Root Cause Analysis

Accident prevention must be planned
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.

Field Offices:

<table>
<thead>
<tr>
<th>Field Offices</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland</td>
<td>503-229-6193</td>
</tr>
<tr>
<td>Salem</td>
<td>503-373-7819</td>
</tr>
<tr>
<td>Eugene</td>
<td>541-686-7913</td>
</tr>
<tr>
<td>Medford</td>
<td>541-776-6016</td>
</tr>
<tr>
<td>Bend</td>
<td>541-388-6068</td>
</tr>
<tr>
<td>Pendleton</td>
<td>541-276-2353</td>
</tr>
</tbody>
</table>

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
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?

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. Specific questions concerning chemicals or procedures at your workplace may require contacting an Oregon OSHA consultant or technical representative.
Review - Accident Investigation Process

1. **Gather information**
   - Secure the accident scene

2. **Analyze the facts**
   - Collect facts about what happened
   - Develop the sequence of events
   - Determine the causes
   - Recommend improvements

3. **Implement Solutions**
   - Write the report
GROUP EXERCISE –

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

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Check the injuries that could happen to these workers:

☐ Death

☐ Broken bones

☐ Head and face injuries

☐ Back injuries

☐ Cuts
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.

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
**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

Failed Power Devices

Overstressed Devices
- Excessive Voltage Application
  Fault is user’s
- Excessive Heat Application
  Fault is user’s

Component Problem
- Parts Defective When Purchased
  Fault is supplier’s
- Good Parts Damaged During Assembly or Test

- Parts Damaged During Installation
  Fault is assembler’s
- Parts Damaged During Test
  Fault is assembler’s
**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.
**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

No Labels on Secondary Chemical Containers

- Safety duties not assigned to specific people
- No one in charge of the Hazard Communication Program
- Staff unaware of labeling rules
- Owner lacks good time management skills
- Unsafe to offer feedback
- New office staff not trained
- No procedure to order safety supplies
- Owner too busy in meetings to focus on safety
- Training program not completed yet
**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?”)
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.
Root Cause Analysis

The Titanic

The Crew
Root Cause Analysis

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 lifeboats 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

Equipment

Processes

Workers

Titanic Sank

Materials

Environment

Management
Your turn!  

Mindmapping

Titanic
Sank
Your turn!

5 Whys

**The Titanic Sank**

Why?

Why?

Why?

Why?

Why?
GROUP IDEAS

Problem: ____________________________

Solutions:
1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________
5. ____________________________
6. ____________________________

ANALYSIS AND CORRECTION FORMS
Solutions – Group Ideas

_Hazard Solution - Using the power of group thought_

Problem:
________________________________________________________________________

Solutions:

1. __________________________________________

2. __________________________________________

3. __________________________________________

4. __________________________________________

5. __________________________________________

6. __________________________________________
## Incident/Accident Analysis

**Company name:**

**Employee:**

**Department:**

**Supervisor:**

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

**Witnesses:**

---

**Describe incident completely.**

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### Identify system problems that contributed to the incident/accident:

<table>
<thead>
<tr>
<th>Management systems</th>
<th>Employee systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Management</strong></td>
<td></td>
</tr>
<tr>
<td>Consider:</td>
<td></td>
</tr>
<tr>
<td>Policy enforcement</td>
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<tr>
<td>Hazard recognition</td>
<td></td>
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<tr>
<td>Accountability</td>
<td></td>
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<tr>
<td>Supervisor training</td>
<td></td>
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<tr>
<td>Corrective action</td>
<td></td>
</tr>
<tr>
<td>Production priority</td>
<td></td>
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<tr>
<td>Proper resources</td>
<td></td>
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<tr>
<td>Job safety training</td>
<td></td>
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<tr>
<td>Hiring practices</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
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<tr>
<td>Adequate staffing</td>
<td></td>
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<tr>
<td>Safety observations</td>
<td></td>
</tr>
<tr>
<td><strong>Employee</strong></td>
<td></td>
</tr>
<tr>
<td>Consider:</td>
<td></td>
</tr>
<tr>
<td>Procedures followed</td>
<td></td>
</tr>
<tr>
<td>Shortcuts taken</td>
<td></td>
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<tr>
<td>Appropriately trained</td>
<td></td>
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<tr>
<td>Experience with the task</td>
<td></td>
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<tr>
<td>Physically able to do the work</td>
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<tr>
<td>PPE used</td>
<td></td>
</tr>
<tr>
<td>Stressful conditions</td>
<td></td>
</tr>
<tr>
<td>Safety attitude</td>
<td></td>
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</tbody>
</table>

### Equipment systems

<table>
<thead>
<tr>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider:</td>
</tr>
<tr>
<td>Proper tool selection</td>
</tr>
<tr>
<td>Tool availability</td>
</tr>
<tr>
<td>Maintenance</td>
</tr>
<tr>
<td>Visual warnings</td>
</tr>
<tr>
<td>Guarding</td>
</tr>
</tbody>
</table>

### Environment systems

<table>
<thead>
<tr>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider:</td>
</tr>
<tr>
<td>Plant layout</td>
</tr>
<tr>
<td>Chemicals used</td>
</tr>
<tr>
<td>Temperature</td>
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<tr>
<td>Noise</td>
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<tr>
<td>Radiation</td>
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<td>Weather</td>
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<td>Terrain</td>
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<td>Vibration</td>
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<td>Ergonomics</td>
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<td>Lighting</td>
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<tr>
<td>Ventilation</td>
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<tr>
<td>Housekeeping</td>
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<tr>
<td>Biological</td>
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</tbody>
</table>

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**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.**

---

**Copy to:** Safety committee, management, owner or president

---

**Supervisor:** Date:
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 7:30AM Date and time reported: SAME Incident location: 5TH FLOOR HALL
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 systems
- Cooler not maintained
- Did not view as hazardous
- No hazard I.D. training
- No preventive maintenance system

Employee systems
- Others not reported incidents
- Did not know they should report incidents
- No incident report system

Equipment systems
- Cooler has been leaking
- No preventive maintenance policy
- Drain plugged not reported

Environment systems
- Water on floor
- No one cleaned it up

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?

Set-up preventive maintenance policy
Discuss value of injury prevention
Develop reporting system
Inspect all coolers

Who will implement? By when? Date done.
BILL 9-1
MARY 8-22
BILL 9-1
JERRY 8-15

Copy to: Safety committee, management, owner or president

S767 SAIF Corporation 5/12
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.)
RECOMMENDATIONS

Corrective actions: ________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

System improvements: ________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

FOLLOW UP

Person responsible for making the corrections: _________________________________________

Actions needed to make the corrections: _______________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

Date by which corrections will be completed: _________________

CONCLUSION

Reviewed by: ________________________________ Close date: ___________________
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