



# Worker contact with motor vehicles top health and safety risk for mining operations

May 26, 2021

1 888 730 7821 (Toll free Ontario)  
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# Welcome to the webinar: Worker contact with motor vehicles top health and safety risk for mining operations

- We will be getting started at 10:00 am Eastern Time.
- Use chat box for commentary or questions.
- Questions may be answered during the presentation, but most will be addressed at the end of the presentation.
- A link to the webinar recording, copy of presentation slides, and reference material will be emailed to registrants within one business day of the webinar.

# Webinar co-hosts

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# Agenda

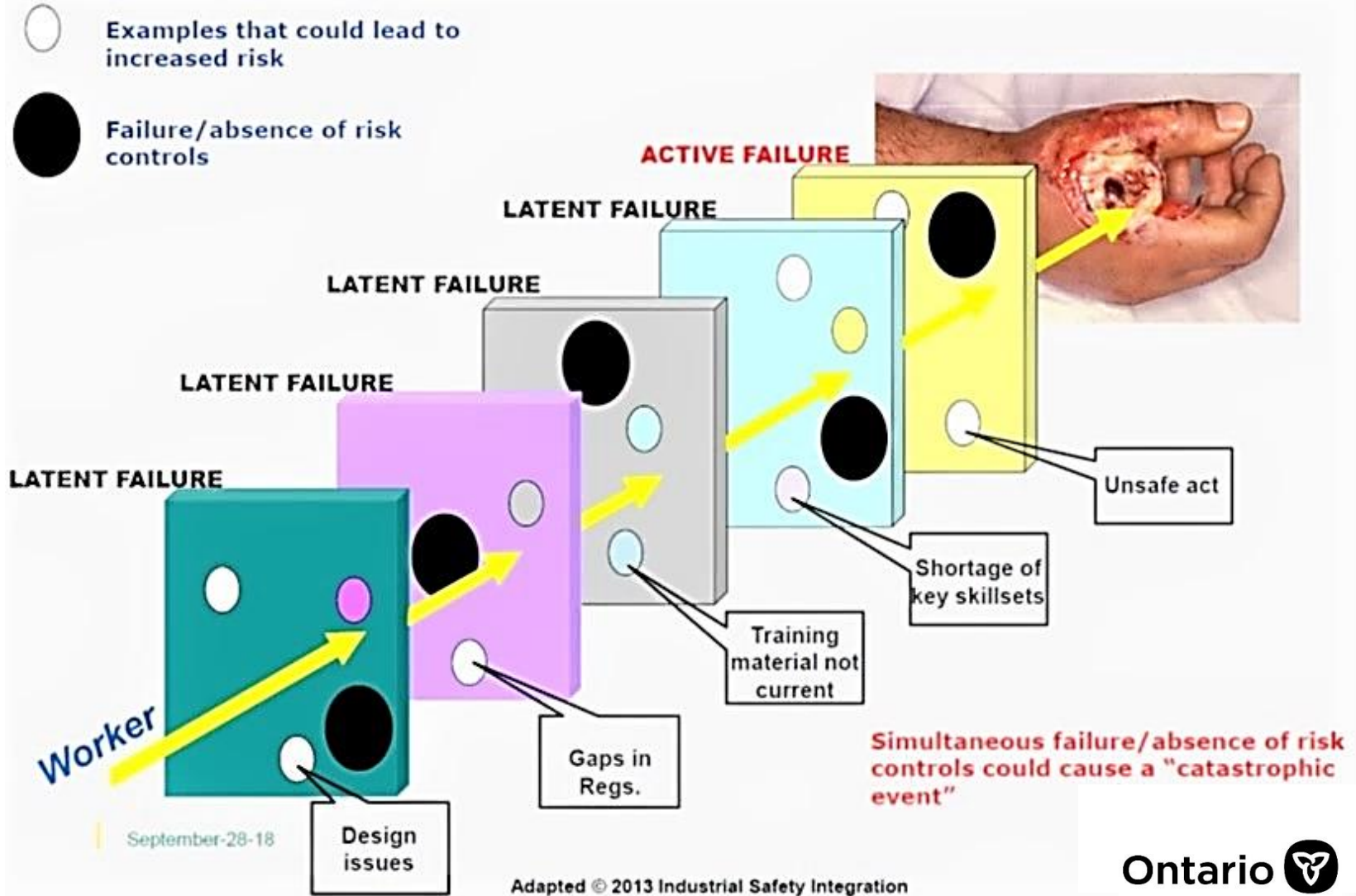
1. Root-Cause Analysis Report - Mining: Mobile Equipment
2. Background and introduction
3. Root-cause analysis process
4. Solutions and controls
5. WSN information and resources
6. Q & A

# Root-Cause Analysis Report - Mining: Mobile Equipment Content

1. **Risk Assessment Project:** The Subject of Inquiry
2. **Background:** Revisiting 2014 Risk Assessment Workshop Results
3. **Root-Cause Analysis:** Risk Statement
4. **Workshop:** A Bipartite and Collective Process
5. **Workshop Participants:** Ground Control Subject Matter Experts
6. **“Fishbone” Diagram:** Primary Causal Factors
7. **Top 10 Primary Causal Factors:** List of Controls
8. **Appendix I - VI:** “Fishbone Diagram” for Secondary, & Tertiary Causal Factors
9. **Appendix A:** Risk Assessment Methods/Standards
10. **Appendix B:** Ministry of Labour, Training and Skills Development Contacts

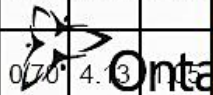
**Note: The MLTSD presentation are excerpts from the Root-Cause Analysis Report on MINING: MOBILE EQUIPMENT prepared by Ministry on September 28, 2018.**

# Risk Assessment Project: The Subject of Inquiry



# Revisiting 2014 Risk Assessment Results: Top 10 Risk Events

Risk Rank	Category	Situation or Condition or Factor that could result in Injury or Illness OR What could keep you up at night?	L		C		Risk
			L	sd-L	C	sd-C	
1	Ground control	Rock bursts underground	4.75	0.66	4.50	0.50	21.38
2	Mobile Equipment	Large vehicle and pedestrian or small vehicle interaction is common and lethal	4.38	0.70	4.75	0.43	20.81
3	Ground control	Loose rock at the face continues to kill and injure workers UG	4.25	0.97	4.63	0.48	19.68
4	Ground Control	Existing underground mines in Ontario are becoming deeper and incurring higher extraction ratios. These situations can result in various forms of ground instability	4.50	0.71	4.25	1.09	19.13
5	Ground control	High faces not scaled and secured to protect workers	4.25	0.97	4.50	0.50	19.13
6	Mobile Equipment	The mobile equipment employed in many underground mines is getting bigger. Bigger equipment can often result in poorer operator visibility (i.e. more and larger blind spots). This can result in collisions with other vehicles or contact with pedestrians.	4.25	0.66	4.38	0.48	18.62
7	Occ. Disease	Exposure to hazardous substances(dusts, materials, metals), gases/ fumes, biological materials or forms, Physical Hazards (vibration, noise, heat/cold stress, light.)	4.63	0.70	4.00	0.71	18.52
8	Fatigue	Working Shiftwork resulting in disrupted sleeping patterns	4.63	0.48	4.00	0.87	18.52
9	Ground control	Fall of ground while installing ground support	4.38	0.86	4.13	0.60	18.09
10	Training	Supervisors in some mines in Ontario lack the proper experience and Training. Inexperienced and improperly trained supervisors pose a threat to themselves and their direct-report workers.	4.38	0.70	4.13	0.60	18.09





# Revisiting 2014 Risk Assessment Results: Top 10 Risk Categories

#	Category	Situation or Condition or Factor that could result in Injury or Illness OR What could keep you up at night?
1	Ground control	Rock bursts underground
2	Mobile Equipment	Large vehicle and pedestrian or small vehicle interaction is common and lethal
3	Occ. Disease	Exposure to hazardous substances(dusts, materials, metals), gases/ fumes, biological materials or forms, Physical Hazards (vibration, noise, heat/cold stress, light.)
4	Fatigue	Working Shiftwork resulting in disrupted sleeping patterns.
5	Training	Supervisors in some mines in Ontario lack the proper experience and Training. Inexperienced and improperly trained supervisors pose a threat to themselves and their direct-report workers.
6	Ventilation	Little in the way of controls on diesel equipment operating in certain areas. No way for workers to know how much equipment is working in any given area. Diesel emissions now a recognized cause of cancer.
7	Lockout/ Guarding	Failure to isolate energy as a result of inappropriate lockout/tagging
8	Mine Services	Working from a scoop-tramp bucket (i.e.. For fan installation and the provision of other services)
9	Water Management	Run of muck due to water in an ore pass
10	Hoisting	Lack of proper signals when hoisting



# Root-Cause Analysis: Risk Statement

Based on the results of the Mining Review, the following risk statement was selected by the subject matter expert participants for Root-Cause Analysis using the “Fishbone” approach. It was decided that the risk statement would cover both Underground as well as Surface Mining

***“Motor vehicle contacts workers”***



(Source: Mine Safety and Health Administration)

# Workshop: A Bipartite and Collective Process

- Workshop participants were peer-recognized subject matter experts
- Workshop process was open, transparent and collaborative
- Workshop was face-to-face - No teleconferencing
- Any ranking/prioritization of causal factors was done using Employer and Worker input only (Ministry of Labour, Training and Skills Development does not vote)

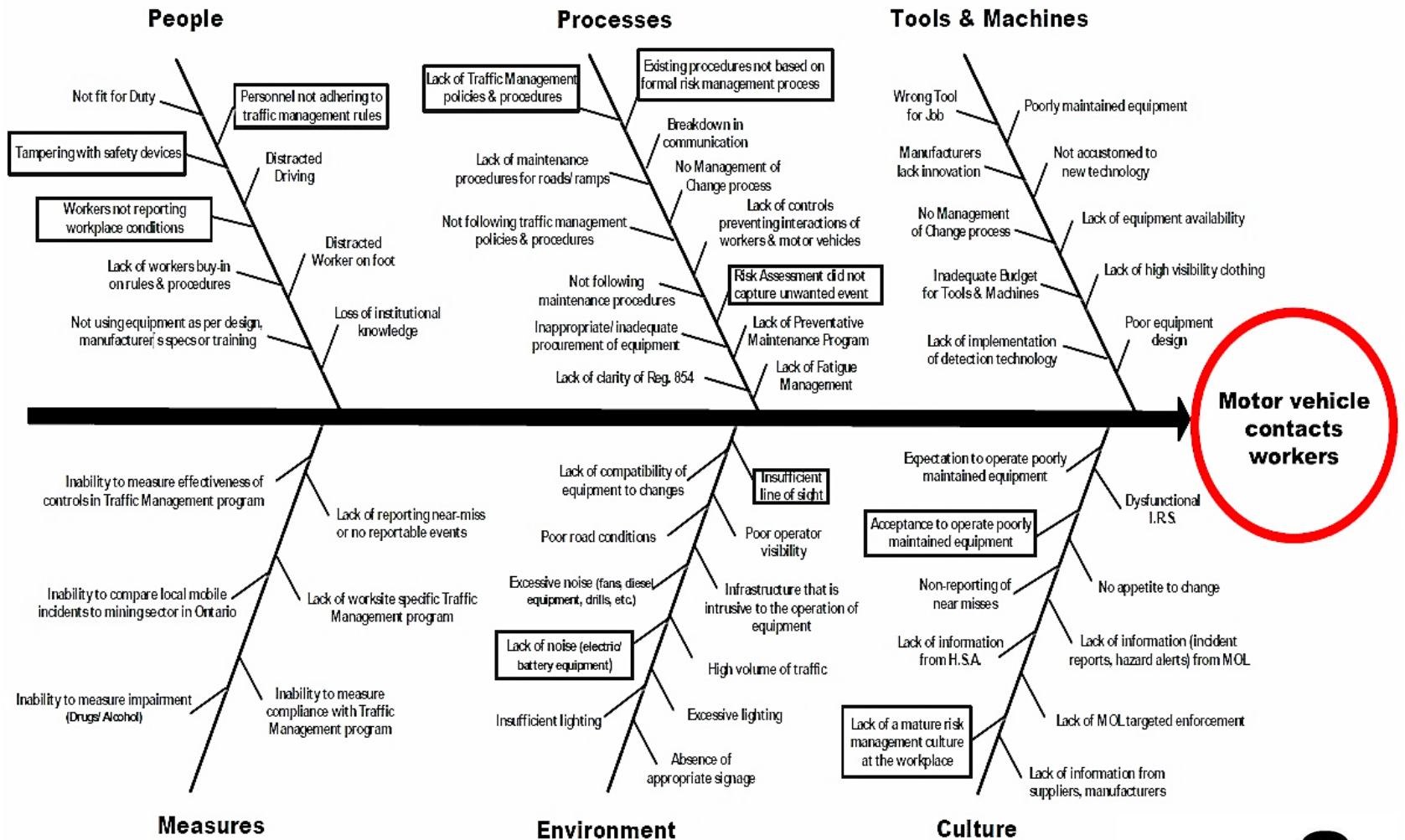


# Mobile Equipment: Workshop Participants

No.	Name	Company/Representation
1	<b>Alain Arsenault*</b>	USW Local 6500
2	<b>Jan Romo*</b>	Unifor
3	<b>Shawn Hembruff*</b>	Glencore
4	<b>Darren Toner*</b>	KGHM
5	<b>Alison Godwin</b>	Laurentian University
6	<b>Joe Guido</b>	USW Local 6500
7	<b>Jamie Cresswell</b>	MLTSD (Operations)
8	<b>Robert Barclay</b>	MLTSD (Operations)
9	<b>Glenn Staskus</b>	MLTSD (Operations)
10	<b>Peg Scherzinger</b>	MLTSD (Operations)
11	<b>Christine Bibby</b>	MLTSD (Corporate Management) - <b>Workshop Tech Support</b>
12	<b>Sujoy Dey</b>	MLTSD (Prevention) - <b>Facilitator</b>

**\*Voting participants**

# Revisiting 2014 Risk Assessment Results: Top 10 Risk Categories



# Mobile Equipment RCA: Top 10 Primary Causal Factors

1. Existing procedures not based on a formal risk assessment process
2. Acceptance to operate poorly maintained equipment
3. Lack of a mature risk management culture at the workplace
4. People tampering with safety devices (e.g., Bypass whisker switch)
5. Insufficient line of sight
6. Lack of noise (electric or battery equipment)
7. Risk Assessment did not capture unwanted risks
8. Personnel not adhering to traffic management rules
9. Personnel not reporting workplace conditions (i.e., hazards and near-misses)
10. Lack of traffic management policies & procedures

# Controls: Top 10 Primary Causal Factors

## 1. Existing procedures not based on a formal risk assessment process

- a. Have a formal risk management framework for the development of operational procedures (e.g., Job Safety Analysis (JSA), Failure Mode and Effect Analysis (FMEA), etc.)
- b. Formal framework to review old/outdated procedures using risk management process in consultation with Joint Health and Safety Committee (JHSC) or worker health and safety representative
- c. Convince leadership and workers (everyone) for the need to get older procedures into the risk management fold

**Note: Control list not in any order of priority**



# Controls: Top 10 Primary Causal Factors (continued...)

## 2. Acceptance to operate poorly maintained equipment

- a. Build in a safety factor into all incentive (money) programs
- b. Education/awareness of risks of using sub-standard equipment vs a good one
- c. Sharing and learning of past examples/incidents to account for “it cannot happen to me” attitudes
- d. Role of the HSAs to bring lessons/lessons learned to industry (it should not take MOL blitz plans to stir HSA proactive action)
- e. Sharing maintenance requirements on tolerance on equipment standards
- f. Having requirements for line management on job observations
- g. Senior leadership should drive safety culture (“Culture starts at the top”)
- h. Having all personnel understand cost implications on poorly operated/maintained equipment
- i. Ensure maintenance programs exist in all workplaces

**Note: Control list not in any order of priority**

# Controls: Top 10 Primary Causal Factors (continued...)

## 3. Lack of a mature risk management culture at the workplace

- a. Educate and involve all workplace parties in the power and the fundamentals of risk assessment and management
- b. Train people on risk management facilitation
- c. Provide risk assessment guidelines
- d. Better capability of HSAs to provide support on risk assessments
- e. Make task risk assessment routine work considering the hierarchy of controls
- f. Proper lineups allow the task hazards and controls to be identified
- g. Work permit controlling traffic flow to minimize risk of motor vehicle contacting worker
- h. Senior leadership action should drive safety culture through employee engagement and buy-in

**Note: Control list not in any order of priority**

# Controls: Top 10 Primary Causal Factors (continued...)

4. **People tampering with safety devices (e.g., Bypass whisker switch)**
  - a. Engineering out ability to tamper (make it tamper-proof)
  - b. Zero-tolerance on such activities by worker or supervisor (everyone)
  - c. Tampered device should warrant investigation as to why there was a need to “tamper”
  - d. Proper training and lockout training as pertains to mobile equipment
  - e. MOL enforcement: add ticket to tampering of safety devices
  - f. Safety devices should be included in equipment maintenance schedule
  - g. Post-op of the equipment
  - h. Formal reporting system that identifies defective safety devices

**Note: Control list not in any order of priority**

# Controls: Top 10 Primary Causal Factors (continued...)

## 5. Insufficient line of sight

- a. Consider “line of sight” in mine design/road design/building design
- b. Consider optimal line of sight during procurement of equipment
- c. Encourage OEMs to interactively consider line of sight in their products
- d. Integrate proximity detection technologies (e.g., Using artificial intelligence)
- e. Management of Change (MOC) process for adding anything to equipment that could impact line of sight
- f. Risk assessment of operating environment/changes to the operating environment
- g. Review line of sight evaluation on equipment ensuring it is incorporated in operator training
- h. Maintenance personnel should be cognizant of line-of-sight issues
- i. Line of sight education/training to everybody (not just the operator)
- j. HSAs to be more proactive for line-of-sight issues
- k. Increase the visibility of smaller vehicles through the use of light shining at the back (e.g., blue lights adopted in Sudbury)
- l. Use of personal strobes
- m. Restricting access to work area
- n. Signage should be standardized and durable

**Note: Control list not in any order of priority**

# Controls: Top 10 Primary Causal Factors (continued...)

## 6. Lack of noise (electric or battery equipment)

- a. Traffic management program should take into consideration hazards associated with equipment that do not generate a lot of noise
- b. Risk assessment should include hazards associated with equipment that do not generate a lot of noise
- c. Consider engineering strobe lights on such vehicles/equipment
- d. Proximity detection in specific areas
- e. Encourage OEMs to work with each other to factor in hazards associated with equipment that do not generate a lot of noise

**Note: Control list not in any order of priority**

# Controls: Top 10 Primary Causal Factors (continued...)

## 7. Risk Assessment did not capture unwanted risks

- a. “Real-life” validation of residual risk and controls by the end-user
- b. Training in risk assessment and hazard identification
- c. Ensure the right people are involved in the process
- d. Training in risk facilitation
- e. Report near-miss data to incorporate into risk assessment analysis
- f. Tangible results on operations based on risk assessments (closing the loop on the risk management cycle)
- g. Better analytics to feed into risk assessments
- h. Better data and analytics to reduce subjectivity
- i. Better capability of HSAs to provide support on risk assessments
- j. Maintain an active “risk register” (constantly being updated)
- k. Integrate risk assessment analysis into a functional system (e.g., Intalex) where people can access the information and act accordingly
- l. MOC process includes updating the risk register

**Note: Control list not in any order of priority**



# Controls: Top 10 Primary Causal Factors (continued...)

## 8. Personnel not adhering to traffic management rules

- a. Develop a risk-based traffic management plan
- b. Communication and monitoring of the traffic management plan to personnel
- c. Awareness on the requirements of the traffic management plan and how it specifically impacts the worker
- d. Monitor and ensure compliance with the traffic management plan
- e. Understand protocols when working close to rail lines
- f. Proper orientation of external personnel (e.g., contractors) with respect to the traffic management plan
- g. Workplaces enforce non-compliance to traffic management rules

**Note: Control list not in any order of priority**

# Controls: Top 10 Primary Causal Factors (continued...)

9. **Personnel not reporting workplace conditions (i.e., hazards & near-misses)**
  - a. Functioning IRS that encourages reporting
  - b. Proper training in hazard/near-miss identification
  - c. Develop a “stop and correct” program
  - d. Create a culture to “stop and correct/report” unsafe conditions as part of the “stop and correct/report” program
  - e. Opportunity with the HSAs to show examples of an empowered workplace
  - f. Ensure a simple process for reporting is in place.
  - g. Build in a safety factor into all incentive (money) programs

**Note: Control list not in any order of priority**

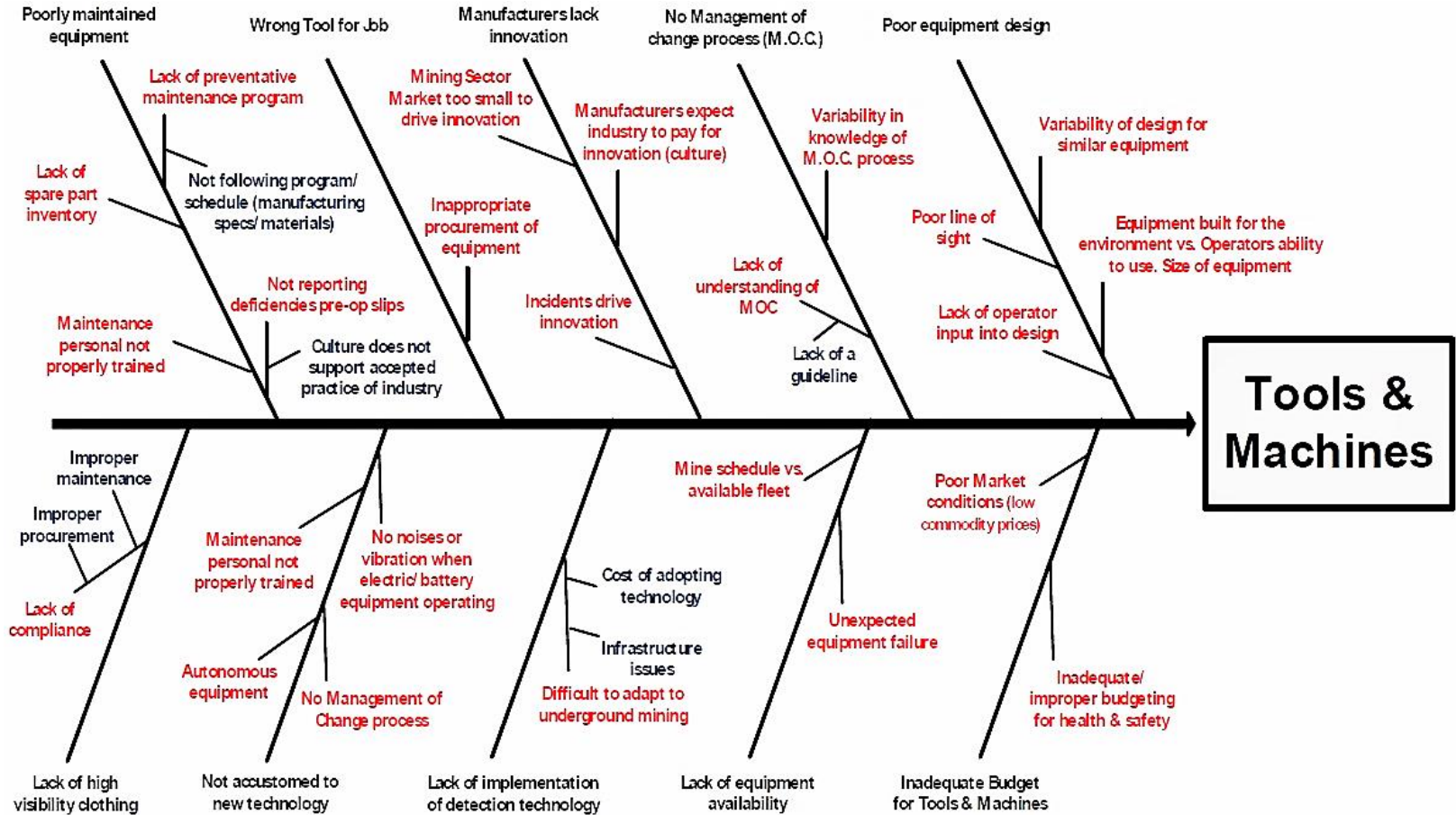
# Controls: Top 10 Primary Causal Factors (continued...)





## 10. Lack of traffic management policies & procedures

- a. Have a formal risk management framework for the development of traffic management polices & procedures
- b. Get the HSAs to provide training to help industry develop traffic management policies & procedures
- c. Understand the expectations of a traffic management program (e.g., MLTSD guideline)

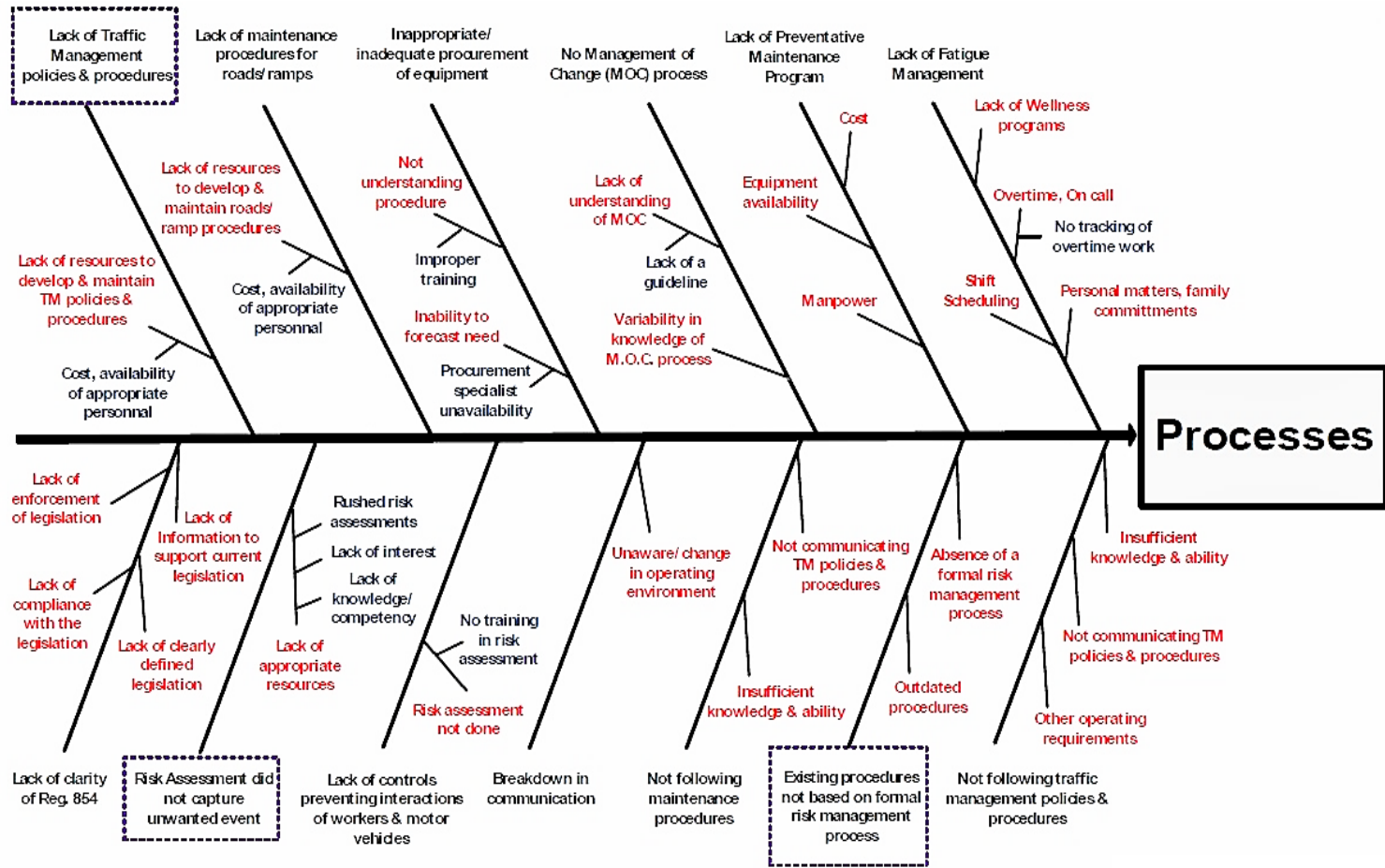
**Note: Control list not in any order of priority**

# Appendix I: Tools & Machines



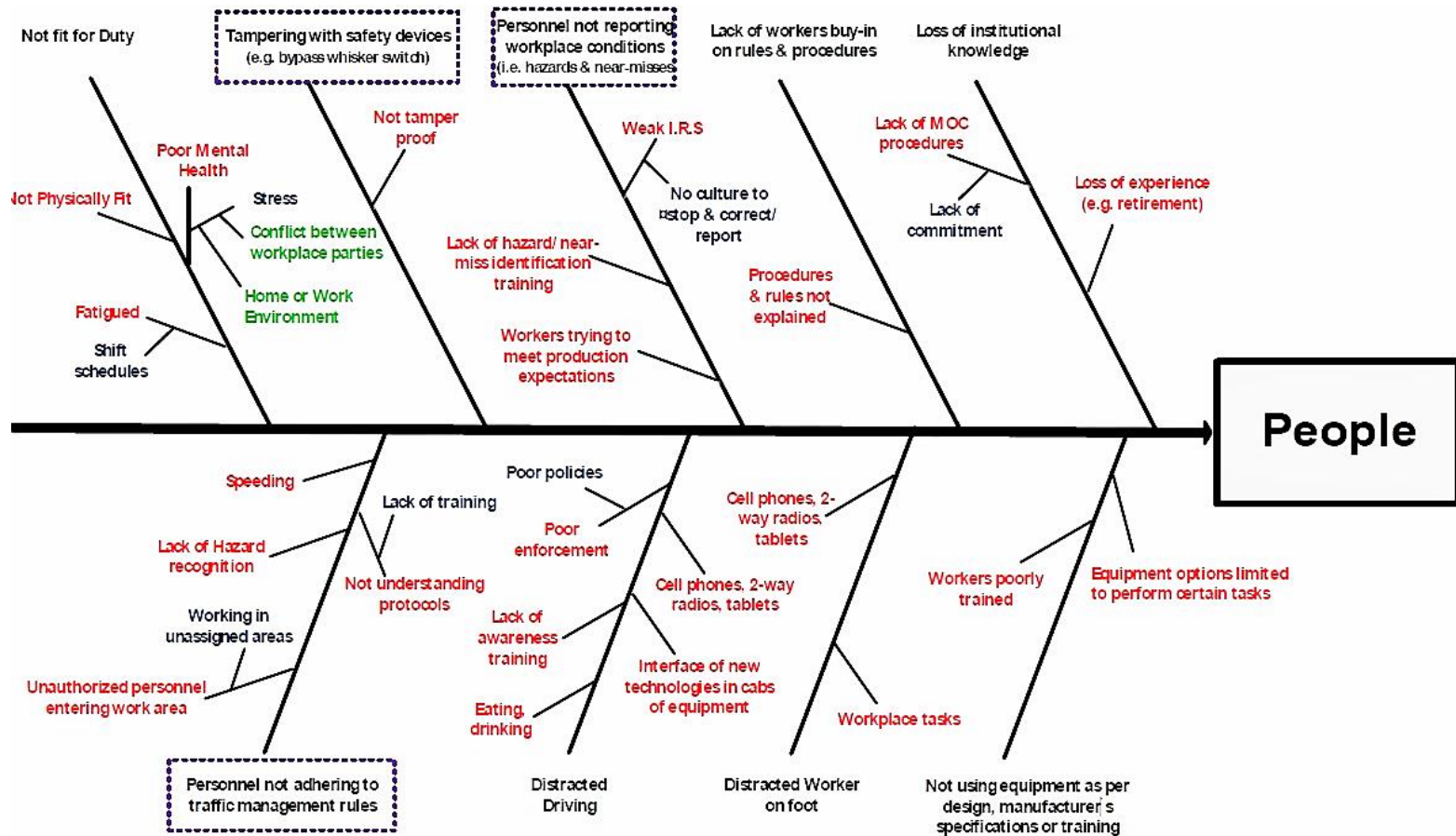
-  Top 10 Primary Root-Cause
-  Primary Root-Cause
-  Secondary Root-Cause
-  Tertiary Root-Cause

# Appendix II: Process



- Top 10 Primary Root-Cause
- Primary Root-Cause
- Secondary Root-Cause
- Tertiary Root-Cause

# Appendix III: People

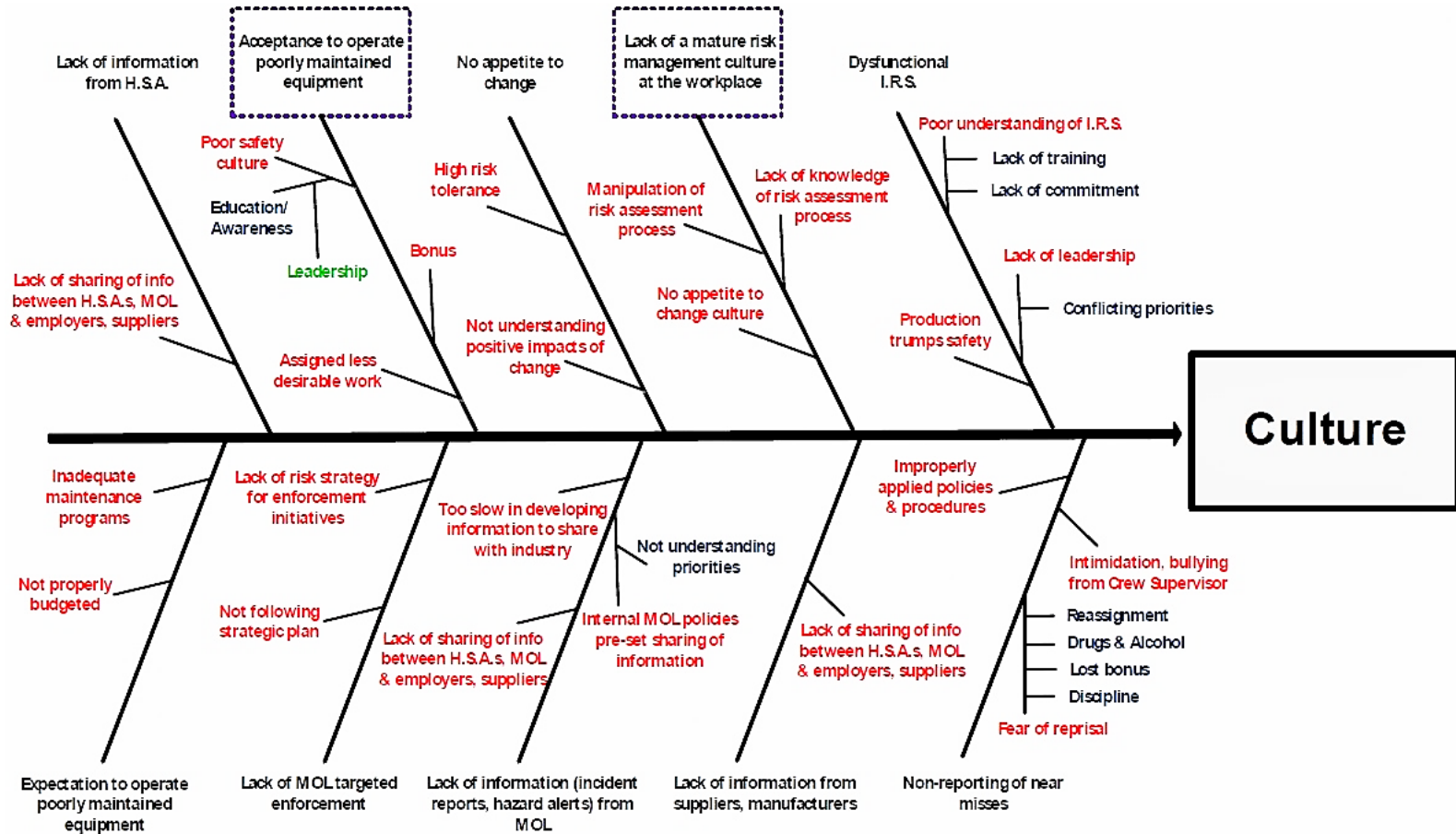


- Top 10 Primary Root-Cause
- Primary Root-Cause
- Secondary Root-Cause
- Tertiary Root-Cause

Quaternary Root-Cause



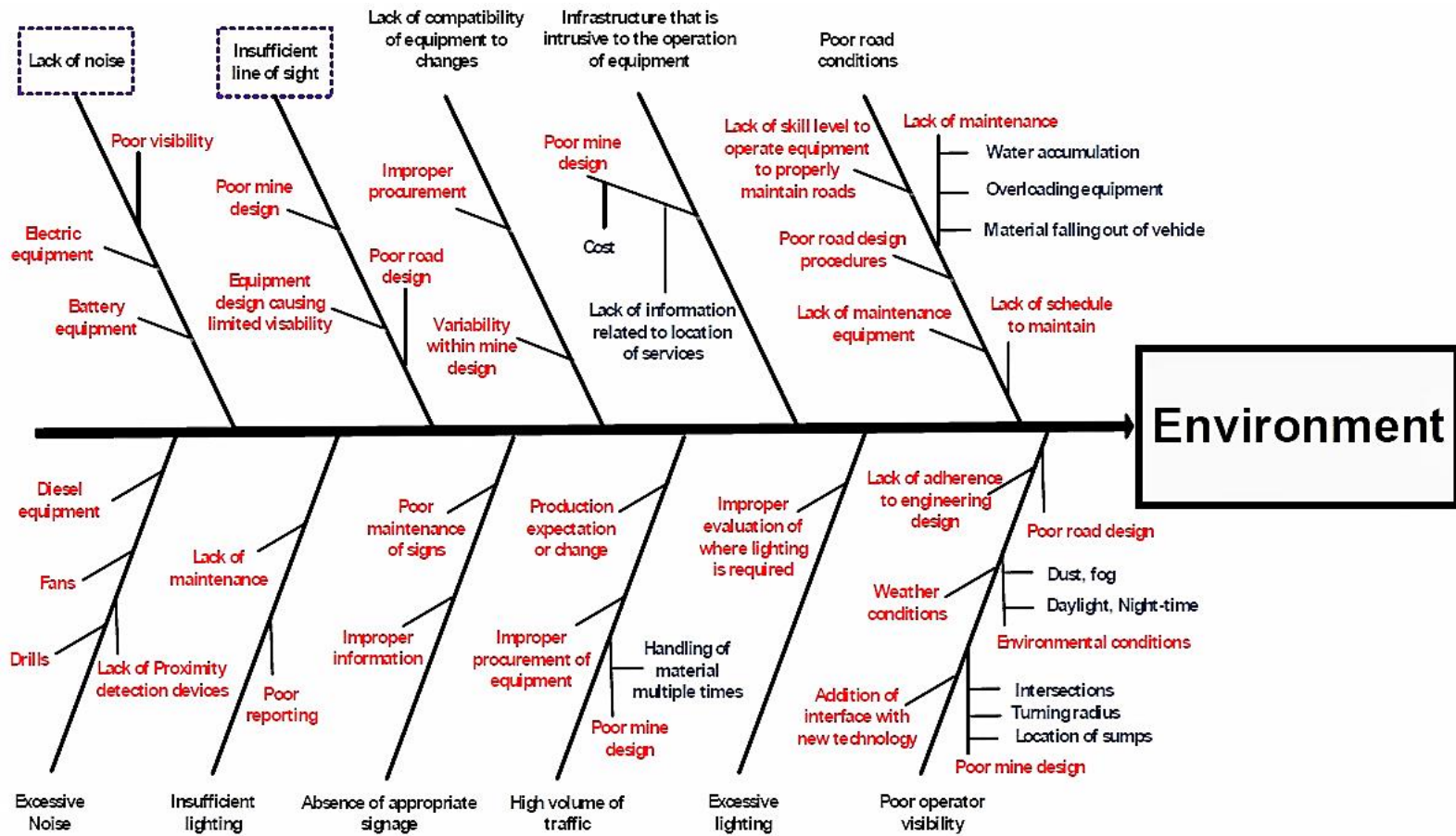
# Appendix IV: Culture



- Top 10 Primary Root-Cause
- Primary Root-Cause
- Secondary Root-Cause
- Tertiary Root-Cause

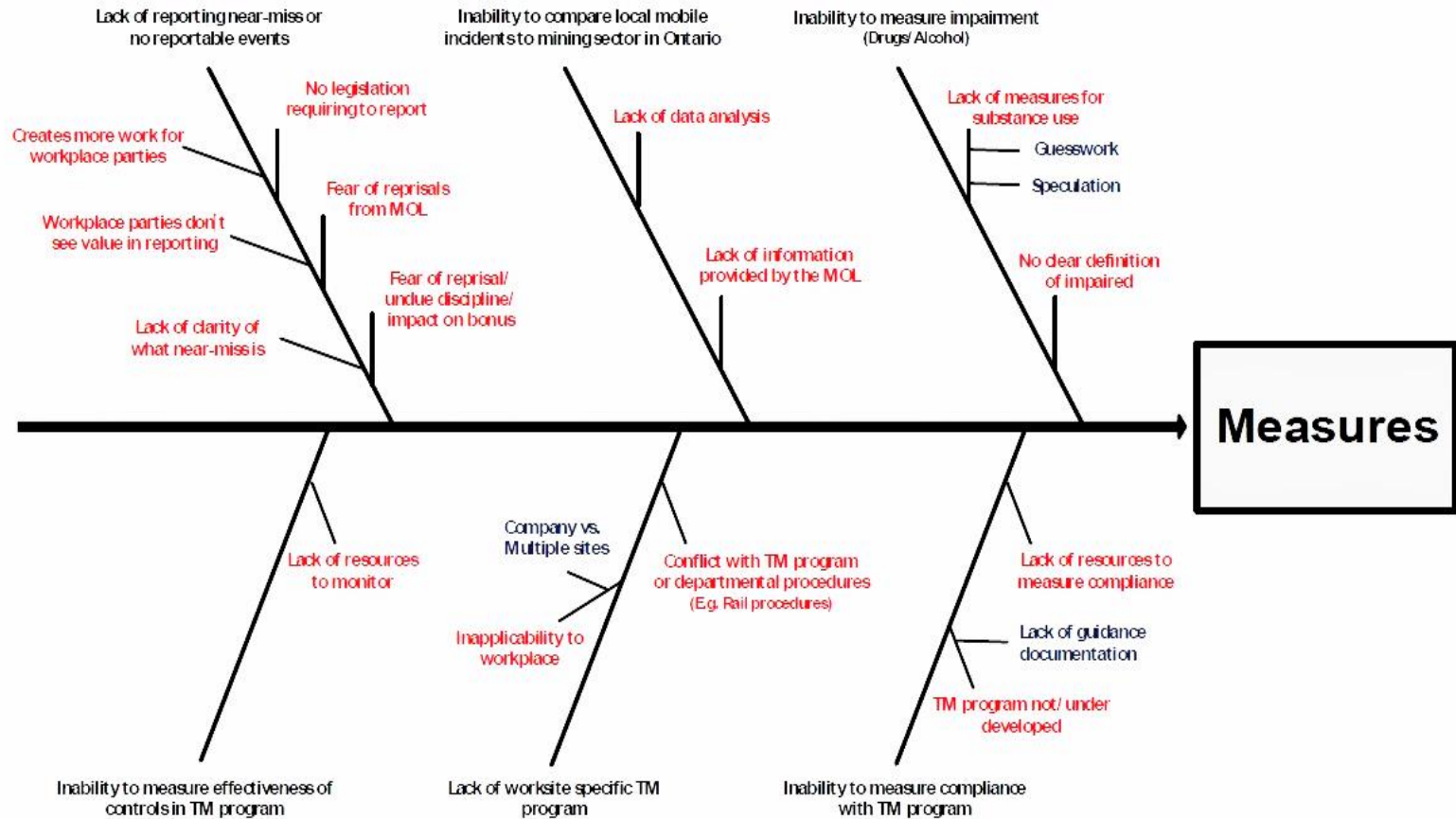
Quaternary Root-Cause

# Appendix V: Environment



- Top 10 Primary Root-Cause
- Primary Root-Cause
- Secondary Root-Cause
- Tertiary Root-Cause

# Appendix VI: Measures



- Top 10 Primary Root-Cause
- Primary Root-Cause
- Secondary Root-Cause
- Tertiary Root-Cause

### **Risk Assessment Methods:**

1. Bayesian Analysis
2. Bow tie analysis
3. Brainstorming (e.g., what-if)
4. Business impact analysis
5. Cause and effect analysis
6. Checklists
7. Computer Hazard and Operability Studies (CHAZOP)
8. Consequence Analysis (also called Cause-Consequence Analysis)
9. Likelihood/Consequence matrix
10. Construction Hazard Assessment and Implication Review (CHAIR)
11. Decision tree
12. Delphi technique
13. Energy Barrier Analysis (or Energy Trace Barrier Analysis)
14. Environmental risk assessment
15. Event tree analysis
16. Failure Mode and Effect Analysis (FMEA)
17. Failure mode, effect and criticality analysis
18. Fault Tree Analysis
19. Fishbone (Ishikawa) Analysis
20. Hazard analysis and critical control points
21. Hazard and Operability studies (HAZOP)
22. Human Error Analysis (HEA)
23. Human reliability analysis
24. Job Safety Analysis (JSA)
25. Level of Protection Analysis (LOPA)
26. Markov analysis
27. Monte Carlo Analysis
28. Preliminary Hazard Analysis (PHA)
29. Reliability centered maintenance
30. Scenario analysis
31. Sneak circuit analysis
32. Structured/semi-structured interviews
33. SWIFT (i.e., structured what-if)
34. Systemic Cause Analysis Technique (SCAT)
35. Workplace Risk Assessment and Control (WRAC)

### **Risk Management Standards:**

1. Risk Management Principles and Guidelines (ISO 31000:2009)
2. Risk Assessment Techniques (ISO/IEC 31010:2009)
3. OH&S Hazard Identification and Elimination and Risk Assessment and Control (CSA Z1002)
4. Process Safety Management (CSA Z767-17)
5. Enterprise Risk Management (COSO 2004)
6. Global Minerals Industry Risk Management (GMIRM)
7. International Council on Mining & Metals (ICMM)

# Appendix B: Ministry of Labour, Training and Skills Development Contacts

**For additional information or questions, please contact:**

**Sujoy Dey, Ph.D., CRM**  
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Ministry of Labour, Training and  
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# Ontario Mining, Steel and Other Smelting Sector: Traumatic Fatal Injuries 2012 - 2016

- From 2012 to 2016, there were 14 traumatic fatal injuries in Ontario mining, steel and other smelting sector for the top 7 incident categories.
- Three (3) of the fatal injuries involve mobile equipment.
  - 2013 - Worker was fatally injured in a motor vehicle when it was in a collision with another vehicle.
  - 2015 - A worker was involved in an underground rail haulage accident which fatally injured the worker.
  - 2015 - A worker was struck by a piece of equipment.

# Risk Assessment > Root Causes > Control Activities





# Top 10 mobile equipment health and safety hazards/risks in underground mines

1. Large vehicle and pedestrian or small vehicle interaction is common and lethal.
2. The mobile equipment employed in many underground mines is getting bigger. Bigger equipment can often result in poorer operator visibility (i.e., more and larger blind spots). This can result in collisions with other vehicles or contact with pedestrians.
3. Mobile Equipment contact with Personnel.
4. Driving a scoop into an open stope and falling into the stope.
5. Wheels and rims, multi-piece rim assembly hazards.
6. Improper tugger hoist inspections.
7. Lack of proper maintenance of brakes and fire suppression systems.
8. Lack of traffic control systems.
9. Poor road conditions.
10. Lack of FOPs fall on protection and maintenance of. No established remote-control program.

# Top 10 mobile equipment health and safety hazards/risks in surface mines

1. Distracted driving - heavy equipment, company light vehicle, personal vehicle, cell phone use.
2. Lack of tire safety.
3. Injury due to haulage vehicles.
4. Poor visibility and blind spots for mobile equipment operators.
5. Vehicle roll-overs (or going over edge of embankment).
6. Lack of traffic control systems.
7. Non-haulage vehicle incidents.
8. Lack of procedure to deal with hydraulic energy on equipment.
9. Struck by vehicle incidents (vehicle or pedestrians).
10. Vehicle roll-overs.

## Top 10 causes of motor vehicle-worker contact in Ontario mining operations

### Worker injury can be severe or fatal

As identified by workers, supervisors, and employers in the Ontario mining industry through Ministry of Labour, Training and Skills Development (MLTSD)-facilitated risk assessment and root-cause analysis workshops in partnership with Workplace Safety North.



**1. Existing procedures not based on formal risk assessment process**



**2. Acceptance to operate poorly maintained equipment**



**3. Lack of a mature risk management culture at the workplace**



**4. People tampering with safety devices**  
(e.g. bypass whisker switch)



**5. Insufficient line of sight**



**6. Lack of noise**  
(electric, battery equipment)



**7. Risk assessment did not capture unwanted risks**



**8. Personnel not following traffic management rules**



**9. Personnel not reporting workplace conditions**  
(i.e. hazards and near-misses)



**10. Lack of traffic management policies and procedures**

The internal responsibility system (IRS) is a system where everyone shares responsibility for occupational health and safety that is appropriate to their role and function within the workplace. All workplace parties — including employers, managers, supervisors, and workers — need to do their part to raise awareness of risks, and follow and promote safety procedures to help make workplaces safer.

For a detailed list of critical controls you can put in place, read the technical paper: Root cause analysis report of motor vehicle-worker contact in Ontario mining operations.

**For more information, please contact your WSN Health and Safety Specialist or visit [workplacesafetynorth.ca](http://workplacesafetynorth.ca)**

# Control activities

## Traffic Management Program

- Develop and maintain a written traffic management program including:
  - Measures and procedures to prevent motor vehicle collisions by addressing hazards related to reduced visibility of motor vehicle operators
  - Protect the health and safety of workers who may be endangered by a moving motor vehicle
- The program must be reviewed at least annually.

## Equipment Maintenance Program

- Comprehensive preventive maintenance is essential to reducing hazards associated with mobile equipment including:
  - Ensure maintenance program is in place and strictly followed
  - A risk assessment to create an inventory of tasks for preventive maintenance on all equipment
  - A method and schedule to determine when preventive maintenance should take place
  - A recording system to document tasks associated with preventive maintenance
  - Supervisors to ensure preventive maintenance is taking place

# Control activities (continued...)

## Risk Assessment and Overview of Hazards

### Risk assessment process:

- Identify all hazards related to mobile equipment travel
- Assess and rate the risk, evaluate existing controls, add controls.

### Overview of Hazards associated with:

- Ramp Travel
- Operating equipment around open holes
- Roadway Lighting
- Vehicle Parking
- Access to shops and equipment maintenance
- Pedestrian Visibility

# Control activities (continued...)

## Traffic Control - Ramp Travel

**Factors to consider for mobile equipment/vehicle travel on a ramp system:**

- Equipment right-of-way
- Pedestrians
- Tracking system
- Radio failure
- Power failure
- Encountering smoke or stench gas
- Breakdown on ramp
- Fog

## Traffic Control - Operating mobile equipment around open holes

**Factors to consider for operating mobile equipment around open holes:**

- Dumping at the edge of an open hole (e.g., open stope or pass)
- Bumper design - sufficient size and secured in a fashion to prevent equipment from falling over the edge.
- Barricades and warning signs - maintained in proper condition to ensure that driving of equipment into open hole is avoided

# Control activities (continued...)

## Traffic Control - Lighting

### Factors to consider:

- Ambient lighting underground and surface
- At underground entrances
- In areas adjacent to the workplace where workers are required to travel
- In circumstances where the nature of the equipment or the operation may create a hazard to a worker due to insufficient lighting

## Traffic Control - Parking

### Factors to consider:

- Orderly parking of equipment
- Parked vehicle with warning lights
- Chocking
- Circle check
- Vehicle start-up
- Fueling



# Control activities (continued...)

## Access to Shops and Equipment Maintenance

### Factors to consider:

- Clearances on entry
- Safety of workers inside the shops
- Signal person
- Remove mechanics from vulnerable positions during the positioning of vehicles
- Procedures for working on tires and assemblies
- Chocking

# Control activities (continued...)

## Technology

### The implementation of a collision management system:

- Cameras
- Radio frequency identification (RFID) tracking system
- Proximity detection
- Levels of intervention
  - Use of strobe lights in the back of hard hats
  - Use of strobe lights mounted on walls where service crew are performing work

### The advent of battery /electrically propelled haulage vehicles:

- Quiet

# Control activities (continued...)

## Visibility Awareness Training

**No single measure is as important in reducing the number of incidents and the likelihood of incidents as training workers.**

**Training should focus on:**

- Visibility/line-of-sight information
- Specific visibility and travel risks that can be encountered underground
- Pedestrians trained to use eyes and ears, safety bays and lamp signals
- Operators trained in emergency warning devices and procedures in the event of mechanical failure
- Training for both operators and pedestrians in any warning systems the company is using

# Information and Resources

## Ministry of Labour, Training and Skill Development (MLTSD) Guideline: High visibility safety apparel for Mines and Mining Plants

- The MLTSD recommends CSA Class 3/Level 2 High-Visibility Safety Apparel for underground mining environments.

- Source -

[www.labour.gov.on.ca/english/hs/pubs/gl\\_hvsa.php](http://www.labour.gov.on.ca/english/hs/pubs/gl_hvsa.php)

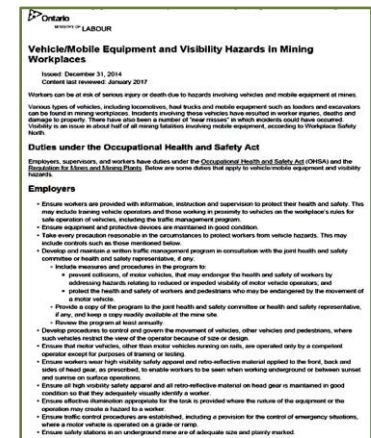
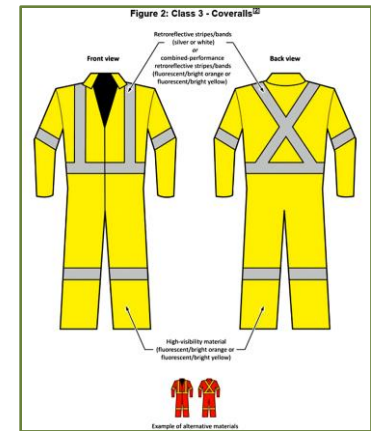
Free download

## MLTSD Information Bulletin: Vehicle/mobile equipment and visibility hazards in mining workplaces

- Source -

[www.labour.gov.on.ca/english/hs/pubs/ib\\_mobilemin.php](http://www.labour.gov.on.ca/english/hs/pubs/ib_mobilemin.php)

Free download



# Information and Resources

## MLTSD Information Bulletin: Working with Wheel Rims and Tire Assemblies

- Source - [www.labour.gov.on.ca/english/hs/pubs/gl\\_wheelrims.php](http://www.labour.gov.on.ca/english/hs/pubs/gl_wheelrims.php)  
Free download

## MLTSD Guideline: Brakes for vehicles in mines

- Source - [www.labour.gov.on.ca/english/hs/pubs/gl\\_brakes.php](http://www.labour.gov.on.ca/english/hs/pubs/gl_brakes.php)  
Free download



**Ontario**  
MINISTRY OF LABOUR

### Working with Wheel Rims and Tire Assemblies

Issued: April 2015  
Content last reviewed: April 2015

**Purpose**  
To assist employers, workers and other workplace parties in understanding the requirements and hazards involving tire and wheel assemblies under Regulation 854 (Mines and Mining Plants) under the Occupational Health and Safety Act (OHSA).

**Legal requirements**  
In addition to the general requirements in the OHSA:

**Tire and wheel assembly requirements**  
Section 107.1 of Regulation 854 (Mines and Mining Plants) under the OHSA covers the important requirements.

**Requirements from other programs/sectors**  
Section 10 of Regulation 213 (Construction Projects) under the OHSA covers the important requirements (re inflation).

Section 77 of Regulation 851 (Industrial Establishments) under the OHSA covers the important requirements (re inflation).

**Background information**  
Workers are injured or killed every year while handling tires and wheel assemblies at Ontario workplaces. Incidents can occur when:

- tires are inflated
- wheel assemblies and tires are overheated
- damaged components are improperly repaired and/or used
- flammable substances are used to treat the bead of a tire

Examples of hazards include:

- Sudden and violent springing of the tire bead rings, rims or flanges during a tire inflation resulting in flying objects that can strike nearby workers causing serious injuries or death
- "Zipper rupture" (failure of the bead) in steel cord radial tires due to corrosion, under-inflation or over-inflation resulting in a blast of air during a tire inflation that can hurt tire and wheel assembly pieces at workers, causing injury
- The explosion resulting from flammable gases in products used for treating of a tire bead or repairing punctures and leaks
- The explosion due to "synthetic" or chemical decomposition of tires, rims or wheels become heated due to a vehicle being near or touching a high voltage power line
  - sparks heating a wheel
  - tire caused by overheating of brakes as a result of excessive use or system malfunction
  - stud being cut off a wheel or
  - wheel being twisted

**Ontario**  
MINISTRY OF LABOUR

### Brakes for Vehicles in Mines

Issued: April 2015  
Content last reviewed: April 2015

**Purpose**  
To assist employers, workers and other workplace parties with understanding the requirements in Regulation 854 (Mines and Mining Plants) under the Occupational Health and Safety Act (OHSA), for the purpose of providing safe and reliable braking systems on motor vehicles.

**Objectives**

- The brakes for motor vehicles operating in underground or surface mines must be capable of stopping and holding a motor vehicle under full load conditions on all operating grades, slopes or ramps.
- Each vehicle must have a redundancy built into the braking systems so that in the event of a single failure of the service brake system, a safe stop can still be made.
- The motor vehicle must be equipped with a parking brake that is unaffected by loss of pressure caused by loss of air or contraction due to temperature changes.

**Legal requirements**  
In addition to the general requirements in the OHSA:

**Brake system requirements**  
Sections 119, 119.1, and 119.2 of Regulation 854 (Mines and Mining Plants) under the OHSA cover the important requirements.

**Testing, maintenance, inspection and other requirements**  
Sections 105 and 106 of Regulation 854 (Mines and Mining Plants) under the OHSA cover the important requirements.

**Background information**  
A failure in the service brake system of a motor vehicle operating on a ramp in an underground or surface mine can cause a runaway and serious injury if there is no back-up brake system. Potential brake failures could result in run-aways of motor vehicles if the brake systems are not tested during operation.

**Acceptable practices**  
Scope of sections 119, 119.1 and 119.2  
These sections apply to "motor vehicles" operating on grades, slopes, or ramps.  
Regulation 854 defines a "motor vehicle" as a vehicle propelled by other than muscular power, including an automobile, a caterpillar-tracked vehicle, a truck, a tractor and a motor vehicle running on rails but does not include a locomotive.  
There are three large groups of motor vehicles used in underground or surface mines: production, utility and personal. These vehicles differ in mass, speed and design of braking systems.  
Grades, slopes or ramps are terms that are commonly understood and used in Regulation 854 and related standards. These terms are generally used to refer to an inclined surface that requires braking performance beyond what would be necessary on a flat surface.

# Information and Resources

## WSN Technical Report: Pedestrian-Mobile Equipment Visibility

- The updated document is currently under final review, formatting and branding
- To be posted on WSN's website in the fall of 2021

## WSN Mobile Equipment, Diesel Powered Commissioning Sheet

- The updated commissioning sheet is currently under final review
- To be posted on WSN's website in the fall of 2021



The image shows a detailed commissioning sheet form for mobile equipment. The form is titled "Mobile Equipment, Diesel Powered Commissioning Sheet" and includes the Workplace Safety North and Ontario Mine Rescue logos. It contains various fields for recording equipment details, including manufacturer, model, serial number, and warranty information. The form is organized into a grid-like structure with multiple rows and columns.

Mine Owner:		Mine Site:	Unit / Asset / Equipment Number:	
Contractor:		End User:		Arrival Date:
Equipment Manufacturer:	Model:	Serial No.	Warranty Expiry Date:	
Engine Manufacturer:	Model:	Serial No.	Warranty Expiry Date:	
Transmission Manufacturer:	Model:	Serial No.	Warranty Expiry Date:	
Torque Converter Manufacturer:	Model:	Serial No.	Warranty Expiry Date:	
Axle Manufacturer:	Model:	Serial No.	Warranty Expiry Date:	
Brake Type:	Brake Oil (if wet):			
Radio Remote Control Model:	Transmitter Serial No.	Receiver Serial No.	Frequency:	ID Code:
Engine Oil Type / Viscosity:	Hydraulic Fluid Type / Viscosity:		Transmission Oil Type:	
Engine Oil Filter Type:	Transmission Oil Filter:			
Hour Meters Readings:	Engine:	Electrical / Hydraulic Unit:	Other:	
Pre-delivery Inspection Complete? ( ) <input type="checkbox"/>		Manufacturer's Commissioning Complete? ( ) <input type="checkbox"/>		Engine CO Emission Results ( )

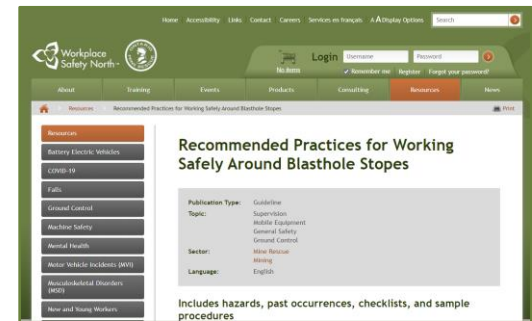
# Information and Resources

## WSN Technical Report: Recommended Practices for Working Safely Around Blasthole Stopes

- Source - [www.workplacesafetynorth.ca/resources/recommended-practices-working-safely-around-blasthole-stopes](http://www.workplacesafetynorth.ca/resources/recommended-practices-working-safely-around-blasthole-stopes)  
Free download

## WSN Technical Report: Safe operation of remote-controlled equipment

- Source - [www.workplacesafetynorth.ca/resources/safe-operation-remote-controlled-equipment](http://www.workplacesafetynorth.ca/resources/safe-operation-remote-controlled-equipment)  
Free download





# Questions?



# Thank you for helping make workplaces safer

## Contact Workplace Safety North

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1-705-474-7233

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