FATAL RISK MANAGEMENT

Craig Ross
Ross SH Consulting LLC
Graph 3: Associated hazards attributed to fatalities in 2018

- **Mobile equipment**: 16
- **Fall of ground**: 9
- **Falling objects (not FnG)**: 5
- **Other**: 4
- **Working at height**: 4
- **Energy Isolation**: 3
- **Machinery**: 2
- **Explosions & fires**: 2
- **Confined spaces & asphyxiating atmosphere**: 1
- **Structural failure**: 1

**Hazard classification**

**Number of fatalities**
WHY APPROACH FATAL RISK DIFFERENTLY?
Graph 2: ICMM total recordable injuries and frequency rate (2012-2018)
Graph 1: ICMM total fatalities and fatality frequency rate (2012-2018)
ICMM - 2014
REALISED THE VALUE POTENTIAL OF CRITICAL CONTROL MANAGEMENT

Critical control management is an integral part of risk management with a focus on the critical few risks and associated critical few controls.

The process requires the active participation across organisational levels in the establishment of adequate controls given the materiality of the risk, allocation of accountability for implementation/maintenance of controls and performance monitoring of critical controls, to prevent the realisation of material risk.
ICMM - FATALITY PREVENTION

Common approach

• Broad, engagement processes
• Broad focus, from low-level hazards to significant risks
• Broad participation in risk identification and risk analysis
• Broad definitions of risks (eg ‘Fire in processing plant’)
• Broad description of consequence
• Broad description of ‘controls’ (including reference to documents – “Traffic Management Plan”)
• Long lists of supposed ‘critical controls’

Good practice

• Targeted, technical exercises
• Focus only on material risk events (Fatal Risks)
• Targeted participation to include the right people at the right time. Subject Matter Experts predominantly driving risk analysis
• Specific risk events (e.g. Fire in conveyer transfer station) to enable detailed understanding of causes and associated controls
• Detailed consequence analysis (based on modelling where possible)
• Focus on specific activities, and associated accountabilities, required to prevent a cause or mitigate a consequence.
• Analysis to identify the ‘critical few’
For further information:

www.icmm.com

@icmm_com

info@icmm.com
## Powered Haulage

2015 – 19%
2016 – 23%
2017 – 46%
2018 – 50%
2019ytd – 32%

### Metal/Nonmetal Daily Fatality Report - October 15, 2019

<table>
<thead>
<tr>
<th>Accident Classifications</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
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<td>15</td>
<td>6</td>
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<td>26</td>
<td>22</td>
<td>22</td>
<td>18</td>
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</table>
• Critical Causal Factors
  – Fatigue
  – Operator error
    – Visibility
    – Distractions
    – Fit for duty
FATIGUE – UNDERSTAND THE PROBLEM

• Lack of Sleep!
  - 10% of operators account for 90% of major fatigue events
    • Medical Condition
    • Lifestyle
    • Life event (positive or negative)
    • Work schedule
FATIGUE MANAGEMENT PLAN

• SHIFT SCHEDULE
  – All workers must be provided a work schedule that enables a minimum of 7 hours of continuous sleep in a 24-hour period (bearing in mind travel, meals, family, etc.)
  – When 7 or more consecutive 12-hour night shifts are worked, a minimum 8 hours of continuous sleep in a 24-hour period is required
  – 12-hour shifts must provide at least 2 or more breaks of least 20 minutes in length in addition to lunch.
  – There must be no less than 24 hours of recovery time between shift rotations to allow for at least 1 complete sleep cycle.
FATIGUE MANAGEMENT PLAN

• Education/Training – Understand the problem!
  – Sleep and normal circadian rhythms
  – Sleep disorders and other risk factors
  – The workplace environment and the effects of shiftwork
  – Recognizing signs and symptoms of fatigue
  – Proper nutrition and the effects of stress, drugs and alcohol
  – Sleep Management

• How to get help!!
  – Confidential medical intervention
ARE CONTROLS EFFECTIVE?

“Risk Creep”
FATIGUE MANAGEMENT PLAN

• FATIGUE MONITORING
  - Employee reporting
  - Supervisory observation
  - Incident/event investigation
# Control Failure Potential Table

## Activities required to maintain or assure control effectiveness

<table>
<thead>
<tr>
<th>Activities required to maintain or assure control effectiveness</th>
<th>No activity necessary and/or human error highly unlikely</th>
<th>Single activity with history of high level of compliance</th>
<th>2 to 5 activities with history of high level of compliance</th>
<th>2 to 5 activities with history of non-compliance or error (intentional or unintentional)</th>
<th>Numerous activities to apply control with high probability of error (intentional or unintentional)</th>
</tr>
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<tbody>
<tr>
<td>5+ year inspection/testing/calibration - may or may not require rebuild or overhaul</td>
<td><strong>25</strong></td>
<td><strong>24</strong></td>
<td><strong>22</strong></td>
<td><strong>17</strong></td>
<td><strong>15</strong></td>
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<tr>
<td>Annual inspection/testing/calibration - often resulting in some repair or replacements</td>
<td><strong>23</strong></td>
<td><strong>21</strong></td>
<td><strong>18</strong></td>
<td><strong>14</strong></td>
<td><strong>10</strong></td>
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<tr>
<td>Biannual or monthly inspections/testing or calibration</td>
<td><strong>20</strong></td>
<td><strong>19</strong></td>
<td><strong>13</strong></td>
<td><strong>9</strong></td>
<td><strong>6</strong></td>
</tr>
<tr>
<td>Weekly inspections/testing or supervisory observations</td>
<td><strong>16</strong></td>
<td><strong>12</strong></td>
<td><strong>8</strong></td>
<td><strong>5</strong></td>
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<tr>
<td>Daily inspections or constant supervisory observations</td>
<td><strong>11</strong></td>
<td><strong>7</strong></td>
<td><strong>4</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

Worker behaviors required to implement controls while performing task or react to the unwanted event.
MONITORING FOCUS

• Critical Controls

A control that is crucial to preventing the event or mitigating the consequences of the event. The absence or failure of a critical control would significantly increase the risk despite the existence of the other controls.
MONITORING FOCUS

Define performance and reporting

• Consider the site-specific requirements for the:
  – Control objectives
  – Performance requirements
  – Activities that affect critical control performance
  – Activities to verify performance (verification activities)
  – Reporting requirements
OPERATOR ERROR – UNDERSTAND THE PROBLEM

- Visibility
- Distractions
- Fit for duty
TRAFFIC MANAGEMENT PLAN

- Education Training
- Separation distances
- Road/intersection design
- Degrading weather conditions
- Operating/Maintenance procedures

**TMP MONITORING**
- Employee reporting
- Supervisory observation
- Incident/event investigation
FATIGUE MANAGEMENT PLAN & TRAFFIC MANAGEMENT PLAN

• MONITORING
  – Employee reporting
  – Supervisory observation
  – Incident/event investigation
  – Monitoring through Technology
PERFORMANCE INDICATORS MONITORING
TECHNOLOGY

Enhancing risk mitigation through technology

Number Of Fatal Accidents
(Civil Aircraft with 10 or More Passengers)

Source: PlaneCrashinfo.com
TECHNOLOGY

• Fatigue Monitoring
• Collision awareness/avoidance

• Advantage of available technology
  – Used as control (alarm/intervention)
  – Used for monitoring controls effectiveness and continuous improvement
TECHNOLOGY (FATIGUE & COLLISION AVOIDANCE)

• Selection criteria
  – Accurate without nuisance alarms (TRUSTED!)
    • Configurable for operating conditions (i.e. Pit operations vs ready line vs shop)
  – Zero assumptions
    • Who, what and where!
  – Capture ALL event data
    • Who, what, where, when and type (EMESRT scenarios)
  – Real time system health & remote reporting/configuration updates
FATIGUE & PROXIMITY TECHNOLOGY MONITORING EXAMPLES

**Situation Based Events**
Understand why and where the events are happening.

**Behavior related Events**
Understand where and who are operating at risk.
FATIGUE & PROXIMITY TECHNOLOGY MONITORING EXAMPLES

Event Density locations
Identify the locations exposed to the major risks.

Critical Risks and Trends
Place the importance to eliminate the extreme consequences near misses, understand if your safety controls are improving.
ICMM – FATALITY PREVENTION
EIGHT LESSONS LEARNED REPORT 2019

- Zero fatalities mindset. As an industry we need to **continue to focus on fatality prevention, while not neglecting work towards injury reduction.**

- Safety leadership at all levels. This is critical if we’re to achieve a fatality free mining industry. Where missing, a true, **positive culture of safety needs to be developed and sustained.**

- **Change management.** Safety as a value must be a constant focus, and cannot be allowed to flex or wane in industry cycles, divestments or joint venture partnerships.

- **Learning from the past.** We must learn from past fatalities and proactively apply critical controls to mitigate known fatal risks.

- **Risk management capability.** We must be better at building adequate capability to ensure high quality risk assessments, and address variations in tolerance to risk at different operations across the world.

- Critical controls. We must recognize fatal risks and eliminate them, including for **technological solutions, as part of a balanced, holistic approach.**

- Fall of ground. Operating deep, high-stress mines requires continued efforts to better protect individuals from rock bursts and fall of ground.

- Prevention is better than cure. **Occupational disease from mining is resulting in more fatalities than has been recognized in the past.** The industry needs to be prepared to adopt new, different controls to those required for other fatal risks to prevent the burden of occupational disease.
Craig Ross
Owner

Ross SH Consulting LLC

Email: rosscfrcraig@outlook.com
Phone: (801) 560-9418
Specializing in Mining Safety & Health

3461 Corner Canyon Road
Erda, UT 84074