

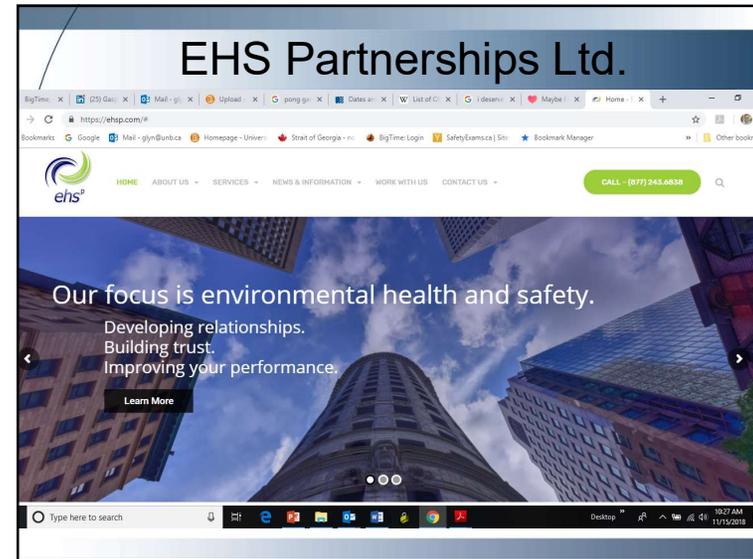


# Turbo-charge your Incident Investigation and Causal Analysis Process

February 6, 2020  
Glyn Jones, M.A.Sc, P.Eng, CIH, CRSP  
EHS Partnerships Ltd.  
gjones@ehsp.ca

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1



EHS Partnerships Ltd.

Our focus is environmental health and safety.  
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Building trust.  
Improving your performance.

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## ALBERTA HEALTH & SAFETY CONFERENCE



### Turbo-charge your Incident Investigation and Causal Analysis Processes

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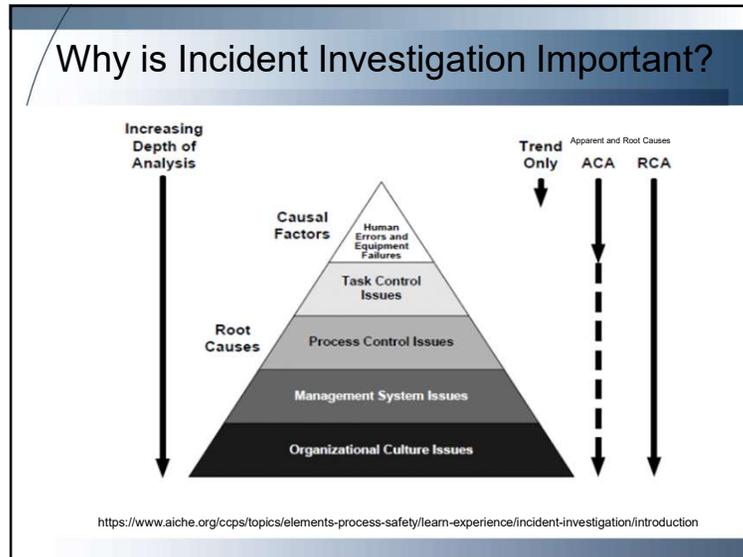
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2

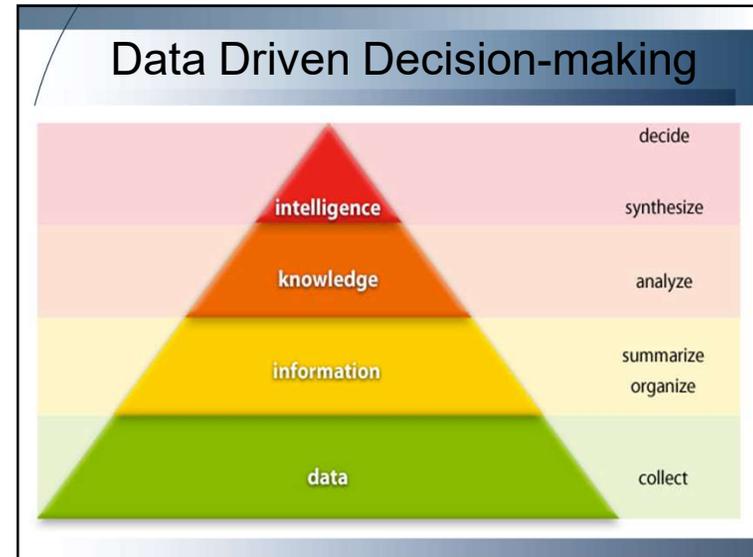


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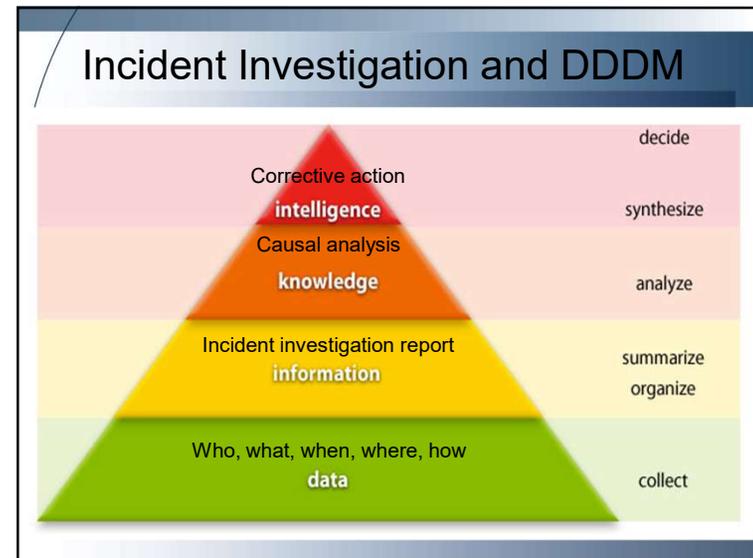
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11



10



12

2019 Report on Work Fatality and Injury Rates in Canada				
Sean Tucker, PHD Anya Keefe, MSc	2017 Data	Number of Lost-Time Injuries	Number of Injury Related Fatalities	Number of Occupational Disease Related Fatalities
UNIVERSITY OF REGINA				
Alberta		26,328	80	86
British Columbia		52,296	71	87
Manitoba		14,313	3	14
New Brunswick		4,708	7	8
Newfoundland and Labrador		3,368	5	20
Nova Scotia		6,148	2	12
NWT/Nunavut		912	3	1
Ontario		59,529	76	215
Prince Edward Island		1,061	2	0
Quebec		73,879	62	168
Saskatchewan		8,596	14	13
Yukon		487	1	1
<b>Total</b>		<b>251,625</b>	<b>326</b>	<b>625</b>

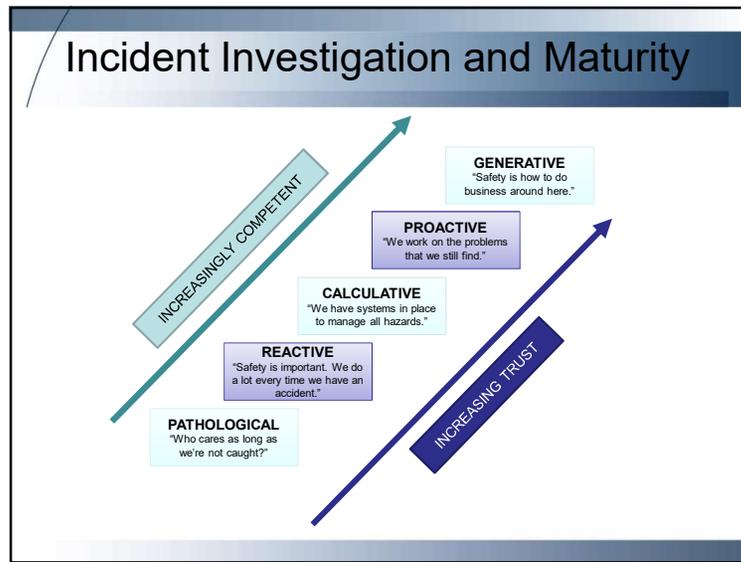
13

## Causes of Incidents

The causes of incidents go by many names. This can cause confusion.

- **Direct Causes** = Proximate Causes = Superficial Causes = Immediate causes
- **Indirect causes** = Distal Causes = Basics causes = Contributing Causes
- **Root causes** = Management System Failures = Fundamental Causes = Underlying Causes

15



14

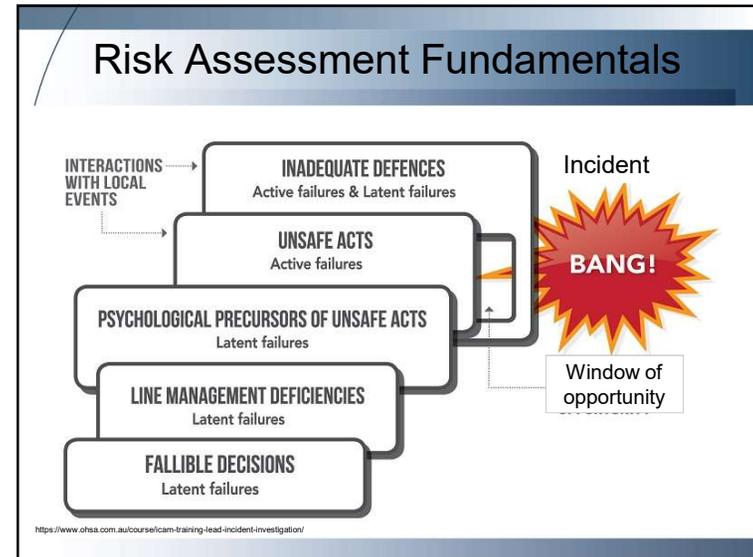
<b>Person Reporting Incident</b> Self Reporting: Last Name: [redacted] First Name: [redacted] Name: [redacted] Title: [redacted] Faculty/Dept: [redacted] Occupation/Position: [redacted] Department: [redacted] Date Reported (yyyy-mm-dd): 2017-11-21 Time of Reporting: 08:14		Location: [redacted] Date Reported: [redacted] Time: [redacted] Day: [redacted] Shift: [redacted]	
<b>Person Involved or Affected</b> Last Name: [redacted] First Name: [redacted] Name: [redacted] Title: [redacted] Work Related: Yes Length of employment: More than 3 years Time in occupation at title: [redacted]		<b>Root Causes</b> Failure to identify hazards, Weather conditions, Other (describe below): Root Causes: Inadequate maintenance, Lack of situational awareness, Other (please provide details below):	
<b>Incident Details</b> Date of Incident (yyyy/mm/dd): 2017-10-02 Time of Incident: 13:28 Location: [redacted] Incident Location/Parking: [redacted] Name: [redacted] Other: [redacted]		<b>Corrective Actions to Prevent Recurrence</b> Submit request for maintenance/repair, Review staff training, Other: Issue: [redacted] Issue: [redacted]	
<b>Management Review</b> Corrective Actions Target Date (yyyy-mm-dd): 2017-12-31 Corrective Actions Complete Date (yyyy-mm-dd): 2017-12-31		<b>Supervisor</b> Name: [redacted] Title: [redacted] Email: [redacted]	
<b>Second Higher Authority</b> Name: [redacted] Title: [redacted] Email: [redacted]		<b>Third Higher Authority</b> Name: [redacted] Title: [redacted] Email: [redacted]	
<b>Classification</b> Level 3: Injury reportable to [redacted] with lost time Type of Incident: [redacted]		<b>EHS</b> Name: [redacted] Title: [redacted] Email: [redacted]	

16

## DDDM at Work in Ottawa

	Winter 2016/17
Snow/Ice Calls to Customer Care	88
Total Lost-time Injuries (LTIs)	15
Fracture LTIs	6
Concussion LTIs	3

17

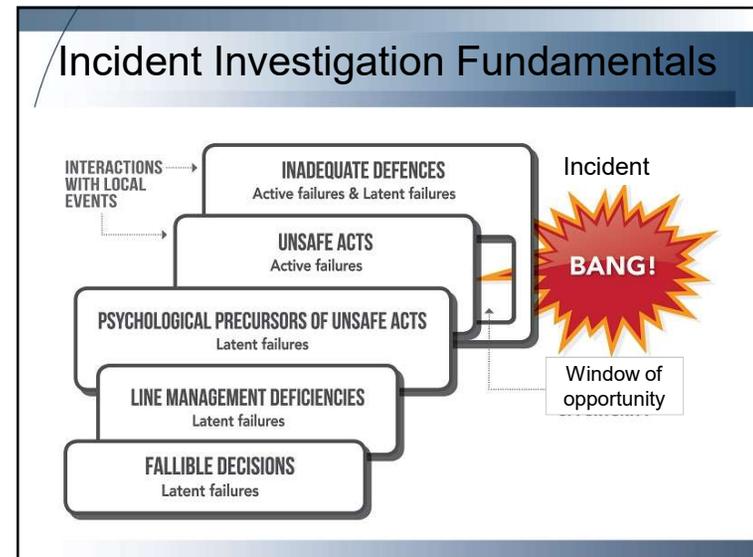


19

## DDDM at Work in Ottawa

	Winter 2016/17	Winter 2017/18	Winter 2018/19
Snow/Ice Calls to Customer Care	88	167	222
Total Lost-time Injuries (LTIs)	15	5	5
Fracture LTIs	6	1	0
Concussion LTIs	3	1	0

18



20

# CRSP's Competency Profile

## CRSPEX COMPETENCY PROFILE

Applied Safety Fundamentals (ASF)	
ASF1	Demonstrate an understanding of workplace inspections.
ASF2	Demonstrate an understanding of incident investigations.
ASF3	Demonstrate an understanding of statistical analysis (e.g., mean, percentage, standard deviation, time weighted average, etc.)

There are 48 questions on the exam from the ASF Domain. Given there are 25 ASF competencies, statistically there might only be two questions on the CRSP exam related to incident investigation. A candidate can get about 65 of the 200 questions wrong and still pass.

21

# OHSMS Continuous Improvement



23

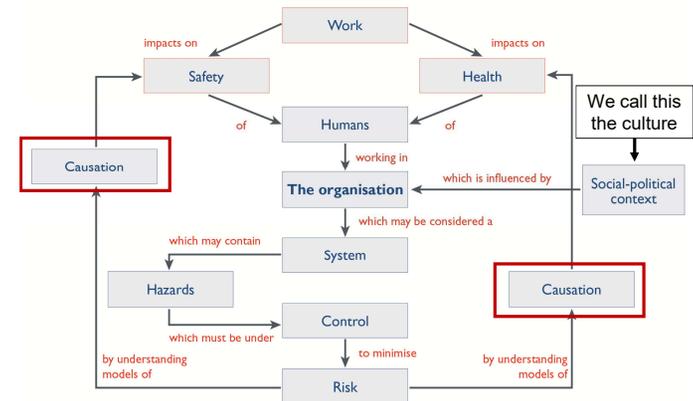
# OHSMS

- Company policy and management commitment
- Worker qualifications, orientation and training
- Hazard identification
- Hazard control
- Ongoing inspections
- Emergency response
- Incident investigation
- Modified Duties Program
- Measurement and continuous improvement
- Program administration



22

# Why Causation Matters



<http://www.ohsbok.org.au/wp-content/uploads/2013/12/32-Models-of-causation-Safety.pdf>  
Safety Institute of Australia

24

## The Value of Incident Investigation

### Why?

Proper incident investigation is a critical aspect of any OHSMS continuous improvement plan.

Current incident investigation processes at many organizations are not always as effective as we need them to be to learn from past incidents and improve processes to prevent future incidents.

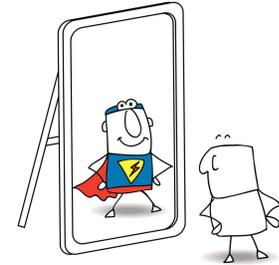
Without good investigation and causal analysis processes there is no system-wide corrective action and no system-wide continuous improvement.

25

## The Value of Incident Investigation

### How?

First, we need to assess, update and upgrade as necessary, the process to be followed by our team to ensure our processes are ready for implementation.



27

## The Value of Incident Investigation

### What?

We need a program to build the capacity of our internal team so that they are better able to investigate incidents properly with proper support and ensure that the true causes of incidents can be determined and corrective actions can be taken as necessary to prevent reoccurrence.

If continuous improvement is to be achieved it requires we are good at this across the organizational chart.

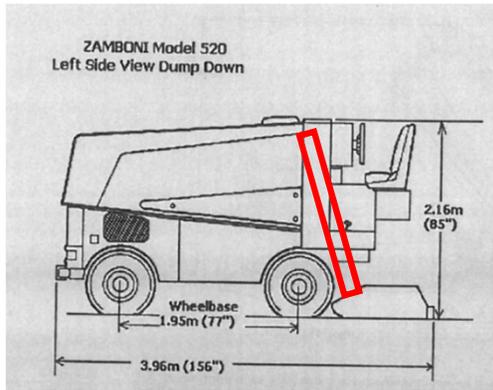
26

## Case Study – Zamboni Driver Injured



28

## Case Study – Zamboni Driver Injured



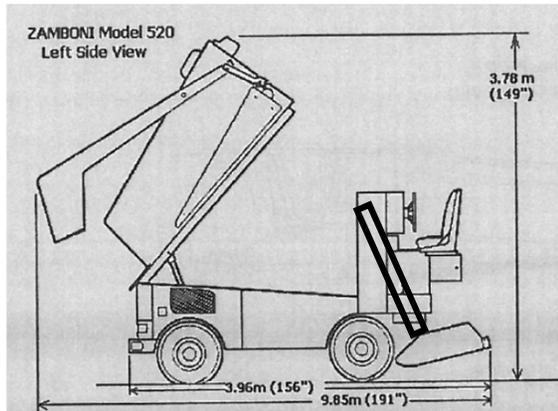
29

## Case Study – Zamboni Driver Injured



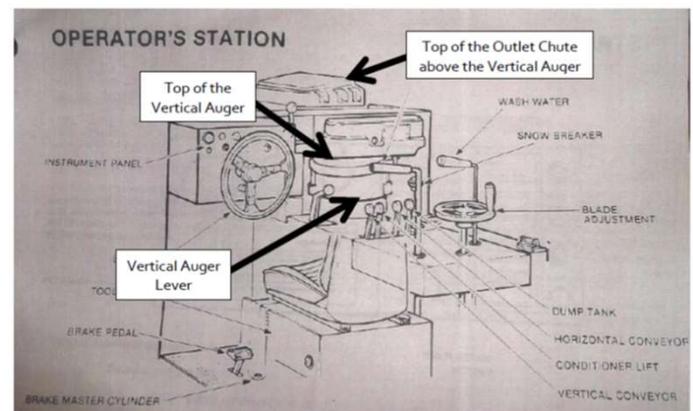
31

## Case Study – Zamboni Driver Injured



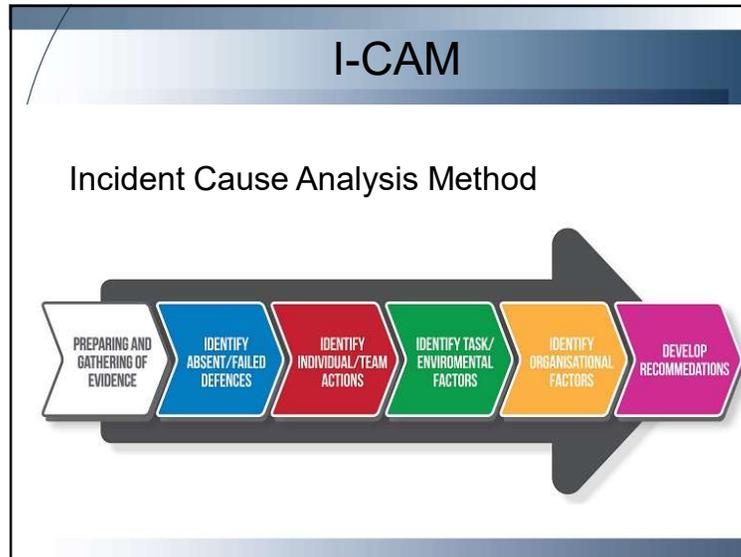
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## Case Study – Zamboni Driver Injured

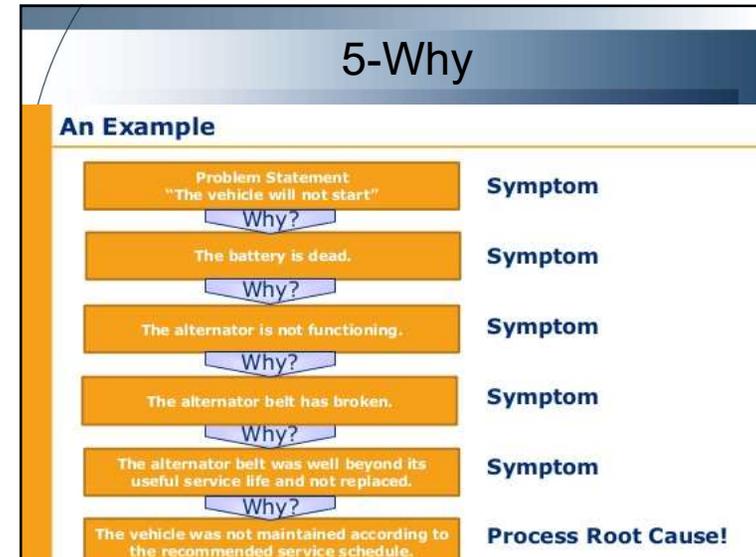


32





37



39

## Audience Participation Test

What tools do you use to undertake incident investigation and causal analysis?

- Our own internal incident investigation process
- TapRoot®
- BowTie
- SCAT (Systematic Causal Analysis Technique)
- ICAM (Incident Cause Analysis Method)

38

## Accident Pre-cursors

Task Demands	Individual Capabilities
• Time Pressure (in a hurry)	• Unfamiliarity w/Task / First Time
• High Workload (memory requirements)	• Lack Knowledge (mental model)
• Simultaneous, Multiple Tasks	• New Technique not Used Before
• Repetitive Actions, Monotonous	• Imprecise Communication Habits
• Irrecoverable Acts	• Lack of Proficiency / Inexperience
• Interpretation Requirements	• Indistinct Problem-Solving Skills
• Unclear Goals, Roles, and Responsibilities	• "Hazardous" Attitude for Critical Task
• Lack of or Unclear Standards	• Illness / Fatigue
• Work Environment	• Human Nature
• Distractions/Interruptions	• Stress (limits attention)
• Changes / Departures from routine	• Habit Patterns
• Confusing Displays or Controls	• Assumptions (inaccurate mental picture)
• Workarounds	• Complacency / Overconfidence
• Hidden System Response	• Mindset ("tuned" to see)
• Unexpected Equipment Conditions	• Inaccurate Risk Perception (Pollyanna)
• Lack of Alternative Indication	• Mental Shortcuts (biases)
• Personality Conflicts	• Limited Short-Term Memory

Shane Bush - Idaho Falls, Idaho

40

# Root Cause Analysis

<https://www.youtube.com/watch?v=sFQFrYtIPUc>  
Mark Galley, Reliability Engineer

## Root Cause Analysis - The Concept

**The Weed**

**The Root**

**Problem**  
Above the surface, obvious

**Source**  
Below the surface, obscured

**LANGUAGE:**

- Contributing factors
- Underlying issues
- Drill down
- Root out
- Dig into

41

# How to report it?

INCIDENT No. \_\_\_\_\_

**INCIDENT REPORT FORM**

This form should be completed by any employee who witnesses an incident or who was directly involved in the incident. Supervisors may complete the form on behalf of any person who witnessed the incident.

Your name: \_\_\_\_\_  
 Your job title: \_\_\_\_\_  
 Location of incident: \_\_\_\_\_  
 Date of incident: \_\_\_\_\_  
 Time of incident: \_\_\_\_\_

Please describe the incident which you witnessed below:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Names of any other witnesses: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Please send completed forms to HR & Corporate Safety

**Incident Reporting Form**

Use this form to report an incident, accident, injury, illness, lost time, or near miss. Return completed form to the Operations Supervisor or Management.

**This is a reporting of:**

Lost Time Injury  First Aid  Incident  Close Call  Observation

Details of person injured or involved to be filled in by person injured if possible

Person Completing Report: \_\_\_\_\_ Date: \_\_\_\_\_  
 Person(s) Involved: \_\_\_\_\_  
 Equipment or Task ID: \_\_\_\_\_

**Event Details**

Date of Event: \_\_\_\_\_ Location of Event: \_\_\_\_\_  
 Time of Event: \_\_\_\_\_ Witness(es): \_\_\_\_\_

**Description of Events** (Describe tasks being performed and sequence of events):

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\*Form reuse is required (even on the back of this sheet)

**Was event / injury caused by an unsafe act (activity or movement) or an unsafe condition (environmental or weather)?** Please explain:

\_\_\_\_\_  
 \_\_\_\_\_

**TO BE COMPLETED ONLY IF LOST TIME/INJURY OR FIRST AID WAS REQUIRED**

Form of First Aid: \_\_\_\_\_  
 Cause of Distress: Injury or Illness: \_\_\_\_\_  
 Was medical treatment required?  Yes  No  
 If yes, name of facility or physician: \_\_\_\_\_

Signature of Employee: \_\_\_\_\_ Date: \_\_\_\_\_  
 Signature of Supervisor: \_\_\_\_\_ Date: \_\_\_\_\_

43

# Incident Investigation

## Incident Investigation and DDDM

**Corrective action**  
**intelligence**      decide

**Causal analysis**  
**knowledge**      synthesize

**Incident investigation report information**      analyze

**Who, what, when, where, how**  
**data**      summarize  
organize

**data**      collect

42



44

## Witness Interviews

Who? The employees directly and indirectly involved.  
 When? As soon as possible after the incident.  
 How? The setting? The approach? The questions?



45

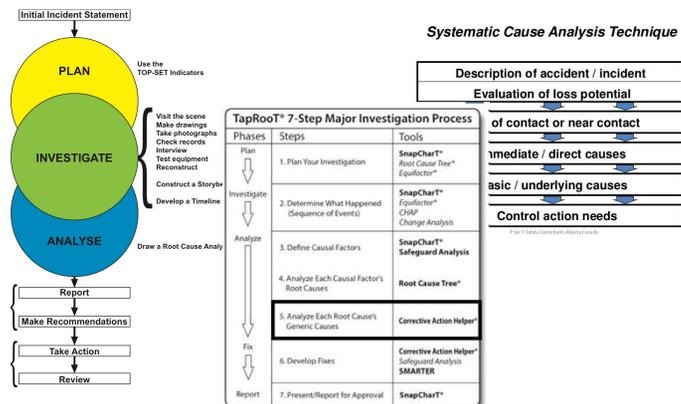
## Incident Investigation

Is a 3+ step process:

1. Incident Notification and Data collection:
  - Preliminary notification with immediate corrective action
  - Full investigation
2. Data (Causal) Analysis; and
3. Detailed System-wide Corrective Action

47

## How do you do causal analysis?



46



48

## Methods of Evidence Collection

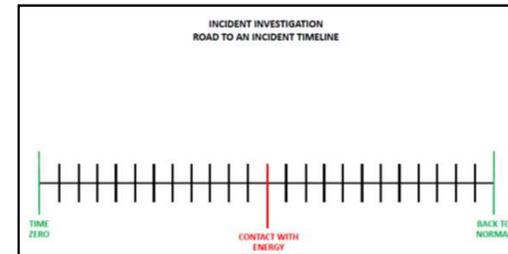
*Evidence* will be found in each of the following categories:

- People (most important)
- Position
- Parts
- Papers (least important)

49

## Detailed Timeline Development

This is used to establish the who, when, where, and how of the incident and forms an important bases for conditions and events analysis, 5-Why analysis and other root cause analysis



51

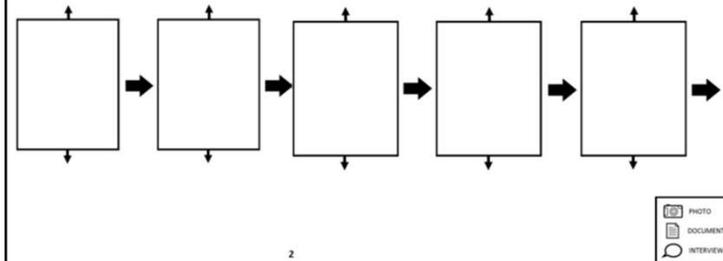
## Causal Analysis and Corrective Action

1. Detailed timeline development
2. Systems review of prevention efforts
3. Events and Conditions Analysis
4. Undertake a technical study of evidence and interpretation using "events and conditions" and "5-Why" analysis and other systems to determine basic causes and root causes, and corrective actions and improved controls
5. Develop corrective action
6. Review and finalize corrective action with Management
7. Track corrective action to completion

50

## Events and Conditions Analysis

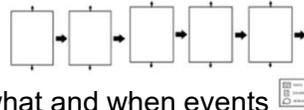
This is used to develop a more detailed description of what happened and allows for description of the conditions that existed to allow the event to occur.



52

## Events and Conditions Analysis

- A graphical method
- It allows you to represent what and when events happened and the conditions present that contributed to the events happening.
- Witness information and physical evidence allow you identify the events and conditions.
- Events go in the squares and conditions are added above or below the squares



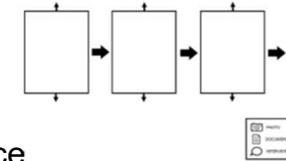
53

## The Real Causes of Incidents

Workplace incidents are a result of:

- Human errors
- Situational aspects and
- Environmental aspects

of the work and workplace.



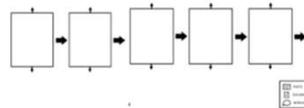
55

## Events and Conditions Analysis

Conditions could be:

1. Environment  
hot, cold, sunny, rainy, dark, light etc.
2. Employee focused  
skills, experience, training, certification, abilities, strength, height, etc.

- Witness information and physical evidence allow you identify the events and conditions.
- Events go in the squares and conditions are added above or below the squares



54

## Look for the Energy

Gravitational	Falls
Kinetic	Human energy, machine and material energy
Thermal	Burns (hot and cold), hypothermia, heat stress, solar
Biological	Infections, disease, pathogens
Chemical	Corrosion, reactions (exothermic, endothermic, explosive, toxic, carcinogenic, mutagenic, teratogenic)
Water	Asphyxiation, motive force, extreme temperature
Electrical	Shocks, burns, motive force (falls)
Radiation	Ionizing, non-ionizing
Animal	Attacks, bites, stings
Stored Potential Energy	Motive force (coiled springs), pressure (steam, compressed gases)
Noise	Machine, human, environmental
Multiple Kinds of Energy	Interaction of two or more of the above

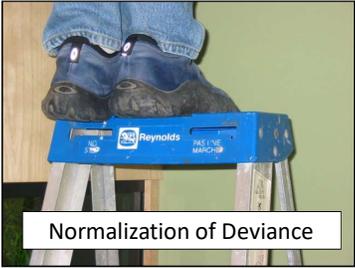
56

## The Social Environment

Human behavior is influenced by social context

Social norms, management practices, morale, training, incentives (e.g. construction workers will not wear safety gear if no one else is)

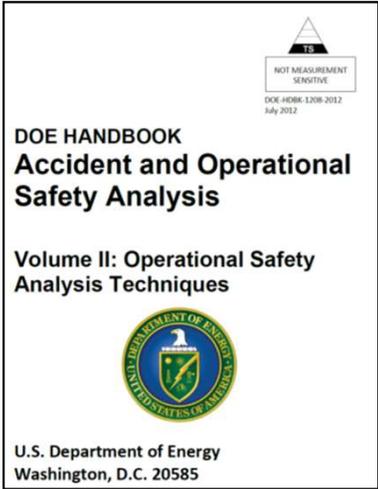
Creates the mechanism for “normalized deviance”



Normalization of Deviance

57

<https://www.standards.doe.gov/standards-documents/1200/1208-bhdbk-2012-v2/@/images/file>



**DOE HANDBOOK**  
**Accident and Operational Safety Analysis**

**Volume II: Operational Safety Analysis Techniques**

U.S. Department of Energy  
Washington, D.C. 20585

59

## The Real Problem

People, some:

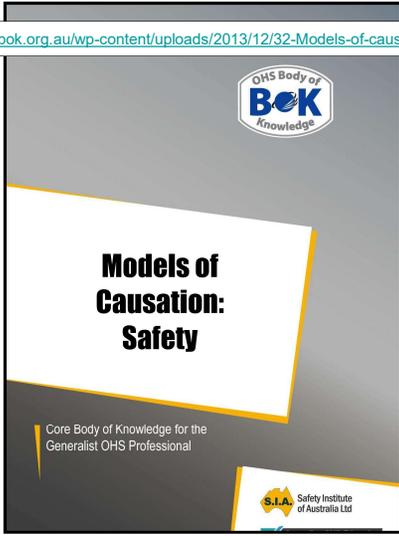
- are weak
- don't know
- don't care
- get tired
- forget
- are lazy
- are stressed
- don't follow rules
- are easily confused



But you need them to run your organization so.....we need to figure this out!

58

<http://www.ohsbok.org.au/wp-content/uploads/2013/12/32-Models-of-causation-Safety.pdf>



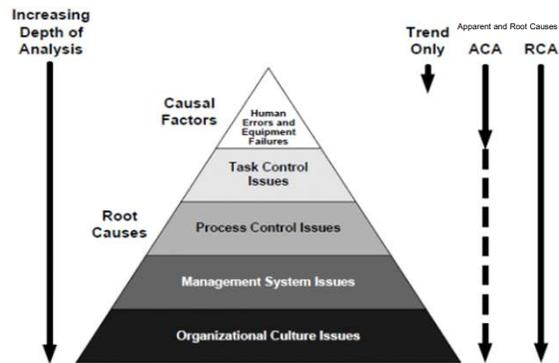
**Models of Causation: Safety**

Core Body of Knowledge for the Generalist OHS Professional

S.I.A. Safety Institute of Australia Ltd

60

## Why is Incident Investigation Important?



<https://www.aiche.org/ccps/topics/elements-process-safety/learn-experience/incident-investigation/introduction>

61

## Questions??

Please feel free to contact me directly



Glyn Jones, M.A.Sc., P.Eng., CIH, CRSP  
*Partner*

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Fax: 403.243.0760  
Email: [gjones@ehsp.ca](mailto:gjones@ehsp.ca)

63

## A Final Thought - Incident Investigation

### Basic Steps:

1. Report occurrence to Supervisor or Manager
2. Complete incident notification report
3. Examine scene for evidence and interview witnesses to determine immediate causes and assess the need to take immediate corrective actions to mitigate risk
4. Take photographs of scene and as appropriate complete a sketch of scene
5. Develop timeline document
6. Undertake a technical study of evidence and interpretation using "events and conditions" and "5-Why" analysis and other systems to determine basic causes and root causes, and corrective actions and improved controls
7. Formal reporting and communication of findings to Management. EHS team member to offer to provide a formal sit-down meeting to discuss incidents with 1-up and 2-up
8. System-wide roll-out, communication (by safety bulletin, hazard alert, or other means), and training, as necessary, on new and improved processes and systems

62