

Table of Contents

1.0	PURPOSE	2
1.1	APPLICATION	2
2.0	REFERENCE DOCUMENTATION	2
3.0	DEFINITIONS	3
4.0	CONTROL OF HAZARDOUS ENERGY FOR HOIST PLANT MAINTENANCE	4
4.1	JUSTIFICATION FOR NOT USING LOCKOUT FOR HOIST PLANT WORK	4
4.2	HAZARDOUS ENERGY RISKS OF NOT USING LOCKOUT	5
5.0	GENERAL PROCEDURES	6
6.0	HAZARDOUS ENERGY CONTROL CATEGORIES	7
6.1	CATEGORY 1 – THREE BELLS HOIST SIGNAL	8
6.2	CATEGORY 2 – DISABLE HOIST CONTROLS	8
6.3	CATEGORY 3 – BRAKE/CLUTCH SYSTEM LOCKOUT	10
6.4	CATEGORY 4 – ELECTRICAL LOCKOUT	10
6.5	CATEGORY 5 – BANKING OR BALANCING CONVEYANCES OR ROPES	11
6.5.1	<i>Remote Tagging</i>	11
7.0	ZES TRAINING	11
8.0	APPENDICES	12
	Appendix A: Hazardous Energy Control Matrix	13
	Appendix B: Revision Notes	27

1.0 PURPOSE

To outline processes to control hazardous energy when conducting maintenance activities on a mine hoist plant based on type of work to ensure safe operations and maintenance of the hoist plant.

1.1 APPLICATION

All maintenance work performed on Vale's mine hoisting plants shall comply with the provisions of this standard and Vale's ZES Program as defined in this standard.

2.0 REFERENCE DOCUMENTATION

The following references were used in the development of this document or are related to it. They shall be used in their most recent revision.

- Vale's Zero State Energy Program standards, accessible at: <http://extportal.vale.com/maint/sud/index.html>
 - SAF-ZES-60000 Program Administration
 - SAF-ZES-60005 Remote Tagging – Installing Personal Protection
 - SAF-ZES-60010 Plant Specific Locking and Tagging Variance
- Ontario Mining Association, Hoist Plant Committee, Best Practice – Mine Hoist Locking & Tagging or Other Effective Precautions, Issued: September 26, 2014 Revision 0
- Vale's Engineering Standard accessible at: <http://extportal.vale.com/eng/Sud/standards/>
 - SPEC-80005 Hoist Maintenance Safeguard (HMS) Systems
- CSA-Z432, Safeguarding of Machinery
- CSA-Z460, Control of Hazardous Energy – Lock out and other methods
- R.R.O. 1990, Reg. 854: Mines and Mining Plants, Section 185
- Vale Ontario Operations All Mines Standard, 2017

3.0 DEFINITIONS

- **Lockout** – a procedure that disconnects, blocks, or bleeds off all sources of energy (electrical, pneumatic, steam, hydraulics, mechanical, stored, or any other source of energy) that may create a motion or action by any part of the machinery and/or its auxiliary equipment and places a lock on the disconnect device, or at the point of disconnect.
- **Hoist Maintenance Safeguard (HMS) system** – an engineered system capable of preventing hoist operation or movement to allow specified maintenance work to be done safely on a mine hoist plant when equipment lockout is not practical, in compliance with engineering standard SPEC-80005.
- **Hoist Plant** – includes the prime mover, transmission equipment, head-frame, sheaves, ropes, shaft, shaft conveyances, shaft furnishings, hoist controls, counterweight, signaling and communications equipment and any other equipment used in connection with a hoist.

4.0 CONTROL OF HAZARDOUS ENERGY FOR HOIST PLANT MAINTENANCE

Lockout is the primary method of hazardous energy control, however, it is recognized that “traditional lockout to a full zero energy state is not practicable in all situations. When lockout affects tasks that are integral to the production process by design, or traditional lockout prohibits the completion of specific tasks, other hazardous energy control methods shall be used” (CSA Z460).

Depending on the type of the work being performed on a mine hoisting plant, effective measures other than standard locking and tagging may be employed.

4.1 JUSTIFICATION FOR NOT USING LOCKOUT FOR HOIST PLANT WORK

Traditional locking and tagging of a hoist plant may not be practical for the following reasons:

- It encompasses an inter-related group of equipment and infrastructure spread over a relatively large and widespread footprint, from hoist building to headframe to shaft bottom. The location where the work is being performed is in many cases remote from the lockout location.
- It is a critical part of the mine emergency egress system. The hoist may be needed on short notice to perform emergency duty.
- It consists of both stationary equipment (i.e. the hoist) and moving equipment (i.e. ropes and shaft conveyances). Access to the moving equipment is restricted by limited accessibility to the shaft compartments. This requires the ability to move the equipment during inspection and repairs in order to access all parts.
- It is often necessary to move the hoist frequently to perform regular inspections and maintenance.
- The actual lockout procedures may expose workers to greater risk than the actual work being performed, primarily in cases where frequent movement of the hoist is required during the duration of the work.

The hoist plant has inherent features that may be used as part of a system to allow work without full lockout:

- It carries personnel on a regular basis and has features, procedures and regulations to prevent inadvertent motion of the hoist to allow safe entry, exit and transport of personnel.
- In many cases, especially where maintenance work is being performed on the hoist, a dedicated operator attends the hoist controls and responds directly to the persons performing the work. The workers rely on training, established hoist operating practices, and the competence and attentiveness of the operator for their safety.
- Hoists have well-developed control systems, most of which have varying levels of interlocks to prevent inadvertent or unsafe hoist movement.

- The signal system to be used for movement of the hoist under manual control is well defined by the regulations.
- A hoist has a sophisticated brake system that is interlocked with the hoist controls & drive system. This lends itself to being used as part of a safeguard system to prevent hoist movement even if the main power is not de-energized.

4.2 HAZARDOUS ENERGY RISKS OF NOT USING LOCKOUT

The primary risk when not using lockout is unexpected movement of the hoist. Movement of the hoist can result in workers being struck by or caught in moving equipment or falling material. Unexpected movement can be caused by:

- Human error by the person doing the work or the hoist operator.
- Accidental movement i.e. bumping the control joystick.
- Responding to signals incorrectly due to unclear signaling or miscommunication.
- Operator inattentiveness during extended periods of hoist inactivity while maintenance is being performed.
- Miscommunication i.e. wrong bells etc.
- Not recognizing all sources of energy, e.g. electricity, gravity (out of balance conveyances), stored energy (brake springs & weights).

Risks of using lockout include:

- A locked out hoist is not readily available for emergency egress
- Lockout procedures causing equipment with limited use lifetimes, such as circuit breakers and disconnect switches, being operated too frequently shortening their life-time and potentially putting personnel at risk of injury due to premature failure of the equipment (e.g. arc flash) or unavailability of equipment for emergency use.

5.0 GENERAL PROCEDURES

The following general procedures apply for all maintenance work performed on a hoist plant regardless of the method to control hazardous energy:

- A. All moves of hoist during maintenance work shall be done using shaft signals.
- One (1) worker shall be designated as the person responsible for signaling to start hoist movement.
 - All workers shall have the ability to stop hoist movement.
 - Shaft signals shall be installed at any location where work is normally performed, including:
 - hoist drums
 - head sheaves
 - dump
 - loading pocket
 - Supplementary instructions such as required speed can be given by voice (radio, telephone); however, these supplementary means of communication do not provide a reliable method of starting and stopping the hoist.
- B. Clear communications between workers and the hoist operator is essential
- Who is doing the work and what is the nature and expected duration of the work.
 - Face-to-face communication where possible
 - If there is more than one worker in the crew, one worker shall be designated to communicate with the hoist operator. This will prevent confusion from the hoist operator receiving different communications from multiple personnel. However, the maintenance leader can delegate responsibility for communication as required by the particular task.
 - Entry in operator's log book
 - Tag or other suitable physical notice (sign, cover over control device, etc.) on operating console. Ideally this shall be a personalized tag or notice, but other means may be used which afford equivalent protection.

See All Mines Standards:

18.2 – Skips	“Men Working in Shaft”
18.4 – Shaft Inspection	“Men Working in Shaft”
18.5 – Service or Repairs	“Maintenance in Progress”
18.6 – Slings	“Slings in Progress”
Appendix 4F.3	“Men Working in Dump”

- C. Workers recognize the hazard of inadvertent movement of the hoist and any limitations and residual risk of the hazardous energy control method they are using.
- D. If multiple work groups are working on the hoist plant simultaneously, appropriate ZES system lockout procedures shall be used to ensure that the hoist is not restarted prior to all groups completing their work and unlocking.

6.0 HAZARDOUS ENERGY CONTROL CATEGORIES

This document establishes the hazardous energy controls that shall be used to minimize risk for specific types of maintenance activities that are performed on a mine hoist plant.

These controls have been organized into separate categories, with increasing levels of protection, to provide the appropriate risk mitigation for the type of work being done. Refer to Appendix A – Table 1 – Mine Hoist Maintenance – Hazardous Energy Control Matrix.

Hoist Plant Hazardous Energy Risks include the following:

- Fluid or gas pressure
- Moving equipment
- Electricity
- Spring energy
- Gravity (hoist or conveyance movement due to unbalanced conveyances)

Maintenance work not categorized in the matrix shall require a Job Hazard Analysis (JHA) prior to the work being done.

The general processes outlined in this specification shall be used in development of the JHA.

To determine the appropriate category for the work being done, follow the category for the type of work in the matrix which is most closely related.

6.1 CATEGORY 1 – THREE BELLS HOIST SIGNAL

Regulation 854 states that 3 bells hoist signals are to be used for “Persons entering or leaving a shaft conveyance”. This normally applies to workers being transported in the cage, however 3 bells has also traditionally been used as a means of signaling that persons are performing other work on a hoist for which the hoist must not be moved. This is the least effective control to prevent hoist movement due to the possibility of miscommunication or human error resulting in inadvertent or unexpected movement of the hoist, or to prevent exposure to the hazardous sources of energy (brake fluid pressure, gravity, electricity).

Workers must be aware of the possibility of inadvertent movement of the hoist or conveyance and should not be in a position where movement could result in injury.

Only one job shall be performed at a time on 3 bells.

Some hoist controls include the software feature that when the hoist is in “Inspection Mode”, hoist movement cannot be initiated unless bells are rung.

Residual Risks:

- Fluid or gas pressure
- Moving equipment
- Electricity
- Spring energy
- Gravity (hoist or conveyance movement due to unbalanced conveyances)

6.2 CATEGORY 2 – DISABLE HOIST CONTROLS

Where inadvertent movement of the hoist could endanger workers, then the Hoist control should be disabled. This does not eliminate all sources of energy, it prevents hoist motion.

Residual Risks:

- Fluid or gas pressure
- Electricity
- Spring energy
- Gravity (hoist or conveyance movement due to unbalanced conveyances)

There are two acceptable means to disable hoist controls as follows:

a) Hoist Maintenance Safeguard (HMS) System

An HMS System is an engineered system designed to prevent motion of the hoist. It has the following features:

- Complies with CSA Z432 – Safeguarding of Machinery
- Interrupts the hoist safety circuit to disable hoist operation
- Has dual channel control circuits for redundancy
- Is locked with a personal lock and key used by the person performing the work. Each person exposed to the hazard applies their individual lock.
- Provides verification that the hoist is disabled by testing for inability to move hoist
- Annunciation to the hoist operator and workers that the protection has been enabled.
- Located in areas where work will be performed
- Requires multiple actions required to reactivate hoist (i.e. remove locks, deactivate safeguard switch, reset hoist)
- Requires that the Hoist Operator remain at hoist controls, hoist is still on 3-bell control

b) Trip Hoist Safety Circuit

Tripping the hoist safety circuit shall be used for hoists that do not yet have an HMS system installed. The following general conditions apply.

- Interrupts the hoist safety circuit to disable hoist operation
- Provides verification that the hoist is disabled by testing for inability to move hoist
- Requires multiple actions to reactivate hoist: reset hoist circuit, initiate motion with master controller
- Requires that the Hoist Operator must remain at hoist controls, hoist is still on 3-bell control. (Hoist operator may leave the hoist controls if authorized by the persons in charge of the conveyance in accordance with regulations).
- Site specific procedures need to be followed as the means of tripping the safety circuit depends on the particular hoist configuration:
 - For AC drive hoist, use Desk Enable or Park key switch, this trips the safety circuit without discharging the drive
 - For DC drive hoist, use the Desk Enable or Park key switch (if so equipped) or the desk e-stop.

6.3 CATEGORY 3 – BRAKE/CLUTCH SYSTEM LOCKOUT

Disabling the brake/clutch system prime mover (hydraulic pumps, air supply) and discharging sources of hydraulic or pneumatic energy prevents the brakes from being released and removes hazards of stored fluid pressure.

The process for locking and tagging brake/clutch systems to allow safe work on the brake system shall include:

- Depressurizing accumulators
- Ensuring that springs and brake weights either remain activated or are blocked up, depending on the type of work being performed and considering the need to prevent the hoist from rotating.

Residual Risks:

- Gravity (hoist or conveyance movement due to unbalanced conveyances)
- Electricity

6.4 CATEGORY 4 – ELECTRICAL LOCKOUT

Electrical lockout means electrically isolating the power to one or more portions of the hoist drive, motor, controls, auxiliary systems, braking system (depending the nature of the work) to eliminate the risk of electrical hazards. This process shall follow ZES Lock and Tag procedures. Consideration should be given to the following:

- Ensure that the devices being locked out provide adequate protection for the work being performed.
- Consider multiple power sources within a panel e.g. control power, battery & Uninterruptable Power Supply (UPS) backup power.

Residual Risks:

- Inadvertent movement of hoist
- Fluid or gas pressure
- Spring energy
- Gravity (hoist or conveyance movement due to unbalanced conveyances)

6.5 CATEGORY 5 – BANKING OR BALANCING CONVEYANCES OR ROPES

To eliminate the risk of gravity causing movement of the hoist or conveyances, banking or balancing conveyances shall be used in conjunction with other hazardous energy control categories.

Depending on the type of work, the conveyances shall be either balanced in the shaft or banked at collar. Banking is most secure. Ropes shall also be tied off at the hoist to prevent rotation of the drum due to rope weight.

Residual Risks:

- Fluid or gas pressure
- Electricity
- Spring energy

6.5.1 Remote Tagging

In circumstances where it is not practical for the person performing the work to apply one of the above methods, remote tagging may be used. The worker requiring the protection (Remote Tagger) is remote from the location where equipment isolation is done by the person applying the protection (Local Tagger). This shall be done in accordance with ZES procedures i.e. MPROC-60005 Remote Tagging – Installing Personal Protection. Remote Taggers must complete the ZES Remote Tagging training module to be qualified to conduct remote tagging activities.

7.0 ZES TRAINING

All personnel performing maintenance work on a hoist plant must be trained in the following Vale Zero Energy State Program training modules:

- ZES Core,
- ZES Isolating, Locking & Tacking, and
- ZES Control of Hazardous Energy for Hoist Plant Maintenance

In addition, anyone acting as a Designated Tagger or Remote Tagger, will require the following training module(s) respectively: ZES Designated Tagger / ZES Remote Tagging.

All ZES training is to be booked through Vale's Learning and Development Department and to be delivered by an authorized Vale L&D ZES Instructor.

8.0 APPENDICES

Appendix A: Hazardous Energy Controls Matrix

Appendix B: Revision Notes

Appendix A: Hazardous Energy Control Matrix

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix							
TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Work on Brakes - Spring Applied Hydraulic Released							
Replace brake linings	Hoist movement. Brake applies unintentionally. Failure of other brake while one brake is lifted.		X	X (if hydraulic lines must be disconnected)		X (balance or bank single line conveyances)	Work on one brake at a time. Clutch must be engaged. Block brake in released position.
Replace brake linkages	Hoist movement. Brake applies unintentionally. Failure of other brake while one brake is lifted.		X	X (if hydraulic lines must be disconnected)		X (balance or bank single line conveyances)	Work on one brake at a time. Clutch must be engaged. Block brake in released position.
Replace brake hydraulic or pneumatic components, where it is not necessary to release a brake.	Fluid pressure.		X	X			Clutch must be engaged.
Measure brake gap or lining thickness	Hoist movement. Brakes apply unintentionally. Failure of other brake while brake is lifted.	X					Hoist power must be on to allow "work on brake" function.

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Adjust brake gap	Hoist movement.Brakes apply unintentionally.Failure of other brake while brake is lifted.	X					Hoist power must be on to allow "work on brake" function.Totten auxiliary: actuators must be caged.
Cleaning Brake Path or drum flanges	Hoist movement. Brakes apply unintentionally. Failure of other brake while brake is lifted.	X	Coleman - disable other hoist while in close proximity.				Use a "handled" cleaning tool instead of rags.
Adjust brake switches	Hoist movement. Brakes apply unintentionally. Failure of other brake while brake is lifted.		X				Release brakes only to determine how much to adjust and to test. Make all adjustments with brakes applied.
Work on Brakes - Pressure Applied, Weight Backup							

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Replace brake linings	Hoist movement. Brake applies unintentionally. Failure of other brake while one brake is lifted.		X	X Coleman cage also block up brake weights and depressurize & L&T air system.		X (balance conveyances)	Work on one brake at a time. Clutch must be engaged. Block brake in released position.
Replace brake linkage components	Hoist movement. Brakes apply unintentionally. Failure of other brake while one brake is lifted.		X	X Coleman cage also block up brake weights and depressurize & L&T air system.		X (balance or bank single line conveyances)	Work on one brake at a time. Clutch must be engaged. Block brake in released position.
Replace brake hydraulic or pneumatic components	Fluid pressure.		X	X			Clutch must be engaged.
Measure brake gap or lining thickness	Hoist movement. Brakes apply unintentionally. Failure of other brake while brake is lifted.	X				X (balance conveyances)	Hoist power must be on to allow "work on brake" function.

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Adjust brake gap	Hoist movement.Brakes apply unintentionally.Failure of other brake while brake is lifted.	X		X Coleman cage also block up brake weights and depressurize & L&T air system.		X (balance conveyances)	Hoist power must be on to allow "work on brake" function.Totten auxiliary: actuators must be caged.
Cleaning Brake Path or drum flanges	Hoist movement. Brakes apply unintentionally. Failure of other brake while brake is lifted.	X	Coleman - disable other hoist while in close proximity.				Use a "handled" cleaning tool instead of rags.
Adjust brake switches	Hoist movement. Brakes apply unintentionally. Failure of other brake while brake is lifted.		X				Release brakes only to determine how much to adjust and to test. Make all adjustments with brakes applied.
Work inside drum							

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Replace drum bushings	Hoist movement. Failure of other brake while clutched drum brake is lifted.		X	X clutched drum brake is released - block in release position		X (bank conveyances at collar)	Must be clutched In
Work inside drum	Hoist movement.		X				Must be clutched In
Mechanical work on hoist							
Work on clutch	Hoist movement.		X	X		X (balance conveyances if clutch remains engaged - bank conveyances at collar if clutch disengaged)	

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
NDE outside of drums	Hoist movement.		X				
Work outside of hoist drum where frequent movement is required (i.e. tighten cheekplate bolts, brake path bolts)	Hoist movement.		X				
Work outside of hoist drum where frequent movement is not required (i.e. welding kickers/risers, replace cheekplates)	Hoist movement.		X				
Replace Main Bearings	Hoist Movement Lateral force of rope pull			X (required for air operated systems only, not required for electric hydraulic)	X	X -drum hoists bank conveyances at collar -Koepe hoists bank headropes	
Replace rope tread inserts	Hoist movement		X				

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Machine rope tread insert grooves	Hoist movement	X (Coleman uses local jogging station)					
General work in hoist room in close proximity to the hoist where there is a risk of the workers being caught in the hoist, or the work they are doing impacting the hoist (i.e. construction work, lifting equipment with O/H crane near hoist).	Hoist movement Protection of equipment Persons travelling in cage and damage occurs to hoist.		X		X If workers are not qualified for HMS system		
Electrical work on hoist	(Refer to “Electrical Safety Plan MPROC-51000”)						
Control system low-voltage work	Electrocution Hoist Movement		X if danger of hoist movement		X Lock & tag power supply for system being worked on		Low voltage troubleshooting can be done with power still on. For working on LV power, use breaker locks.

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Medium or higher voltage work	Electrocution Hoist Movement				X		
Conveyance Work							
Replace skip liners	Hoist Movement	X if frequent movement required. Activate man safety mode	X for non-frequent movements				
Greasing conveyance	Hoist Movement	X	X when exposed to entanglement				
Conveyance repairs, NDE, hanging slings under conveyance	Hoist Movement		X				
Replace conveyance	Hoist Movement		X While conveyance is disconnected from ropes and hoist movement is not required.				

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Dailies & Weeklies	Hoist Movement	X	X when exposed to entanglement or movement conveyances				
3-month drop test	Hoist movement	X					
Rope Work							
Recap	Hoist Movement		X When rope is out of shaft and hoist movement is not required.				
Rope replacement	Hoist Movement		X When rope is out of shaft and hoist movement is not required.				Remote tagging of HMS for tailrope socketing.
Monthly Inspection	Hoist Movement	X					

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Collar to collar test	Hoist Movement	X	X While out on the planks. (Stobie 9 only)				
Lubing Ropes	Hoist Movement	X					
EM Test	Hoist Movement	X	X For tailrope EM test only. When working on planks under conveyance.				
Daily inspection	Hoist Movement	X					
Tensioning headropes (Koepe hoist)	Hoist Movement		X (remote tagging)				
Headsheave Work							

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Machine groove	Hoist Movement	X					
Replace inserts	Hoist Movement		X				
Tighten bolts	Hoist Movement		X				
Bearing Inspection & NDE shaft	Hoist Movement		X (Also HMS on other hoist if sheaves are in close proximity to the sheave being tested.)				
NDE sheave	Hoist Movement		X				
Shaft Work							
Shaft Inspection	Hoist Movement	X	X Remote HMS other hoist when workers in shaft are exposed to movement of conveyance in other compartment.				HMS must be remote in case the other hoist is required for emergency use.

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Replace guides	Hoist Movement	X	X Remote HMS other hoist when workers in shaft are exposed to movement of conveyance in other compartment.				HMS must be remote in case the other hoist is required for emergency use.
Significant shaft repairs when exposed outside of conveyance (includes manway work)	Hoist Movement	X	X And remote HMS other hoist when workers in shaft are exposed to movement of conveyance in other compartment.				
Loading pocket chute work	Hoist Movement	X	X				

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
Use conveyance as head cover while working in compartment	Hoist Movement		X				
Headframe Work							
Working in headframe bin	Hoist Movement		X (skip hoist)				Totten exception – use man safety to allow man travel below dump
Replace chute or scroll liners, working on top of skip	Hoist Movement	X	X (when required i.e. extending a platform out to access chute liner and frequent movement not required or hoist operator away from controls)				

Table 1 – Mine Hoist Maintenance - Hazardous Energy Control Matrix

TYPE OF WORK	HAZARD	Category 1	Category 2	Category 3	Category 4	Category 5	Notes
		3-Bells	Disable Hoist Controls	Brake/Clutch System Lockout	Electrical Lockout	Banking or Balancing Conveyances or Ropes	
General work in headframe in close proximity to the compartments where there is a risk of the workers being caught by conveyances.	Hoist Movement		X		X If workers are not qualified for ZES Hoist Lockout system		

Appendix B: Revision Notes

Revision notes describe what was changed, and if applicable, why it was changed, and the plan to implement the change, including whether changes are retroactive. The revision notes are a summary of the changes and may not necessarily be a complete list. A risk code is entered each revision and if applicable, the revision notes will describe how risk was addressed for the revision

Risk Code:	Risk Category
A	The revision is a minor change and/or introduces no risk.
B	Risk has been addressed for this revision by the reviewer and approver. Low risk or no new hazards identified.
C	For this revision, a risk management tool has been used to address risk and minimize hazards. This risk assessment has been document and is available through Maintenance Engineering.

Rev	Revision Notes
	Document Owner: Al Guse, Principal Engineer, Hoisting Group, Specialty Engineering, Ontario
2	Ownership of ZES Program transitioned to Ontario Operations Safety, Health & Environment Department. Risk Code A – minor change and introduces no risk. Changes include: Header of program documentation and reference number changes for example: MPROC-60000 now SPI-ZES-60000. Location of documents and forms on Websites remain the same. FORMS have no change other than “reference numbers” to the documents where applicable
1	New standard guideline. Risks have been assessed by means of a modified PHR process as shown in Appendix A. Reviewed and approved by the Hoist Hazardous Energy Control Team as per Al Guse. Document was updated Oct 31, 2017 to correct page numbering in footer pages. NO content change.