

# “Risk-Based Incident Investigation and Analysis”

Presented by:

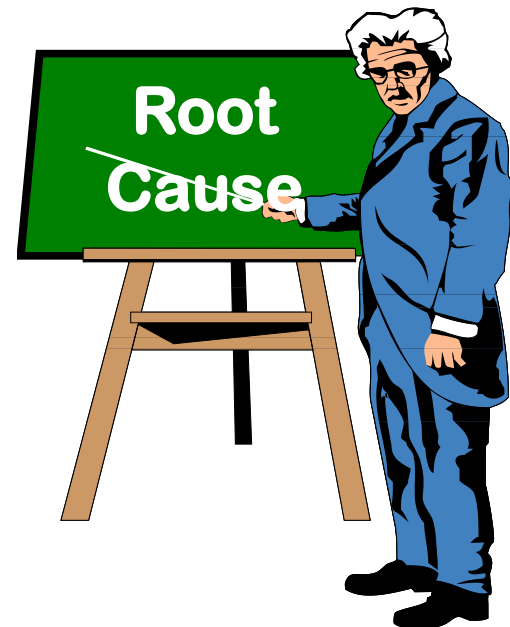
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# Objectives

- ☆ Implement the 10 Basic Steps in conducting incident investigations (per NSC)
- ☆ Collect all relevant data for analysis
- ☆ Examine control strategies for corrective and preventive actions.

# Purpose of an Incident Investigation

- ☆ Control the hazardous energy
- ☆ Identify basic causal factors
- ☆ Narrow-down Root Causes from list of causal factors
- ☆ Identify deficiencies in systems
- ☆ Suggest immediate, corrective (causal factors) and preventive actions (root causes) for a given incident
- ☆ Fact-Finding, not Fault-Finding!
- ☆ Prevent dissimilar incidents with
  - ☆ Risk Based Trend Analysis

# Incident Analysis Definitions

## Accident / Incident Definitions (injury, illness, property damage)



# Ten Steps for Incident Investigation and Analysis

1. Provide Emergency Response
2. Secure the Area, control immediate hazardous energies
3. Identify Potential Witnesses (within 24 hours)
4. Use an Investigation Kit
5. Procure Hard Evidence and Record Data
6. Conduct Interviews
7. Review Data
8. Prepare Report
9. Implement Corrective Action
10. Follow Up - Classify and Analyze Data and Communicate Results

# Asbestos Exposure Scenario

- ☆ Employee drilled through asbestos containing spray applied ceiling (ACM) to install electrical conduit.
- ☆ O&M plan identified this material as ACM.
- ☆ Public area

H&S happened to walk by. Saw some popcorn ceiling materials on the floor.

Approached the electrician. Stopped the job. 5 min in duration.  
Contact the ACM O&M Manager, Confirmed material as ASM.

# Step 1: Immediate Response

- ☆ Assess any potential hazard to others, including rescue/first aid personnel
- ☆ Eliminate/control identified hazardous energies before rescue attempt.
- ☆ Call for professional medical or rescue assistance as dictated by the conditions.
- ☆ Provide first aid, if qualified.
- ☆ Prevent or minimize future risk.

Decon the Electrician

# Step 2: Secure the Area

★ Why?

- 1- to prevent anyone else from being injured by the same thing.
- 2- to preserve evidence.
- 3 – to do immediate fixes.

Isolated the immediate area.  
Restricted any access  
ERT cleaned up any residual ACM (HEPA)



# Step 3: Collect Additional Information

- ☆ Visit the incident scene
- ☆ Collect samples (such as spills and residues)
- ☆ Make visual records
  - ☆ Take Photos
  - ☆ Draw a sketch of the incident scene
- ☆ Preserve evidence
- ☆ Identify those involved and other resources

# Step 4: Use Investigation Tools

- ☆ Pictures
- ☆ Sketches
- ☆ Baggies
- ☆ Flashlight
- ☆ Barricade tape (to preserve the scene)
- ☆ Warning Tape (in case there are still exposed conditions)
- ☆ Interview Forms
- ☆ Investigation Forms
- ☆ Measuring Tape
- ☆ PPE
- ☆ Etc.



# Step 5: Procure Hard Evidence and Record Data



1. People
2. Paper
3. Parts
4. Position

# Five “W”s of Incident Investigation

## ★ WHO

- ★ Injured Party / Supervisor / Team

## ★ WHEN

- ★ ASAP -- Memories & Evidence Fresh

## ★ WHERE

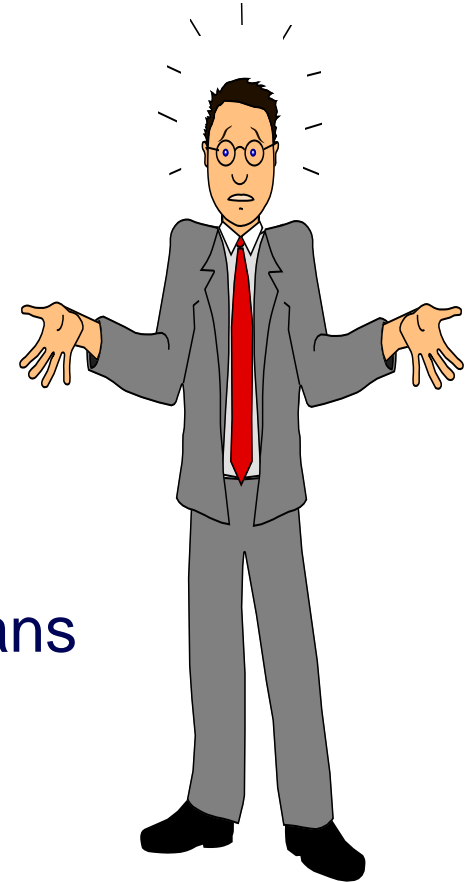
- ★ At the Scene

## ★ WHAT

- ★ Causal Factors / Corrective Action Plans

## ★ WHY

- ★ Identify all Causes
- ★ Prevent Similar Incidents



# Who are the People?

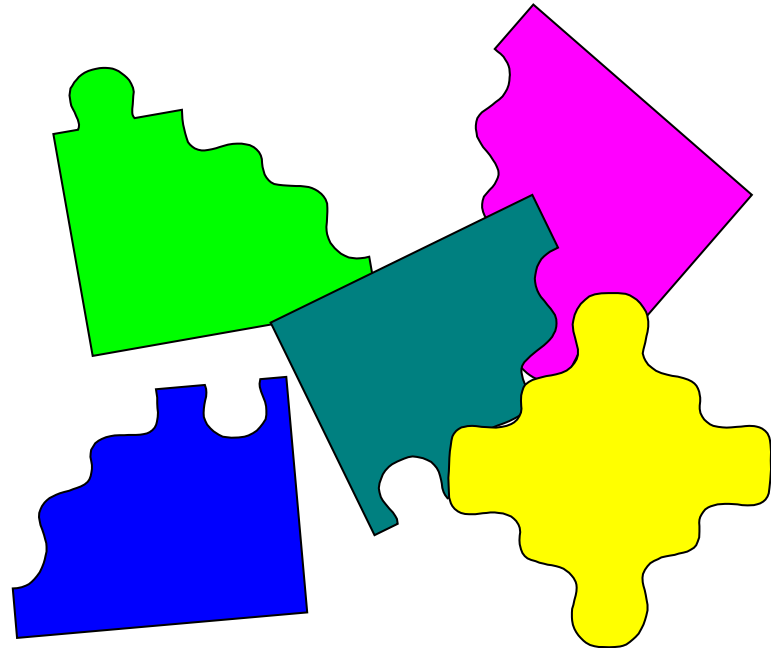
## Asbestos Release

- ☆ Maintenance Driller
- ☆ Maintenance Supervisor
- ☆ Asbestos O&M Manager
- ☆ H&S Observer

# Collecting Evidence - Paper

## ☆ Different Types of Paper Evidence:

- ☆ Records
- ☆ Standards
- ☆ Blueprints
- ☆ Codes



# What Papers are Involved?

## Asbestos

- ☆ O&M Procedure
  - ☆ List of ACM
  - ☆ Roles and Responsibilities
  - ☆ Annual O&M Audit
- ☆ Pre-job approvals
- ☆ Pre-job planning
- ☆ Driller (electrician) training

### Findings:

- 1) AC identified.
- 2) Electrician followed the procedure to get O&M Mgr Approval
- 3) Annual Audit performed by O&M Mgr.
- 4) Electrician trained in ACM locations two years ago

# Collecting Evidence - Parts

- ☆ Various Examples of Parts (Tools, Materials and Equipment)
  - ☆ Failed Machinery
  - ☆ Communication (electrical signal) Failure
  - ☆ Inadequate Support Equipment
  - ☆ Improper Fuels and Fluids
  - ☆ Debris at Incident

ACM  
Drilling



# Collecting Evidence - Position

- ★ Location, Location, Location
  - ★ Where Incident Occurred
  - ★ Where Equipment Ended Up
  - ★ Where Wreckage Found
  - ★ Where People Were

Public Exposure

# Step 6: Conduct Interviews

- ☆ Once data is collected, additional interviews will often need to be conducted
  - ☆ Interview as soon as possible.
  - ☆ Take notes when talking to personnel.
  - ☆ Conduct private, separate interviews.
  - ☆ Put worker at ease; investigation is for prevention, not to place blame.
  - ☆ Use open-ended questions. “what”
  - ☆ Ask for worker’s version of incident; confirm what is said by rephrasing.
  - ☆ Ask yourself “why” questions last, as part of the causal factor.
  - ☆ Close with a positive reminder and thank you.

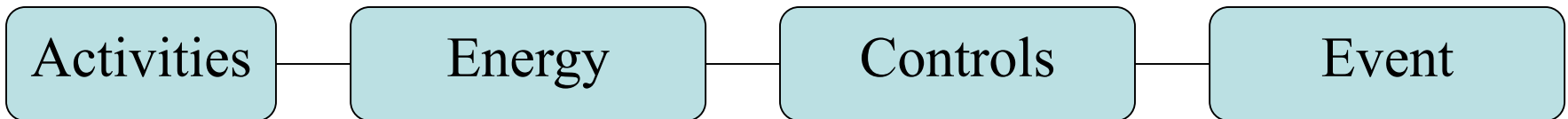
# How to Investigate: Interviewing Options

## ☆ Ask

☆ “Tell me what happened”,

☆ “What were you doing” “what are the Typical Steps”

☆ Pull the string: establish a timeline.



☆ Use “What” phrases to help you find out “Why”

# Interview Findings

## Asbestos

Supervisor and Driller (Electrician) cleared this material with the O&M Mgr.

O&M Manager gave their approval to disturb this Material. Said it was Not ACM. Later confirmed that this was ACM.

H&S walked by and saw the disturbance.

No labels were visible.

# Step 7: Review Data

Incident	Activities	Energy	Controls	Event
List background data: Time location, who, conditions, etc.	<u>What</u> were the steps leading up to the event?	<u>What</u> were the energy sources?	<u>What</u> controls were supposed to be in place, but failed? Or were ineffective ?	Start Here: Describe the event and the potential harm

# Energies = Hazards

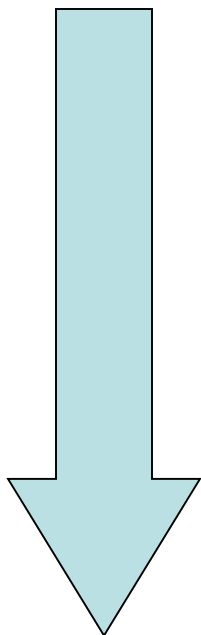
- ☆ When are hazards not hazardous?
- ☆ When will a hazard cause harm?

From OSHA Pub 3071...

- 1) Any chemicals or substances that can cause harm?
- 2) Any unwanted release of energy?
- 3) Any configuration hazards?
- 4) Any gravity hazards?
- 5) Any mechanical hazards?
- 6) Any environmental hazards?

# Hierarchy of Control

Most Effective

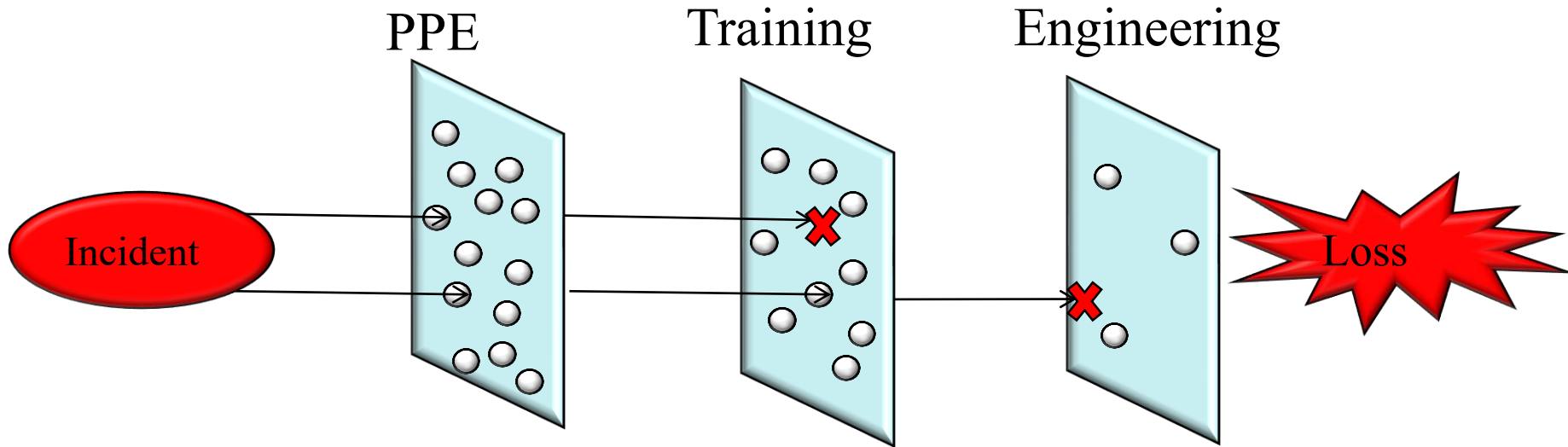


Least Effective

Protective Measure	Examples
Elimination or Substitution	<p><b>Eliminate human interaction</b></p> <p><b>Eliminate pinch points (increase clearance)</b></p> <p><b>Automated materials handling (robots, conveyors, etc.)</b></p> <p><b>Replace with less toxic compound,</b></p> <p><b>Replace/eliminate a reaction step, etc.</b></p>
Engineering Controls	<p><b>Barriers</b></p> <p><b>Interlocks</b></p> <p><b>Presence Sensing Devices (light curtains, safety mats, etc.)</b></p> <p><b>Two Hand Controls, etc.</b></p>
Training, Procedures and Awareness Means	<p><b>Safe work procedures</b></p> <p><b>Safety inspections</b></p> <p><b>Training</b></p> <p><b>Lights, beacons, and strobes</b></p> <p><b>Computer warnings</b></p> <p><b>Worker rotation</b></p> <p><b>Signs and Labels</b></p> <p><b>Beepers, horns and sirens, etc.</b></p>
Personal Protective Equipment (PPE)	<p><b>Ear plugs, gloves, respirators,</b></p> <p><b>Safety Glasses, face shields, etc.</b></p>

# Layers of Protection

## (Defense in Depth) and Hierarchy of Controls



- The circles represent holes or potential failures in a control. As you can see, some controls are more effective than others.
- With multiple layers of protection, what is the chance of each layer failing at the same time?
- The more severe the potential hazard, the more layers of protection you may need.
- SMS risk management is more than a one-time assessment!!!



# Are all engineering controls equal?

Protective Measures (Control)	Examples
Engineering	<ul style="list-style-type: none"><li>• Barriers</li><li>• Interlocks</li><li>• Presence Sensing Devices (light curtains, safety mats)</li><li>• Machine guards</li><li>• Pressure relief valves, energy isolation valves</li><li>• Non-skid floor coatings</li><li>• Local exhaust ventilation, containerization</li><li>• Two-hand controls</li><li>• Emergency stops are <u>NOT</u> an engineering controls in this model</li></ul>

- Active: less reliable. Requires human initiation
- Passive: more reliable

# What Controls Failed? Succeeded?

## Succeeded

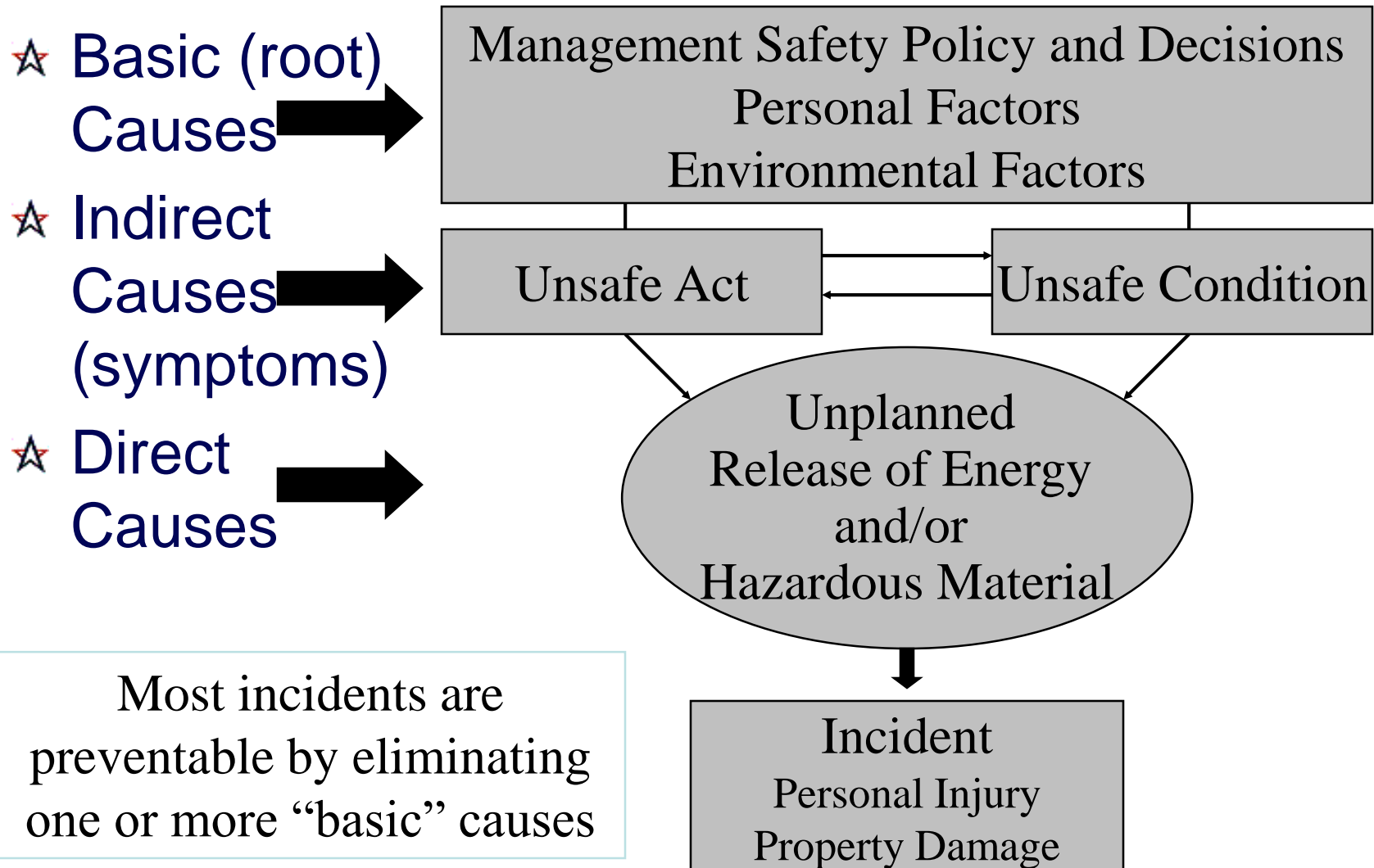
- ☆ Admin Procedure: Contact O&M Mgr.
- ☆ Admin: List of ACM

## Failed

- ☆ Admin: O&M Manager – single point failure
- ☆ Admin: Labeling

Any layers of controls?

# OSHA's Three "Cause" Levels



# Causal Factors

- ☆ People
- ☆ Equipment
- ☆ Materials
- ☆ Environment

Draw the 5 why's  
from EACH Causal  
Factor

People and Materials

# Root Causes

- ☆ Programs that were “supposed” to prevent the incident from happening
- ☆ Includes the “Culture”

## System Weaknesses:

- 1) O&M Mgr – Lack of oversight, ownership and accountability
- 2) O&M Audits – Did not ID “no labeling”
- 3) O&M Audits – Not independent of O&M owner. (\$\$\$)
- 4) Risk Assessment does not require engineering level or layers of protection for high severity hazards (Appetite)
- 5) Training by itself is NOT effective

# Immediate and Preventive Corrective Actions

## ★ Immediate

- ★ Barricade and prevent personnel
- ★ Clean

## ★ Corrective

- ★ Materials: labeling

## ★ Preventive

- ★ Two layers of controls
- ★ Approvals need QC level of supervisor. Signed permit.
- ★ Periodic Independent Auditing of the O&M

Have you minimized the energy, or exposure to the energy?

# Follow-Up

- ☆ Action Tracking
- ☆ Closure Verification
  - ☆ Build into recognitions
- ☆ Closure sustainability
  - ☆ 90 days later, is the action still closed
- ☆ Control and Risk Appetite
- ☆ Trend Reductions
  - ☆ Build into recognitions

Accountability and Recognition

# Where Do Most Incident Investigations Fail

- ☆ Typically blames employees
- ☆ Typically identifies “Human Error” or “Training”
- ☆ No standardization of Causal Factor system
- ☆ Little real training for Investigators
- ☆ No tracking to or verification of “Closure”.
- ☆ No QC process or review
- ☆ Incidents fixes are considered to be H&S responsibility (not assigning or tracking to the right party)



# Where Do Most Succeed!!

- ☆ Always includes a review of procedures and controls, to see where the analysis or control(s) failed
- ☆ ID “engineering” fixes
- ☆ Worker teams independently verify all corrective actions, to include interviews of affected workers
- ☆ Trend analysis of “Causal Factors”, Hazard Categories, and Control Failures
- ☆ Line management reports status of corrective and preventive action “fix” to Sr. Management

# Summary

- ✓ Implement 7 of the 10 Basic Steps in conducting incident investigations
- ✓ Collect all relevant data for incident analysis
- ✓ Examine control strategies for corrective and preventive actions.

# More Info ...

- ☆ National Safety Council (NSC)
  - ☆ Incident Investigation Manuals and Videos
- ☆ Incident Prevention Manual - NSC
  - ☆ Incident Prevention Manual: Administration and Programs
  - ☆ Incident Prevention Manual: Engineering and Technology
- ☆ James Reasons – the swiss cheese model of accident causation

# Questions?



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