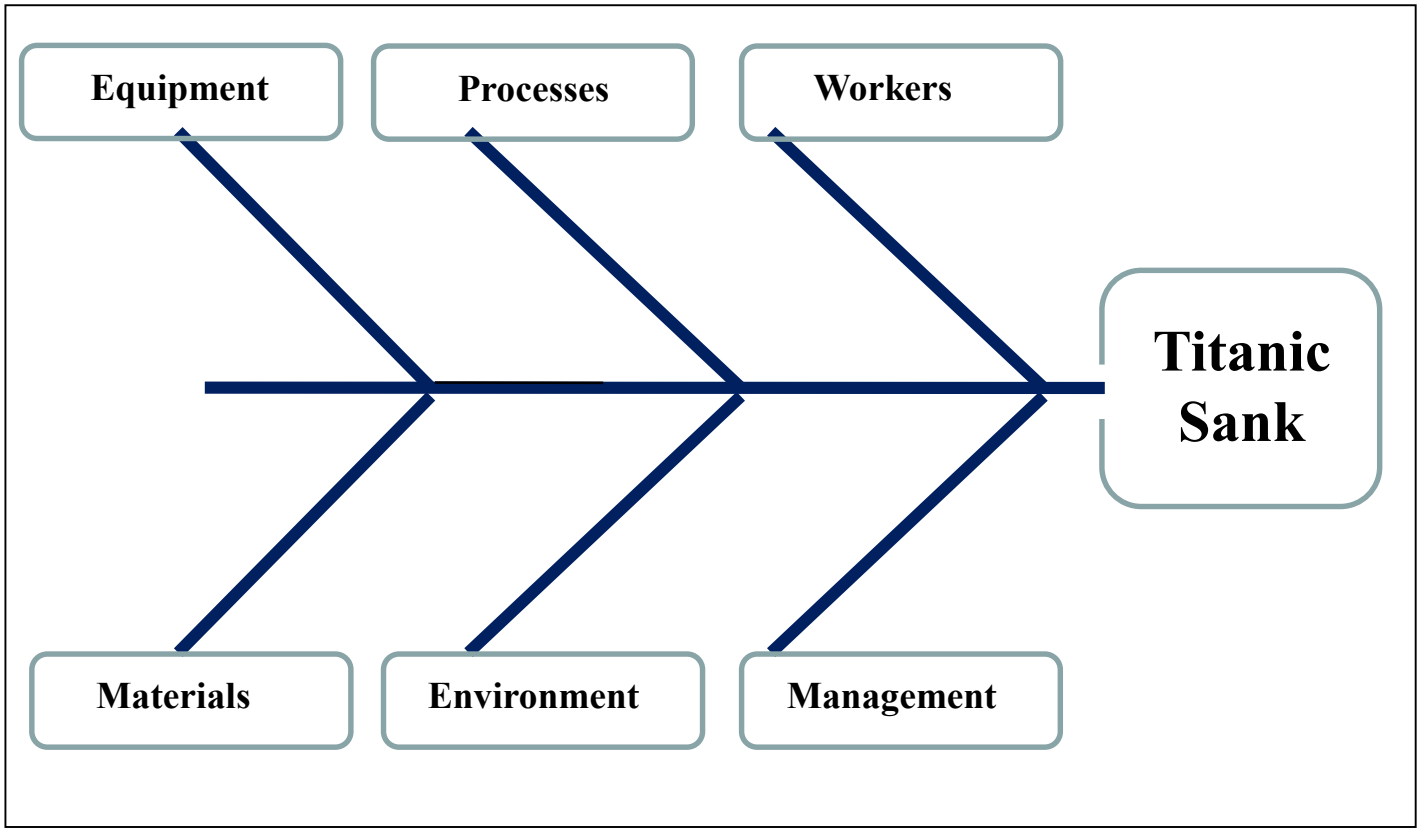


Titanic Sank

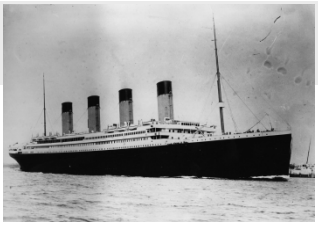
Your turn!



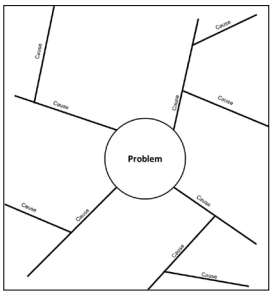
Fishbone Diagram



Your turn!



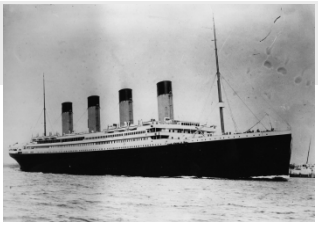
Mindmapping



Titanic Sank

Your turn!

5 Whys



Why?
Why?
Why?
Why?
Why?

The Titanic Sank

Why?

Why?

Why?

Why?

Why?

Solutions

GROUP IDEAS

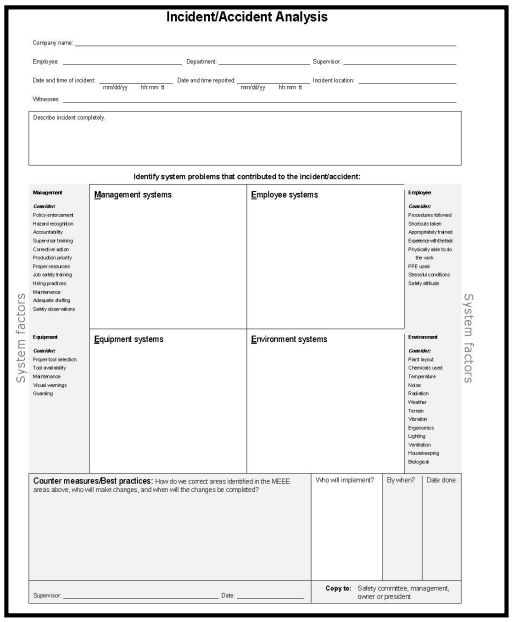
Problem: _____

_____

Solutions:

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

ANALYSIS AND CORRECTION FORMS



Incident/Accident Analysis

Company name: _____

Employee: _____ Department: _____ Supervisor: _____

Date and time of incident: _____ mm/dd/yy hh:mm tt Date and time reported: _____ mm/dd/yy hh:mm tt Incident location: _____

Witnesses: _____

Describe incident completely.

Identify system problems that contributed to the incident/accident:

Management — Consider: Policy enforcement; Hazard recognition; Accountability; Supervisor training; Corrective action; Production priority; Proper resources; Job safety training; Hiring practices; Maintenance; Adequate staffing; Safety observations

Management systems

Employee systems

Employee — Consider: Procedures followed; Shortcuts taken; Appropriately trained; Experience with tasks; Physically able to do the work; PPE used; Stressful conditions; Safety attitude

System factors

Equipment — Consider: Proper tool selection; Tool availability; Maintenance; Visual warnings; Guarding

Equipment systems

Environment systems

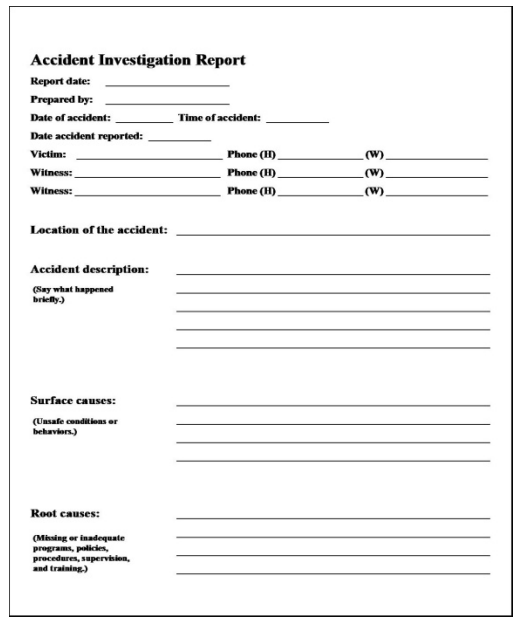
Environment — Consider: Plant layout; Chemicals used; Temperature; Noise; Radiation; Weather; Terrain; Vibration; Ergonomics; Lighting; Ventilation; Housekeeping; Biological

System factors

Counter measures/Best practices: How do we correct areas identified in the MEEE areas above, who will make changes, and when will the changes be completed?	Who will implement?	By when?	Date done

Supervisor: _____ Date: _____

Copy to: Safety committee, management, owner or president



Accident Investigation Report

Report date: _____

Prepared by: _____

Date of accident: _____ **Time of accident:** _____

Date accident reported: _____

Victim: _____ **Phone (H)** _____ **(W)** _____

Witness: _____ **Phone (H)** _____ **(W)** _____

Witness: _____ **Phone (H)** _____ **(W)** _____

Location of the accident: _____

Accident description: _____

(Say what happened briefly.)

Surface causes: _____

(Unsafe conditions or behaviors.)

Root causes: _____

(Missing or inadequate programs, policies, procedures, supervision, and training.)

Solutions – Group ideas

Hazard Solution - Using the power of group thought

Problem:

_____

Solutions:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Analysis and Correction Form – SAIF Corp.

Incident/Accident Analysis

Company name: _____

Employee: _____ Department: _____ Supervisor: _____

Date and time of incident: _____ Date and time reported: _____ Incident location: _____
mm/dd/yy hh:mm tt mm/dd/yy hh:mm tt

Witnesses: _____

Describe incident completely.

Identify system problems that contributed to the incident/accident:

System factors

Management

Consider:
Policy enforcement
Hazard recognition
Accountability
Supervisor training
Corrective action
Production priority
Proper resources
Job safety training
Hiring practices
Maintenance
Adequate staffing
Safety observations

Equipment

Consider:
Proper tool selection
Tool availability
Maintenance
Visual warnings
Guarding

Management systems	**E**mployee systems
Equipment systems	**E**nvironment systems

Employee

Consider:
Procedures followed
Shortcuts taken
Appropriately trained
Experience with the task
Physically able to do the work
PPE used
Stressful conditions
Safety attitude

Environment

Consider:
Plant layout
Chemicals used
Temperature
Noise
Radiation
Weather
Terrain
Vibration
Ergonomics
Lighting
Ventilation
Housekeeping
Biological

System factors

Counter measures/Best practices: How do we correct areas identified in the MEEE areas above, who will make changes, and when will the changes be completed?	Who will implement?	By when?	Date done.

Supervisor: _____ Date: _____

Copy to: Safety committee, management, owner or president

Analysis and Correction Form – Example

Company name: BEACH LUMBER

Employee: PETER PETERSON Department: 5TH FLOOR Supervisor: JOE BROWN

Date and time of incident: 8-12-2012 (mm/dd/yy) 7:30AM (hh:mm tt) Date and time reported: SAME (mm/dd/yy hh:mm tt) Incident location: 5TH FLOOR HALL BY DRINKING FOUNTAI

Witnesses: BILL SWEET & VICTORIA SUAREZ

Describe incident completely.

I WAS WALKING DOWN THE HALL AND SLIPPED ON WATER ON THE FLOOR. I FELL LANDING ON MY BACK AND HEAD.

Identify system problems that contributed to the incident/accident:

Management

Consider:
Policy enforcement
Hazard recognition
Accountability
Supervisor training
Corrective action
Production priority
Proper resources
Job safety training
Hiring practices
Maintenance
Adequate staffing
Safety observations

Management systems

COOLER NOT MAINTAINED

DID NOT VIEW AS HAZARDOUS

NO HAZARD I.D. TRAINING

NO PREVENTIVE MAINTENANCE TRAINING

Employee systems

OTHERS NOT REPORTED INCIDENTS

DID NOT KNOW THEY SHOULD REPORT INCIDENTS

NO INCIDENT REPORT SYSTEM

Employee

Consider:
Procedures followed
Shortcuts taken
Appropriately trained
Experience with the task
Physically able to do the work
PPE used
Stressful conditions
Safety attitude

Equipment

Consider:
Proper tool selection
Tool availability
Maintenance
Visual warnings
Guarding

Equipment systems

COOLER HAS BEEN LEAKING

NO PREVENTIVE MAINTENANCE POLICY

DRAIN PLUGGED NOT REPORTED

Environment systems

WATER ON FLOOR

NO ONE CLEANED IT UP

Environment

Consider:
Plant layout
Chemicals used
Temperature
Noise
Radiation
Weather
Terrain
Vibration
Ergonomics
Lighting
Ventilation
Housekeeping
Biological

Counter measures/Best practices: How do we correct areas identified in the MEEE areas above, who will make changes, and when will the changes be completed?	Who will implement?	By when?	Date done.
SET-UP PREVENTIVE MAINTENANCE POLICY	BILL	9-1	
DISCUSS VALUE OF INJURY PREVENTION	MARY	8-22	
DEVELOP REPORTING SYSTEM	BILL	9-1	
INSPECT ALL COOLERS	JERRY	8-15	

Supervisor: _____ Date: _____

Copy to: Safety committee, management, owner or president

S767 SAIF Corporation 5/12

Investigation and Correction Form (page 1)

Accident Investigation Report

Report date: _____

Prepared by: _____

Date of accident: _____ **Time of accident:** _____

Date accident reported: _____

Victim: _____ **Phone (H)** _____ **(W)** _____

Witness: _____ **Phone (H)** _____ **(W)** _____

Witness: _____ **Phone (H)** _____ **(W)** _____

Location of the accident: _____

Accident description: _____

(Say what happened briefly.) _____

_____

_____

_____

Surface causes: _____

(Unsafe conditions or behaviors.) _____

_____

_____

Root causes: _____

(Missing or inadequate programs, policies, procedures, supervision, and training.) _____

_____

_____

Investigation and Correction Form (page 2)

RECOMMENDATIONS

Corrective actions: _____

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

System improvements: _____

(To revise and improve the missing or inadequate programs, policies, procedures, supervision, and training.) _____

FOLLOW UP

Person responsible for making the corrections: _____

Actions needed to make the corrections: _____

(Describe equipment, machinery repaired, training conducted etc. Also describe system improvements such as programs, policies, procedures developed, and supervision and training improvements.) _____

Date by which corrections will be completed: _____

CONCLUSION

Reviewed by: _____ **Close date:** _____

Notes:

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).