Improving Safety and Reducing Risks with Prevention through Design

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Presented by: Jon Treen PE, Stantec
Technical Leader, Global Mining
Background

20+ years in Mining

Operations
• GM Ontario Operations
• GM Production Support
• Manager Creighton Mine
• Manager Copper Cliff Mine
• Frontline Supervisor

Safety
• Safety Supervisor
• Ontario Mine Rescue
• Loss Control Leadership

Engineering
• PE, P.Eng
• Mine Engineering Supervisor
• Manager Discipline Engineering
• Technical Leader

Consulting
• Senior Consultant
• Operational Improvements
• Senior Reviewer
• Project Manager
Agenda

1. The Goal of Zero Harm
2. Hierarchy of Controls
3. The Zero Harm Journey
4. Learning across the Industry
1 The Goal of Zero Harm
The Goal of Zero Harm?

MSHA Reported Fatalities Metal/Non-metal Mines

Year

Fatalities


Stantec
From Fatalities to Zero Harm

1 Fatality
30 Lost Work Day Cases
300 Recordable Injuries
3,000 Near Misses (Estimated)
30,000 At-Risk Behaviors (Estimated)
Behavioral Based Safety

Hierarchy of Controls

5 Point Safety System (Neil George)

Audits

Management of Change Processes

Job Observations

Risk Assessment and Controls

Safety Shares

Incident Investigations

Hazops

Hazops
2 Hierarchy of Controls

- Eliminate: The complete removal of the hazard from the design
- Substitute: Replace the material or hazard with a less hazardous one
- Redesign: Design the equipment or work process in a different way
- Separate: Isolate the hazard by guarding it or enclosing it
- Admin.: Provide controls such as procedures, training, signage, etc.
- PPE: Use appropriate and properly fitted Personal Protective Equipment where other controls are not practical
Training in personal injury prevention is essential for Engineers.

Unfortunately, Engineers often get the same training as frontline employees, after the fact and without application to their specific functions.

Training them on the Hierarchy of Controls is essential for the mining industry.
3 The Zero Harm Journey
Presence in the Workplace
Stop
Look
Assess
Manage
# Safety Shares

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>Maintenance Shops</td>
<td>Fuelling Stations</td>
<td>Explosive Magazines</td>
</tr>
<tr>
<td>Shops</td>
<td></td>
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<tr>
<td>April</td>
<td>Water Management</td>
<td>Mine Accesses</td>
<td>Mining Methods</td>
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<tr>
<td>July</td>
<td>Materials Handling</td>
<td>Electrical Rooms</td>
<td>Ventilation Systems</td>
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<td>October</td>
<td>Shafts &amp; Conveyances</td>
<td>Personnel Egress</td>
<td>Emergency Preparedness</td>
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Safety Share

Explosive Magazine Design – Deteriorated Explosives

Statement (the situation you are referencing):

In November 2013 there was double fatality as a result of carbon monoxide poisoning. This was a result of detonating 1,600 lbs of deteriorated explosives.

One of the findings in the MSHA Investigations was “The accident occurred due to management’s failure to dispose of deteriorated explosives in a safe manner.”

Although it is rare that Engineering Firms are involved in procedures related to explosive handling, we are involved in the design of explosive storages.

In an attempt to eliminate this hazard, our designs should ensure they provide a safe and practical design to allow for First In – First Out (FIFO) in the explosive magazines.
Safety Share

Explosive Magazine Design – Deteriorated Explosives

Expectation (what you want people receiving this message to do):

When designing an explosives magazine, we need to ensure that the design allows for FIFO explosives handling ability.

Follow up (how is management going to ensure this happens):

This Safety Share will be shared with the Design Teams (both discipline and mining).

This design criteria will be added to the Prevention through Design Checklist.
## PtD Checklist Format

<table>
<thead>
<tr>
<th>Risk Considered</th>
<th>Hazard Identification</th>
<th>Designed Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confined Space</td>
<td>Poor Egress or Contaminants</td>
<td>Ease of access and adequate ventilation</td>
</tr>
<tr>
<td>Electrical</td>
<td>Cabling in Accessed Areas</td>
<td>Located cables away from other services or equipment</td>
</tr>
<tr>
<td>Explosive</td>
<td>Product that is Explosive</td>
<td>Eliminate ignition sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explosive proof lighting</td>
</tr>
<tr>
<td>Fall from Heights</td>
<td>Working from Elevated Locations</td>
<td>Eliminate the need (put all valves below chest level)</td>
</tr>
<tr>
<td>Fire</td>
<td>Burning or Smoke Inhalation</td>
<td>Fire doors and/or suppression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Close to return air system</td>
</tr>
<tr>
<td>Ground Control</td>
<td>Fall of Ground</td>
<td>Shotcrete in areas where high frequency of support damage</td>
</tr>
<tr>
<td>Isolation (LOTOTO)</td>
<td>Working on Energized Equipment or Lines</td>
<td>Design accessible valves Easy locking at all shut offs</td>
</tr>
<tr>
<td>Mobile Equipment</td>
<td>Human Equipment Interaction</td>
<td>Eliminate “Y” intersections Minimize curves on declines</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### General Checklist

<table>
<thead>
<tr>
<th>Risk Considered</th>
<th>Hazard ID</th>
<th>Designed Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confined Space</td>
<td>Egress and Contaminants</td>
<td>Ease of access and adequate ventilation</td>
</tr>
</tbody>
</table>

### Secondary Sump Design

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<thead>
<tr>
<th>Risk Considered</th>
<th>Hazard ID</th>
<th>Designed Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Control</td>
<td>Fall of Ground</td>
<td>Shotcrete ribs below potential water level</td>
</tr>
</tbody>
</table>

### Ore pass Design

<table>
<thead>
<tr>
<th>Risk Considered</th>
<th>Hazard ID</th>
<th>Designed Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run of Material</td>
<td>Water in Passes</td>
<td>Draining away from top of pass</td>
</tr>
</tbody>
</table>

### Maintenance Shops

<table>
<thead>
<tr>
<th>Risk Considered</th>
<th>Hazard ID</th>
<th>Designed Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Equipment</td>
<td>Struck by Equipment</td>
<td>Ensure clearance for toolbox</td>
</tr>
</tbody>
</table>
4 Learning across the Industry
Fatal Risks

Stantec’s Critical Risks

Golden Rules

Seven Keys to Life

Top Five Material Risks

MSHA Rules to Live By

Golden Guide
Your designs impact the safety of 100% of the people that utilize them.

Questions?