

Morenci Safe Production Standard	Standard 2.2	
Conveyor Safety	Revision #	05
	Revision Date	08/25/2014
	Effective Date	11/01/2014
	Document Owner	Crush and Convey
Approvals:		
Senior VP Morenci Operations: 10/29/2014		Safety Steering Committee: 9/24/2014

1.0 PURPOSE:

Conveyor belts are important components of Morenci's bulk material handling operation. The intent of this standard is to provide minimum specification for the safe design, construction, maintenance and operation of conveyor belt systems. The design and installation of new conveyor belt systems shall be done in conjunction with qualified engineers, personnel familiar with conveyance systems and meet the requirements established within this standard.

2.0 SCOPE:

This standard applies to all Freeport-McMoRan Morenci employees, contractors and vendors who work on or near conveyor belts. This standard does not prescribe operation, maintenance or installation procedures specific to all conveyor belts or system components. Other applicable FMMO standards must be reviewed and adhered to in addition to manufacturer specifications and training. The requirements established within this standard apply to the following type of conveyance systems:

1. Fabric Conveyor Belts
2. Steel Cord Conveyor Belts
3. Metal Conveyor Systems (such as chain or feeder systems)

3.0 TERMS, DEFINITIONS AND ABBREVIATIONS

- 3.1 Accessible:** As used in the standard refers to the ability for employees to intentionally or inadvertently gain entry into or nearby an unguarded conveyor belt or hazardous components thereof. The underside of inclined conveyor belts that are within 7ft of the ground/working surface are generally considered accessible and shall be guarded to prevent contact with moving machine parts.
- 3.2 Backstop:** a mechanical device to prevent reversal of a loaded conveyor under action of gravity when forward travel is interrupted.
- 3.3 Belt Clamp:** engineered beams, clamps, chains or metal plates secured transversely and capable of holding the belt in a desired position.
- 3.4 Chute:** a vertical or horizontal chamber that allows for material to flow from one conveyor belt to another belt or component of the material transportation and crushing system.
- 3.5 Competent Person:** an individual with the requisite knowledge, training, skills or experience to perform the desired task in a safe manner.
- 3.6 Conveyor Belt Installations:** means a mechanical system used for the transportation of minerals or materials along a belt. For this standard, chain conveyors, screw conveyors and others with similar

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functions and hazard characteristics are considered conveyors and require the same protective measures as outlined within the standard.

- 3.7 Crossover:** any designed safe work platform equipped with standard railing and stairs designated as a place to cross over a conveyor belt safely.
- 3.8 Energy Isolation:** refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.
- 3.9 Guarded by Location:** when moving machine part hazards are located 7 feet or more (in all dimensions) from the working surface. The working surface includes any travelways, permanent safe work platforms and temporary access devices such as ladders, man lifts and scissor lifts.
- 3.10 Inclined/Declined Conveyor Belt:** are conveyor belts which transport material up or down a defined slope.
- 3.11 Locked Out:** As used in this standard refers to the act of identifying energy sources, isolating power, placement of a point of operation energy control device and trying out or testing the equipment to verify a zero energy state (LOTOTO).
- 3.12 Magnets:** designed to catch metal before entering feeders, crushers or other areas.
- 3.13 Mobile Conveyor:** A conveyor supported by a structure that is capable of moving under its own power and includes but is not limited to, radial stackers and super-portable stackers.
- 3.14 Power supply:** means any energy source feeding the drive motor of a conveyor belt installation. Other energy sources may be present and must be evaluated prior to work commencing.
- 3.15 Return idler:** Idler roller which supports the empty side of the belt.
- 3.16 Readily Accessible:** Referring to pull cord location, means that the emergency stop device is positioned so that persons falling on or against the belt can easily reach and initiate the stop function associated with the device. The rapid visual contact, recognition and physical availability of an emergency stop device for actuation.
- 3.17 Secondary blocking:** Physical constraints used in addition to primary energy isolation to prevent release of energy due to uncontrolled movement from mechanical or gravitational forces; energy can released in different directions even after initial controls had been applied.
- 3.18 Trestle:** An engineered structure designed to support an elevated conveyor.

4.0 RESPONSIBILITIES

- 4.1 Supervisors:** will ensure that employees and contractors working within their areas understand and follow this standard. Supervisor's duties include evaluation of the work to be performed, determination of the means of controls that will be used, and adherence to this standard. The supervisor must ensure daily, or more often if required, that all conveyors in their area of responsibility are inspected, operated, and maintained in a safe manner.
- 4.2 Contractors:** will follow this standard and notify their supervisor or an FMI agent of the company of any situations that do not comply with this standard. Contractor employees who perform work on conveyor belts must have established procedures and training programs necessary for safely conducting their work in accordance with this standard.
- 4.3 Employees:** will follow this standard and notify their supervisor of any situations that do not comply with this standard. Employees who perform work on or around conveyor belts will be responsible for completing workplace examinations to identify hazardous conditions or practices.
- 4.4 Management:** will provide resources for supervisors and employees to comply with this standard. Resources may include information, training, time, money and equipment. Management

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must ensure all conveyors in their area of responsibility are designed and constructed in a safe manner.

- 4.5 **Health and Safety Department:** will provide information related to conveyor hazards and controls including interpretive guidance when requested and conduct in the field evaluations in conjunction with management to identify deficiencies.
- 4.6 **Project Managers:** will ensure that contractors are informed of the standard and that contractors understand the requirements for compliance with the standard. When new conveyor belt systems are installed they shall be configured and equipped with controls necessary to meet the requirements of this standard.

5.0 GENERAL SAFE PRODUCTION REQUIREMENTS

- 5.1 Climbing, crossing or riding on conveyors is prohibited except when designated crossovers, equipped with hand railing and toe-boards, are used. When conveyors must be accessed for material removal or maintenance; energy control procedures shall be followed and safe access/fall protection provided in accordance with Section 9.1.
- 5.2 No loose garments should be worn when traveling or working around energized conveyor belts; loose clothing increases the likelihood of entanglement with moving machine parts. Ensure clothing fits well and shirt is tucked in at all times; long hair is under hard hat and/or hair net; coveralls must be pulled up on shoulders and zipped; when safety vests are worn they must be zipped and well fitted.
- 5.3 Safe Work Platforms shall be kept clear and so far as possible dry, particularly at loading and unloading points. Spilled materials shall be removed in a timely manner before it creates a significant slipping hazard or begins to damage and push out guarding. ***Using flagging alone (for longer than one shift) as a means of restricted access to areas of significant spillage is not consistent with FMMO flagging and barricading requirements or MSHA regulations.***
- 5.4 No attempt should be made to clear or clean a moving conveyor, except where adequate provisions have been made for the job to be done safely. (See: Section 9.2 "Cleaning around moving conveyors").
- 5.5 Guards or safety devices shall not be removed or interfered with unless energy control procedures are followed. If unguarded areas around pulleys, counterweight, feeders and other similar moving machine parts are identified the conveyor belt system shall be shut down until the unsafe condition is mitigated. ***(The use of flagging is not an acceptable alternative to guarding because it does not obstruct passage of persons or flying material)***
- 5.6 Using a conveyor to transport material, other than the material which it is designed for, is prohibited. Examples of prohibited transportation practices include hauling liners, tools, equipment and personnel on a conveyor belt.
- 5.7 Appropriate protection must be provided anytime work involves material handling that creates a fall of material hazard. Where overhead work or processes create a fall of material hazard that cannot be eliminated or mitigated through the use of engineering controls; barricading and/or flagging shall be installed in accordance with the Morenci Flagging and Barricading Standard.

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- 5.8** When a manual test of interlocked features is required employees must be effectively protected from hazardous motion through guarding or remote testing capabilities. ***At no time, without including additional approved control measures, may an employee be allowed to remove guards while belt systems are energized to perform interlock tests.***
- 5.9** **Parking around conveyors:** Parking underneath or within 25ft of overhead elevated conveyor belts is prohibited unless the equipment is effectively protected from falling material. Where repetitive uncontrolled fall of material hazards exist berms, barricades, delineators or similar devices shall be used to designate parking and travel locations.
- 5.10** **Scale Down:** Prior to entering chutes, feeders, crushers or screens material shall be scaled down (removed) a minimum of 24inches back from the material fall or break over point. If 24inches of scale back is determined to be infeasible the chute shall be evaluated by a competent person and supervisor prior to entry.

6.0 CONVEYOR BELT SYSTEM PROTECTION DEVICES

The safety of personnel and the integrity of conveyor systems are largely dependent on the correct specification, installation and operation of these devices. Interlocked devices such as pull cords, alignment switches, light curtains, overload protection devices and motor failure alarms may not be used as a means of Lock Out.

- 6.1** **Startup Warnings:** All conveyors (including mobile stacking systems and tripper cars) must be equipped with an audible warning system that provides a pre-start notification 20-30 seconds prior to initiating motion. The audible warning must be capable of being heard along the entire length of the conveyor. Flashing lights and strobe systems may be included within the start-up warning system but not used in lieu of audible alarms.
- 6.2** **Belt Alignment:** If misalignment switches result in conveyor belt stoppage an inspection of the conveyor system by a competent person shall be done. If major adjustments (i.e. manual removal of build-up on idlers, adjustment of idler frames, adjustment of system components beyond guards) must be made that expose employees to hazardous belt movement and an increased likelihood of contact with in-running nip points; the conveyor belt shall be isolated in accordance with general energy control requirements (LOTOTO).
- 6.3** **Belt scrapers** shall not be adjusted manually where adjustments expose employees to hazardous belt movement. Carryback issues, due to material consistency, improperly adjusted or worn scrapers and other factors, can result in material accumulation along the conveyor belt structure. This can create an unsafe condition that exposes miners to fall of material hazards. Material build-up along the underside of elevated conveyors that constitutes a fall of material hazard shall be corrected or effectively controlled in a timely manner. Conveyors passing over areas that are occupied, traveled or used by employees shall be so guarded as to prevent the material from falling on or causing injury to employees.
- 6.4** **Metal Detection/Removal Systems:** These systems should be installed at strategic locations along beltline systems to prevent accumulation or passage of non-approved metallic substances into feeders, chutes, crushers and screens.

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- 6.4.1 Adequate warning signs shall be installed in readily identifiable locations near the magnet assemblies. Warning and Caution plates and decals on the magnet must not be removed or painted over. It is important that these warnings and cautions be legible and that they be followed at all times.
 - 6.4.2 Employees who use a heart pacemaker or similar device must never approach the magnetic equipment because your device may malfunction in the magnetic field, with consequences up to and including death.
 - 6.4.3 To avoid serious crushing injuries caused by objects attracted to the magnet, keep all steel and iron objects well away from the equipment. Do not allow hands, fingers, and other body parts to be caught between the equipment and nearby metallic objects.
 - 6.4.4 When work is performed on or near magnet assemblies the energy source powering the magnet and the conveyor belt must be isolated and locked out.
 - 6.4.6 Magnets shall be installed in accordance with manufacturer specifications and the conveyor configuration. Special care is needed to ensure that burden depth, magnet location and height are configured as specified by the manufacturer. Magnet assemblies shall be installed on fixed structural members and not suspended over conveyors using hoist applications.
 - 6.4.7 Damaged magnets may be welded or patched as required but extreme caution shall be taken to control the risk of a fire. The welding must be performed by qualified welders using electric arc welding equipment and follow the FMMO Hot Work Standard. Oil shall be drained and the magnet purged of all oil fumes by using an inert gas (argon or CO₂). In addition an atmospheric monitor should be used when necessary to help identify potentially dangerous atmospheric conditions. Manufacturer guidelines related to inspecting, maintaining and repairing magnet assemblies shall be followed.
- 6.5 Pull Cords:** Unguarded conveyors and feeders with adjacent travel ways must be equipped with pull cords along the entire length of each accessible side. Hand railing may be used in lieu of pull cords if the railing is:
- a. Positioned to prevent persons from falling on or against the conveyor (generally considered acceptable if positioned at 42-46 inches in height and equipped with a mid-rail and toeboard);
 - b. Will be able to withstand the vibration, shock, and wear to which it will be subjected during normal operation; and
 - c. Is constructed and maintained so that it will not create a hazard
 - d. Neither the conveyor installation nor its framework is considered a railing for the purpose of these standards irrespective of its conformance with standard railing dimensions.

Tripping of the pull-cord is a controlled stop, and shall not be considered a means of lock out of the conveyor power source. It is important to note that pull cords are not substitutes for guards. In the event that a pull cord is actuated the conveyor belt may still move a significant distance under its own power prior to coming to a complete stop.

Refer to Appendix 13.2 for more details concerning Pull Cord Installation Requirements

- 6.6 Backstops:** Backstops or brakes shall be installed on the drive units of inclined and declined conveyors and feeders in accordance with manufacturer recommendations, to prevent the conveyors from running in reverse and creating a hazard to persons. In general flat-overland conveyors do not require backstops unless determined necessary through an analysis of the conveyor system by a

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qualified individual. Without a backstop, a conveyor can rapidly accelerate into a runaway condition, which can result in material spillage, exposure to nip points and catastrophic failure of system components.

Where equipped, backstops shall be of an approved design and capable of withstanding the loads generated from the beltline when fully loaded.

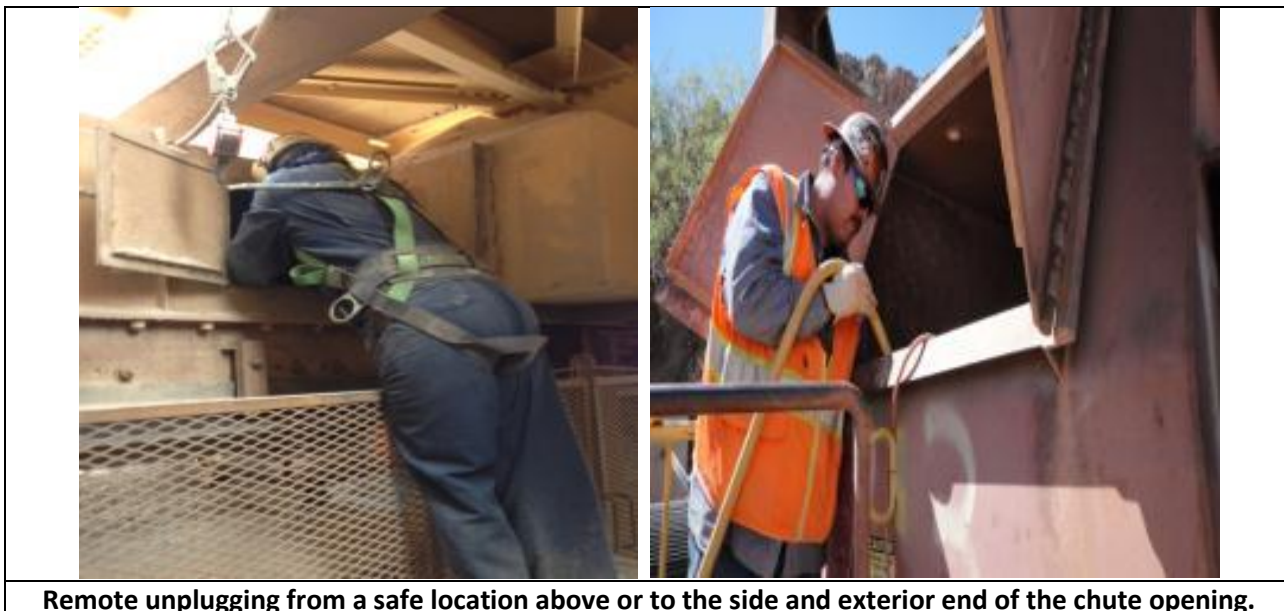
- a. Backstop or holdback clutches must be maintained in a functional condition and inspected according to OEM guidelines.
- b. Only approved lubricants shall be used on backstop and holdback systems. Failure to use the correct lubricant can lead to rapid clutch failure, damage to drive equipment and the potential for the uncontrolled backward rotation of conveyor belts.
- c. Backstops may be used as a means of blocking the belt from hazardous reverse motion in accordance with the requirements outlined in *section 8.4 Belt Blockage*.

6.7 Blocked or Plugged Chutes: When plugged chute switches indicate a problem the subsequent clean-up or repair efforts must be done in accordance with FMMO energy control, fall protection and confined space standards. In general, the following protection shall be used to coordinate clean-up efforts:

- a. The conveyor belt(s) and associated air cannons locked out tagged out and tried out
- b. Material shall be scaled down to eliminate fall of material hazards
- c. The belt analyzed for mechanical blocking in accordance with section 8.4 of the standard
- d. Accumulated material shall be removed using a method which minimizes exposure to material movement. Large material may require break-up or specialized rigging to remove.
- e. At no time is an employee allowed to unplug material distribution systems from a hazardous uncontrolled area below the plug. Efforts shall be made to remotely unplug chutes using air lances, water sprays and long handled tools. If entry is required to free a plug the Morenci Confined Space Standard shall be followed and the unplugging method evaluated by management.
- f. In the event the plug must be removed from below, the longest manageable bar should be used. The minimum length bar that may be used to remove a plug from below the chute is 36" provided that the distance of the bar affords employees protection from falling material and engulfment risks.



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6.8 Fire Management: Conveyor belt material of construction can burn and give off noxious gasses that can be particularly hazardous in tunnels, underneath feeders or other confined poorly ventilated areas. Conveyor belts (which may be limited to only portions of the belt system) should be evaluated and equipped with fire detection and/or suppression systems when:

- a. They are located in areas where belt fires could hinder the escape of employees or where in place ventilation and/or dust collector systems may be insufficient to prevent development of an Immediately Dangerous to Life or Health condition.
- b. Damage to the beltline will result in significant operational costs either due to the cost of the belt and other property, downtime, process limitations or a combination thereof.

6.8.1 Where fire detection or suppression systems are used they shall be installed in accordance with NFPA requirements, visually inspected at least once every 6 months, use tested annually and maintained in a functional condition. If fire detection/suppression systems are found to be defective the beltline must be taken down and repairs initiated immediately. If returning the system to operational condition cannot be done immediately continued operation may be granted if the controls outlined below are used:

1. The system is tagged out of service and relieved of stored pressure that may constitute a hazard to persons, and
2. Sufficient portable firefighting equipment is staged along the affected area of the beltline so that the travel distance for employees to any extinguisher is 75 feet or less, and
3. Access into the area is restricted to authorized personnel for specific duties only (unless the beltline is taken down prior to entry).

6.8.2 Hot Idler / Belt Fire: Do Not Shut Down a conveyor belt if an Idler is on Fire. A hot idler can be caused by various reasons including hot grease that has leaked out of the bearing of an idler roll. To help prevent the belting from catching on fire, keep the conveyor belting operating so that no one spot of the belting is subjected to the fire for any length of time. Immediately contact supervision and dispatch the Morenci Fire Department when a conveyor

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belt fire is identified. If a conveyor belt fire is recognized control evacuate areas alongside and at the tail of inclined conveyors.

- 6.9 Dust Sprays:** Belts transporting dusty material shall be evaluated to determine if they should be equipped with water based dust suppression systems. Where installed these systems shall spray the belt material at selected transfer and belt loading points. The dust sprays shall be turned off when the belt is idle or unloaded to prevent spillage and the development of a housekeeping hazard.
- 6.10 Counterweights:** When counterweights are supported by belting, wire rope, and chains or similarly suspended above the working surface, weights shall be confined in a secured enclosure to prevent personnel from traveling underneath the suspended load. In addition when counterweight systems can be accessed via travelways or ladders they shall be guarded to prevent personnel from contacting the counterweight assembly. Counterweight systems shall be inspected annually by a competent person to identify defects in the suspension system.
- 6.11 Lubrication:** Lubrication of machinery shall never be undertaken whilst the machinery is in motion, unless provision has been made to do so at a safe working position away from any dangerous moving parts. Grouping of lubrication points and extending grease fittings beyond guards is required so that they are readily accessible without exposing employees to moving machine part hazards. Belt Dressing shall not be applied manually while conveyor belts are in operation.

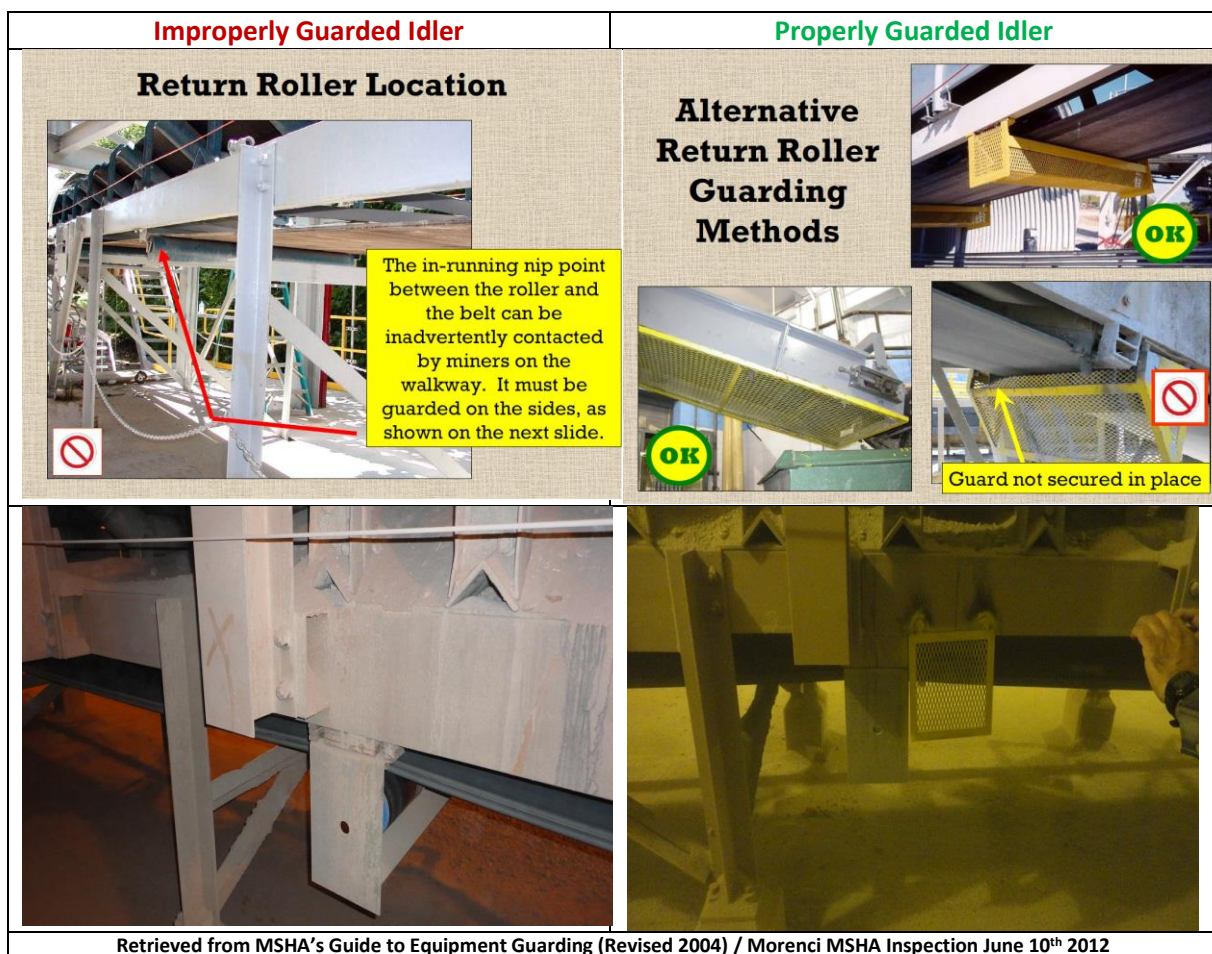
7.0 CONVEYOR GUARDING:

- 7.1 Moving Machine Parts:** Conveyor belt system components shall be guarded to prevent individuals from contacting moving machine parts. For additional guarding requirements refer to MSHA's guide to equipment guarding.
- Guards must be constructed and installed so that they guard against contact as a result of inattention, carelessness and purposeful work related actions such as: (inspection, testing, cleaning, maintenance, troubleshooting, lubrication, adjustment, servicing, etc...).
 - Guards must be securely in place unless equipment is Locked Out. Approved fastening methods for point of operation guards, including expanded metal fencing along sections of conveyors include: Bolts, clamps, bars/wedges and pins/sleeves. Plastic tie wraps are not considered adequate methods of fastening under this standard.
 - Hinged guards (such as those around tail pulleys – used for clean-up) positioned at the bottom of fixed guards shall allow no more than 18" of exposure above the working surface.
 - All belt conveyor pulleys shall be so guarded that the entire sides of the pulleys are covered. When within 7ft of working surfaces the underside of pulley systems shall also be guarded. The guard shall extend in the direction of the in-running nip point such a distance that a person cannot reach behind it and contact the pulley.
 - Where appropriate guards shall be constructed to allow safe access to side travel adjustment components (i.e. adjustment bolt, pillow block) without exposing employees to moving machine parts.
 - When area guards are used to prevent contact with moving machine parts they shall be difficult to defeat, readily identifiable as a guard, bolted or locked against entry and equipped with signage indicating; Danger: LOTOTO Required Prior to Entry.
 - Guarding methods need to be re-evaluated if the working surface adjacent to conveyances will be altered through the use of portable working surfaces (i.e. use of scaffolding, a man-lift, scissor

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lift, or crane suspended work platform) or when significant material build-up / carryback is observed.

- 7.2 Return Idlers:** These are considered to be “similar moving parts” and shall be guarded when employees are exposed to injury during work or travel activities. Return idlers must be guarded when they are positioned between 36” and 84” above a walking or working surface because of the increased exposure to nip points. Chains are not considered to be an effective means of guarding and shall not be used for the purposes of restricting access to moving machine parts.



Refer to MSHA's Guide to Equipment Guarding Handbook (Revision Date 2004, OTC 3) for additional information <http://www.msha.gov/s&hinfo/equipguarding2004.pdf>

8.0 ENERGY IDENTIFICATION, ASSESSMENT & CONTROL

On a moving conveyor belt, the belt, pulleys and idlers are all in motion, and each idler, chute skirt, belt cleaner or pulley has a potential nip point, depending on its accessibility. The prohibition of work on or near unguarded moving machinery relates to tasks such as belt cleaning, maintenance, housekeeping and the removal of spillage at localized points.

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- 8.1 Energy Control:** Anytime guards or safety devices are removed, certain clean-up operations are performed that expose employees to moving machine parts (including return idlers), access onto belts or into chutes is required and when working on conveyor system components the following applies as applicable:
1. LOTOTO of the primary drive system; and
 2. LOTOTO of pneumatic cannon systems and auxiliary equipment; and
 3. The conveyor belt evaluated for the need to mechanically secure the belt from movement; and
 4. LOTOTO of any equipment that might feed material to or from the belt conveyor. This other equipment may include conveyors, feeders, crushers, screens and slide gates. In addition, restrict access to any load points that may be serviced by mobile equipment or which could result in material accumulation due to slope or pile movement.
- 8.2 Stored Energy:** When maintenance is required on a conveyor system, it is important to remember the danger presented by residual energy stored within the system and to address this adequately. In many cases it is necessary to release, isolate or control the stored energy from the work area. Stored energy sources that could be present on conveyor belt systems include:
- a. Gravitational energy sources: Material build up inside chutes, above feeders, at the head of belts, under belts and as a result of belt movement (natural and as a result of work activities)
 - b. When removing the final bolts off couplings
 - c. Other examples
 - d. Stored pneumatic energy
 - e. Stored hydraulic energy

Danger: Even when conveyor belts have been properly locked-out, tagged-out and tried out to prevent mechanical motion or exposure due to other identified and isolated actual hazards; there remains the potential for serious injury or death if stored energy is not relieved or controlled.

Gravitational energy sources must be evaluated during pre-job area inspections and included within the scope of energy isolation procedures. Effective protection can be accomplished by scale down, use of spilling bars, the application of belt clamps and through releasing the energy applied by the take-up system.

- 8.3 Belt and Feeder Blockage Requirements:** Conveyor belt and feeder systems must be evaluated to determine if mechanically securing the system to prevent inadvertent movement is required. Efforts must be made when feasible to completely empty conveyor belts/feeder systems of material prior to performing work.

When work is performed on conveyor belts/feeders, near nip-points or in areas where movement could create a hazard to employees; mechanically securing the belt or feeder from movement shall occur:

- a. When inclined or declined systems contain material or feed.
- b. When adjustments to the tension of an inclined or declined system are made or could result from work activities (i.e. during counterweight adjustment, weight cart movement, link replacement, belt splicing activities and pulley change outs)
- c. When backstop or brake systems are removed or rendered inoperable as a result of maintenance activities
- d. When flat, inclined or declined systems are plugged and manual material removal is required.

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Note: Belt blocking, when required, is a prerequisite to work and must be included in the energy isolation procedures performed by the work group. To assist with determining when conveyor belt blockage is required **Appendix 13.1 Conveyor Belt Risk Assessment Form** can be used.

When blocking is required, the belt must be effectively secured from moving in both the incoming and outgoing directions using belt clamps or other approved methods. Belt clamps need to be installed according to manufacturer requirements. The only exception to blocking in both directions is when clamping feeder belts, which, due to the flat configuration and short length of the belt, only one clamp is required to be installed on feeder belts.

Where belt clamps are utilized, they must be securely anchored. This applies to both permanent clamps and temporary belt pulling clamps. Belt clamps must be inspected before attachment to ensure they are able to withstand the belt tensions in the localized area. Qualified engineers in conjunction with competent employees shall be used to design belt clamps, material guards and other specialized devices that will be used to control exposure to gravitational energy sources. *(Refer to the FMMO Hand Tools Standard for specific design and fabrication requirements associated with internal tools)*

When belt blocking methods are used as the primary source of energy control they shall be locked and tagged out to prevent inadvertent removal by personnel. Belt blocking requirements apply to conveyances and feeder systems.

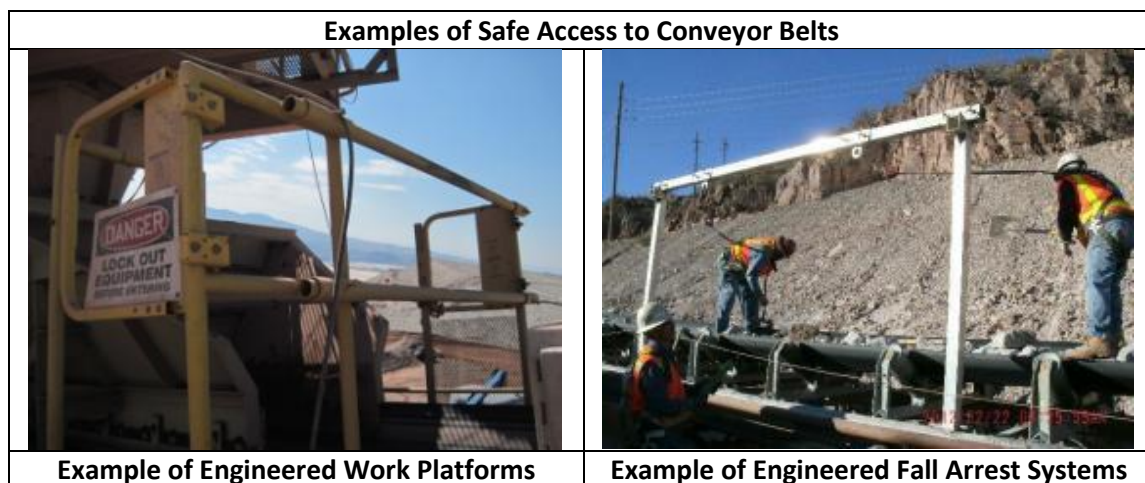
9.0 SPECIFIC REQUIREMENTS FOR CONVEYOR BELTS

9.1 Safe Access for Maintaining Conveyor Belt & Feeder Systems:

- 9.1.1** Crossovers: a means of crossing conveyor belts shall be provided and used where it is necessary to pass over conveyors. Unless determined unnecessary by professional judgment and an in the field evaluation; crossovers shall be provided along beltlines every 1000ft. Such crossovers shall be properly equipped with standard railings, toe boards and have a fixed ladder, ramp, or stairway as a safe means of access.
- 9.1.2** Scaffold Planks and boards used to provide temporary access to chutes, feeders, screens or crushers shall be installed and secured from movement (through cleats, scaffold wire, dimensions or placement). Only OSHA grade stamped scaffold planks rated to withstand at least 75lbs/square foot may be used. Spans in excess of 6ft must be evaluated by a qualified individual to determine if additional supports/planking is required.
- 9.1.3** Safe Access: A safe means of access must be provided to all work locations including conveyor belts and feeders requiring access to perform maintenance, clean-up, gain entry into chutes and take thickness measurements. Due to the configuration of conveyance systems, a fall of person hazard exists when climbing onto and performing work from the top of the belt. **Employees shall not access and work from ground level or elevated conveyor belts without the use of fall prevention, fall restraint or fall arrest devices.** If areas exist that are not equipped with ladder ways, hand railing, platforms, lifelines, hand holds, steps,

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anchor points or similar critical controls which reduces the risk of a fall; employees shall STOP, inform supervision of the issue and determine a safe method of accessing and/or working from atop beltlines.



9.2 Cleaning around Moving Conveyor Belts: Serious injuries and death have resulted from performing work in close proximity to moving conveyors when specific critical controls are not followed.

- 9.2.2** Cleaning shall be done in a manner that reduces the risk of same level falls by cleaning material closest to the entry/access point or travel way first. As material is removed and a safe means of access established, cleaning can proceed within the entire area. If needed an 18-24" travel path within the area shall be established to promote safe access; once a safe means of access has been established clean-up of the entire area can continue. Flagging alone is not sufficient for use as a long term abatement measure to restrict access into areas containing hazardous build-up or spillage. If immediate clean-up (within 24 hours) cannot be done the area shall be restricted from access through establishing a physical barricade. Refer to Morenci Flagging and Barricading Standard for more details.
- 9.2.3** Shovels and tools used to clean around moving equipment shall be long enough to allow for material handling without requiring the employee to place themselves in close proximity to moving machine parts. In addition to reduce the likelihood of a caught tool pulling an employee into a nip point tools shall not be equipped with closed ended handles.
- 9.2.4** Employees shall not place any portion of their body underneath an operational conveyor belt due to the increased likelihood of contacting nip points created between the belt and idlers.
- 9.2.5** Guarding must be securely in place at all times while cleaning around conveyor belt pulleys unless the belt is de-energized and isolated. Hinged guards positioned at the bottom of fixed guards shall allow no more than 18" of exposure above the working surface. **At no time shall an employee place any part of their body beyond a guard.**
- 9.2.6** When mobile equipment is used to remove material, ground personnel shall not place themselves in between the mobile equipment and a pinch point (i.e. the conveyor, structure, scraper attachment). Spotters, barriers, pre-job coordination and personnel placement during the task are critical to prevent contact.
- 9.2.7** Long Term Blue stake permits shall be obtained for applicable conveyor systems in accordance with the Morenci Blue Stake Standard.

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9.3 Fall of Material: Material build-up and Housekeeping Practices (Including Scale down): Inspection of operational conveyor systems by competent employees at least once per shift (prior to conducting work) for hazardous conditions; in addition the following minimum protection shall be used to control fall of material risks associated with conveyed material:

- 9.3.1** Where fall of material hazards exist Red Flagging shall be installed immediately to restrict access into the area. Supervision shall be contacted and the conveyor belt cleaned as soon as feasibly possible. If fall of material hazards cannot be cleaned within one shift than the hazardous area shall be restricted from access by installing physical barricades (concrete pillars, chain, wire rope, berms, gates, etc...)
- 9.3.2** Where routine/repetitious fall of material concerns are identified as a result of carryback or spillage the areas shall be communicated to supervision and an action plan developed to better prevent/control exposure. Employees assigned to inspect conveyor systems shall be trained to identify and correct areas where fugitive material escapes a belt.
- 9.3.3** Conveyor structure including trestles shall be cleaned off periodically, at minimum once per month or as conditions warrant, to control fall of material risks and prevent overloading of the conveyance structure.
- 9.3.4** When fall of material hazards are created from work activities the following methods of protection shall be used:
 - a. The area (within 20ft) of the overhead hazard shall be red flagged/tagged at each possible access point for the duration of the material removal
 - b. A spotter shall be positioned, a significant distance away from the overhead hazard (minimum of 20ft) and used to restrict entry into the area when a fall hazard exists.
 - c. Falling object protection is provided through nets, barriers and other forms of falling object protection that will prevent falling material from contacting personnel or equipment.
- 9.3.5** Elevated return idlers positioned over designated travelways or active roadways shall be equipped with fall of material protection (i.e. cage, catch basin, chain or other secondary blocking mechanism)

9.4 Chain Conveyor Belts: Chain conveyors, by necessity, have moving chain segments that cannot be guarded or completely enclosed without impairing the functionality of the equipment. Chain conveyor systems shall be equipped with adequate warning signs displaying the nature of the entanglement hazard.

- 9.4.1** On chain conveyors, the nip points between chains and sprockets or idlers shall be guarded to prevent contact unless guarded by location or position. The guarding shall be designed to prevent hands, fingers or other body parts from reaching through, under, over or around the guard.
- 9.4.2** Chain conveyor systems shall be provided with pull cords along each accessible unguarded side of the conveyor. Pull cord installations shall meet the requirements outlined in section 6.5. Pull cords are only considered adequate protection for chain segments; where sprockets, drive mechanisms, transfer points or other similar moving machine parts exist, physical guarding is required.
- 9.4.3** Where safe access points exist that allow authorized workers to travel into or out of chain conveyor segments or stripping machines they shall be equipped with light curtains or similar interlocked automatic shut off systems. Such systems shall de-energize the drive mechanisms

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of all moving machine parts within the area and require initiation of a start-up alarm prior to re-activation.

9.4.4 Limit switches shall be provided at the ends of conveyor belt systems to prevent over travel of material or equipment that could create a hazard to persons.

9.4.5 Where personnel are permitted to travel or pass under chain conveyor segments the underside of the conveyor shall be equipped with a catch pan or similar protection to control fall of material risks generated when chain conveyor segments fail.

9.5 Mobile Conveyances: Mobile conveyor belt systems such as tripper cars, portable stacking conveyors and powered extendable conveyors require specific protective devices to ensure personnel are effectively protected from hazardous motion and energy. The following protection shall be provided on all mobile conveyances operated on FMCO property:

- a. Mobile conveyor systems shall be provided with a rail clamp, brake or other engineered position locking device for each motion where movement could present a hazard to persons (examples of movement include luffing, slewing and traversing).
- b. Rail mounted mobile conveyances shall be provided with limit switches and rail stops to prevent over travel.
- c. The tracks of mobile conveyor systems shall be equipped with pull cord assemblies positioned around the track segment so that a person falling on or towards the track can readily activate the pull cord de-energizing the stacking system.
- d. Sweeps shall be provided on all rail mounted mobile conveyor systems to deflect objects ahead of the nip points (between the wheel and the track) unless it can be determined that no hazard could be created without the use of such sweeps. Where nip points exist which are within 7ft of a working/walking surface; the hazardous area shall be guarded to prevent contact.
- e. Access stairways, ladders, and platforms shall be designed and located in a manner that prevents shear or nip points from developing between sections of structures that in operation move relative to one another.
- f. When high wind conditions exist that could create a hazard to persons, normal operation shall cease, and if needed the conveyor parked and secured. At no time may mobile conveyor systems be operated when sustained gusts reach 70mph.
- g. Mobile conveyor systems including portable conveyors, extendable belt conveyors and tripper cars shall not be accessed while the conveyor belt system is moving. When access is necessary the conveyor belt system must be:
 - a) Equipped with operating controls or e-stops that would allow a person to stop the conveyor and safely exit; or
 - b) Locked out tagged out tried out; or
 - c) Use other administrative controls that will provide a safe means of ingress and egress while the system is not in motion.

9.6 Inspection of Conveyor Chutes: Inspecting conveyor belt drop chutes may expose employees to fall of person, fall of material, moving machine parts and other energy sources if specific procedures are not followed. Prior to opening chute doors or hatches the following controls must be used:

- a. Positive communication must occur with the control room operator that has control of the area informing them of which chute is going to be inspected.

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- b. Feed must be isolated from the area by shutting down the feeder and belt systems that distribute material into the chute. A failure to properly isolate material being distributed into the chute may result in serious injury or death.
- c. The feeder and belt systems distributing material into the chute shall be shut down
- d. The emergency stop device (pull cord) shall be pulled as a secondary interlock control. At no time may entry into the chute or onto the conveyor belt occur unless all applicable equipment is LOTOTO'd, the belt effectively blocked from hazardous movement and scale down/confined space procedures have been used.
- e. A tryout of the belt system shall be done to ensure the safety interlock (pull cord) is functioning properly
- f. Inspect all belts at the head to determine if scale down is necessary to remove any potential material that could fall into the chute.
- g. Depending upon the design and configuration of the chute opening it may be necessary to guard against a fall of person/open hole hazard. If the following 2 conditions are present, open hole/fall protection procedures must be used:
 - 1. The chute opening is 30 inches or more in height and 18 inches or wider; and
 - 2. The chute is positioned less than 42 inches from the working surface (ground/platform level)

9.7 Belt Replacement and Splicing: Prior to performing repairs or replacements the conveyor belt system shall be emptied of material and isolated in accordance with Section 8. When repairing or replacing a conveyor belt, it is mandatory that the take-up assembly be fully released to remove any tension from the belt. Failure to release the belt tension could result in serious injury or death.

9.7.1 Handling and Transportation: The Transportation and handling of new conveyor belt rolls shall be done by competent employees using properly rated rigging and handling equipment. Conveyor belt rolls shall be secured from inadvertent movement during transportation, storage and while being installed.

NOTE: In general conveyor belting is rolled at the factory with the carrying or top side out. Therefore, the belt must lead from the top of the roll if it is being pulled onto the troughing or carrying idlers and from the bottom of the roll if it is being pulled onto the return idlers. Belting shall be placed in locations that reduce side pulling and installed on belt pull bars or belt winders to help facilitate installation.


9.7.2 Installation Precautions: Threading a belt onto a conveyor is accomplished in several ways. The existing belt can be used to pull the replacement belt into position or a specialized rigging system can be attached to the belt and pulled through the conveyor system. Conveyor belts and conveyor system components shall be repaired and installed in accordance with manufacturer specifications. Prior to installing, replacing or repairing conveyor belts competent employees shall conduct an in the field evaluation of the beltline and develop a plan to safely conduct the work (Appendix 13.1 should be used to guide the risk assessment process).

Before attempting to replace or repair an existing belt:

- a) Ensure the belt system is free of material and feed
- b) Lockout/Tagout/Tryout all power to the conveyor belt system

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- c) Remove all tension from the belt by manually adjusting the belt take-ups.
- d) Securely fasten the belt to a solid, stationary object using an engineered belt clamp so that it cannot move when it is cut

 **WARNING:** Pre Installation Checklist: Prior to installing a conveyor belt ensure that pulleys, idlers, loading devices and other components are functional and aligned. Excessive spillage, side-travel, misalignment or component damage can increase the force placed on rigging components during removal and install. Evaluate the existing conveyor belt and ore distribution system (pull cords, guards, belting, idlers, skirt boards, liners, pulleys, feeders, chutes, etc...) for the following:

- 1. Damage 2. Alignment 3. Excessive wear 4. Missing components
- 2. Spilled Material (specifically around idlers, skirt board liners and pulleys)

All belt clamps, rigging devices, pull tabs and conveyor belt handling systems shall be engineered and designed to withstand the forces that will be applied during removal and installation activities. The rated capacity of each device shall be stamped on the unit.

9.7.3 Belt Winder and Pulling Precautions: All mechanically driven moving machine parts and those moving machine parts which are driven as a result of belt movement shall be physically guarded unless they are otherwise guarded by location.

- a) If debris needs to be removed from the belt during active pulling, the operator should be notified to turn off the winder and a shovel or hoe should be used to rake the debris off the belt surface. If entry beyond the guarded area is required the belt winder shall be LOTOTO'd.
- b) Belt pull tabs shall be installed in accordance with OEM specifications or engineered to withstand pull forces equal to the strength of the belt being installed.
- c) Due to the potential risk factors associated with the setup and operation, belt winders and belt stands must be equipped with engineered braking systems.
- d) This braking mechanism must be positively controlled by a competent operator, using an engineered brake engagement control.
- e) The operator must be able to operate the belt stand braking mechanism from a safe location where he/she will not be exposed to the unwinding motion of the belt.
- f) Belt winders and stands must be anchored for belt installation or removal.
- g) All belt winders and belt stands must be inspected prior to use for brake, drive chain, coupling, motor, lubrication system, or other defects. In addition, they must be placed on a preventative maintenance program to maintain critical components.
- h) Belt stand and belt winder operators must be task trained on the safe use of that equipment. All training and inspection documentation must be kept in accordance with FMMO record retention requirements.

9.7.4 Conveyor Components (Head, tail, snubber pulleys, motors, idlers, gearboxes, etc.)
Removal/installation of conveyor components involves the use of rigging and other engineering devices to maneuver components out of or into operating location. These

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activities may require added consideration for body positioning, equipment blocking, or other safety factors.

- a) Risks associated with component replacement activities must be identified, documented and communicated before work activity commences.
- b) When removing/installing conveyor components from an anchored location, they must be fully controlled at all times. This includes controlling suspension, swing, or any other potentially unexpected motion.
- c) When using multiple cables or slings to suspend loads, rigging techniques shall be utilized to ensure balanced suspension and control is maintained throughout the process.
- d) Secondary blocking is mandatory if there is any potential for the component to shift or swing during removal or installation.
- e) At no time during the activity will workers be allowed to position any part of their body underneath a suspended load or in the line of fire of tensioned rigging components.

9.7.5 Belt Splicing Considerations & Recommendations: Conveyor installations with limited take-up travel should be spliced to a tension based on the loaded running tension. Belts tensioned by pulling in only one direction (held in place with clamps) require more splicing tension than those pulled in both directions.

- Sloped belts spliced at the top of the slope require more splicing tension than those spliced at the bottom.
- Inclined belts are equipped with anti-rollback device that cannot be released must be tensioned by pulling in the direction of belt travel only.
- The conveyor belt shall be checked frequently while tensioning to ensure the belt is free, unobstructed and unbound
- During the final tensioning pull, ensure the ends of the belt are lined up properly
- All personnel shall remain clear of the line of fire of unblocked tensioned belts

Splice Preparation: On incline or decline belts, it is easier to work at the lower end of the incline if possible. Splices can be made at the upper end, but high belt tensions can cause difficulties in restraining the belt. Level belts may be spliced anywhere as long as power is available and it is convenient to set up the equipment. Where employees are required to access the top of conveyor belts a safe means of access shall be provided through the use of belt maintenance platforms or fall arrest systems.

Splicing Tools: All tools and equipment shall be inspected before use for damage and defects. Portable Generators shall be grounded in accordance with manufacturer guidelines. Where manual belt cutting methods are used employees shall be protected from sharp surfaces through the use of Kevlar sleeves and leggings.

Failure to remove tools from installation area and conveyor belt before turning on energy source can cause serious injury to personnel and damage to belt.

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10.0 TRAINING REQUIREMENTS

The unique hazards and controls related to conveyor belts require that all employees receive general awareness training prior to performing work on or near conveyor belts. This site specific training must be administered by a competent person familiar with the hazards and protective measures of conveyor belts or administered in another manner that will ensure accurate and consistent delivery of the content (examples include video or computer based training program). At minimum hazard awareness training shall consist of:

- a. Hazards of conveyor belts and system components
- b. General safety practices around conveyor belts
- c. Purpose and function of conveyor belt protective devices
- d. Unique and hazardous conditions
- e. Inspection and Maintenance precautions

11.0 REFERENCE DOCUMENTS

- 11.1 MSHA Guide to Equipment Guarding, Other Training Material (OT – 3), Revised 2004. Retrieved 11/25/2011 from <http://www.msha.gov/s&hinfo/equipguarding2004.pdf>
- 11.2 MSHA Guarding Conveyor Belts at Metal/Non-Metal Mines, Revised June 2010. Retrieved 11/25/2011 from <http://www.nmmineasafety.com/dump/GuardingConveyorBelts%202010.pdf>
- 11.3 MSHA 30CFR Part 56.4503, 56.9310, 56.11009, 56.11013, 56.11014, 56.14105, 56.14107, 56.14109, 56.14113, 56.14200, 56.14202, 56.14203, 56.16002.
- 11.4 American Society of Mechanical Engineers (ASME). Safety Standards for Conveyors and Related Equipment. ASME B20.1-2009. (Revised 2009). Purchased and Downloaded as single use copy on 12/6/2011 from www.asme.org
- 11.5 FMMO Plant Engineering Department: Conveyor Belt Motion Block Analysis (P250-121, Rev# 0, 8/25/2011)
- 11.6 OSHA 1910.28(a)(9) Scaffold Planking System Requirements

12.0 RECORDS

Name of the Document	Responsible for Control	Records Retention
Original Document of this Standard	Health & Safety	Permanent
Training Certificates	Division/Area	Duration of employment + 10 years
Pull Cord Annual Inspection Records	Division/Area	10 Years
Conveyor Belt Risk Assessment Forms	Division/Area	10 Years

13.0 APPENDICES

- 13.1 HS-SPS-2.2-001 Conveyor Belt Risk Assessment Form
- 13.2 Pull Cord Installation Requirements

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14.0 REVIEW AND CHANGE

All changes, modifications and/or revisions must be documented on the table below:

Description of Changes to this Document	
Corrected references – B. Lamanna 08/30/2012	
Included Form ID # in section 13.0 Appendices and Snapshot in Appendix 13.1 S. Elias 08/30/2012	
The above changes were completed prior to official first release of the document. Rev 00	
Section 6.5 page 5– corrected appendix reference from 14.2 to 13.2	
Section 6.5 page 9 – corrected appendix reference from 14.1 to 13.1	
Changes for clarification only and do not require re-approval – S. Elias Rev. 01	
<ul style="list-style-type: none"> • (Field Observations) Definitions Added: Trestle – An engineered structure designed to support an elevated conveyor. • (Significant Incident) Section 7.1 Page 7 under guarding: <ul style="list-style-type: none"> ○ Where appropriate guards shall be constructed to allow safe access to side travel adjustment components (i.e. adjustment bolt, pillow block) without exposing employees to moving machine parts. ○ When area guards are used to prevent contact with moving machine parts they shall be difficult to defeat, readily identifiable as a guard, bolted or locked against entry and equipped with signage indicating; Danger: LOTOTO Required Prior to Entry. • (Significant Incident) Original Section 8.1 referring to energized work has been removed • (Field Observations) Section 9.3.3 added: Conveyor structure including trestles shall be cleaned off periodically, at minimum once per month or as conditions warrant, to control fall of material risks and prevent overloading of the conveyance structure. • (Employee Feedback) Section 9.3.5 added: Elevated return idlers positioned over designated Travelways or active roadways shall be equipped with fall of material protection (i.e. cage, catch basin or secondary chain) • (Compliance Gap) Modified Section 6.1 to include MSC/Tripper cars (audible warnings) • (Rio Tinto Fatality Risk Identification) Added section 6.7 e: At no time is an employee allowed to unplug material distribution systems from a hazardous area below the plug. Efforts shall be made to remotely unplug chutes using air lances, water sprays and long handled tools. If entry is required to free a plug the Morenci Confined Space Standard shall be followed and the unplugging method evaluated by supervision. • (Significant Event) Updated section 9.2 (cleaning around conveyors to include subsection 9.2.6 - When mobile equipment is used to remove material, ground personnel shall not place themselves in between the mobile equipment and a pinch point (i.e. the conveyor, structure, scraper attachment). Spotters, barriers, pre-job coordination and personnel placement during the task are critical to prevent contact. • (Reference other Standard) Updated section 9.2 to reference blue stake policy change: Long Term Blue stake permits shall be obtained for applicable conveyor systems in accordance with the Morenci Blue Stake Standard. • (Significant Event) Added Section 9.7.3 Under Belt Maintenance - Belt Winder and Pulling Precautions: All mechanically driven moving machine parts and those moving machine parts which are driven as a result of belt movement shall be physically guarded unless they are otherwise guarded by location. <ul style="list-style-type: none"> ○ If debris needs to be removed from the belt during active pulling, the operator should be notified to turn off the winder and a shovel or hoe should be used to rake the debris off the belt surface. If entry beyond the guarded area is required the belt winder shall be LOTOTO'd. ○ Belt pull tabs shall be installed in accordance with OEM specifications or engineered to withstand pull forces equal to the strength of the belt being installed. 	

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- (Employee Feedback) Modified Section 9.1. to include a new requirement: 9.1.2 Scaffold Planks and boards used to provide temporary access to chutes, feeders, screens or crushers shall be installed and secured from movement (through cleats, scaffold wire, dimensions or placement). Only OSHA grade stamped scaffold planks rated to withstand at least 75lbs/square foot may be used. Spans in excess of 6ft must be evaluated by a qualified individual to determine if additional supports/planking is required.
- (Employee Feedback) Modified section 5.2 - when safety vests are worn they must be zipped and well fitted.
- (Management Feedback) Added Section 9.5 (d) - The tracks of mobile conveyor systems shall be equipped with pull cord assemblies positioned around the track segment so that a person falling on or towards the track can readily activate the pull cord de-energizing the stacking system.

Changes reviewed with Crush Convey and Concentrator Management Reps on 4/4/2013 – Completed by Brian Lamana on 4/10/2013 *Rev. 02*

Updated record retention times — S. Elias 06/24/2013 *Rev. 03*

Included minimum bar length for use unplugging chutes – T. Messick 7/8/2013

Added an additional example of appropriate guarding of high impact return idlers – B.L. 7/8/2013

Added requirements in section 8.3 to block belt in both directions when blocking is required – H. Sullivan/ 8/11/14

Added additional requirements in section 9.7.4 for use of belt winders and belt stands – H. Sullivan, Jerry Alvillar/ Tim Messick 8/12/14

Included additional requirements in section 9.7.5 for secondary blocking during conveyor component replacement – H. Sullivan/ Jerry Alvillar / Tim Messick 8/12/14

Added appendix 13.1 HP-SP-2.2-001 Jerry Alvillar 8/12/14

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APPENDIX 13.1 – HS-SPS-2.2-001

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Conveyor Belt Risk Assessment Form										
Division:		Department		Date						
Description of Work Activities:										
Location of Work Activities (Mark Applicable Boxes)		Tail	Head	Alongside	Chute	Idlers	Take-up	Under Belt	On Belt	Drive Motor
Other Area:										
Failure to coordinate activities with co-workers and different workgroups may expose employees to risks generated from work being performed at different areas along the beltline or task.										
STEP 1 – General Hazard Identification										
YES	NO	Section A: Conveyor Belt System Hazards			YES	NO	Section B: Potential Hazards Generated from Work Activities			
		Exposure to Moving Machine Parts					Pinch Points			
		Material Build-up/Fall of Material					Suspended Loads			
		Spillage/Housekeeping					Fall of Person/Open Hole			
		Hazardous Energy (Pneumatic, Electrical, Hydraulic, Gravitational, etc)					Material Handling/Ergonomic Risks			
		Unsafe Access					Hot Work/ Fire /Confined Space			
		Environmental – Dust, Gases, Fumes, Noise					Line of Fire			
		Other:					Other:			
When conditions/practices are observed that could result in serious injury or death work must be stopped until the hazards have been eliminated or controlled.										
Description of Hazardous Conditions										
STEP 2 – Belt Blockage Requirements (If Belt Blocking is required the blocking device must be installed before work begins and remain in place for the duration of the task)										
YES	NO	Section A – Belt Configuration			YES	NO	Section B – Exposure (Proximity and Work Location)			
		Is the uphill or downhill running conveyor belt plugged or stuck?					Will guarding be removed and employees exposed to pinch/nip points?			
		Does the uphill or downhill running conveyor belt contain feed?					Does work require employees to access chutes or the top of belts?			
		Will work activities result in adjustments to the tension of the beltline?					Will work occur in other areas where movement could create hazards to			
If YES is answered to any question in Section A, controls must be determined prior to										
If required how will the blocking device(s) be installed:										
STEP 3 – Risk Management (Analyze all potential hazards and energies / Implement control measures to reduce risk to an acceptable level)										
Scale Down (removal of buildup)		LOTO		Belt Clamps/Blocking devices		Personal Protective Equipment (PPE)				
Partial Guarding		Open Hole Protection (Barricades)		Confined Space Procedures		Flagging/Demarcation				
Crane/Specialized Rigging		Radio/Communication/Attendant		Ladders/Temporary means of access		Lighting / Ventilation Equipment				
Cribbing/Other Blocking Devices		Lifting Techniques		Secondary Blocking Controls		Tag Lines/Suspended Load Zones				
Describe actions taken to control hazards.										
STEP 4 – Authorization & Approval										
Employee Name		Employee I.D.		Employee Name		Employee I.D.				
1				4						
2				5						
3				6						

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APPENDIX 13.2 – Pull Cord Installation Requirements

The emergency stop cord (pull cord) must be sufficiently tight to assure the conveyor drive motor will be deactivated when the cord is pulled. Pull Cords must be installed in such a way that they are clearly visible and readily accessible from all areas that provide access to the conveyor. Unless otherwise specified by the manufacturer pull cords shall meet the installation requirements established below.

- a. Pull cords shall be located so that a person falling on or against the conveyor can readily activate the pull cord de-energizing the conveyor belt system.
- b. Pull cords are not considered adequate protection in areas where return idlers are positioned above 36" from the walking or working surface. In situations where idlers and corresponding nip points are located in positions that increase the likelihood of an injury; point of operation guarding shall be installed that prevents contact resulting from inattention, carelessness, and stumbling.
- c. Pull-cord switches shall be located along the conveyor at intervals not exceeding 300ft between individual switch units unless specified differently by the manufacturer.
- d. The pull force required to operate a switch should not exceed 15 pounds when applied at mid span between supports, with a movement of not more than 6 inches, prior to deactivation, when applied at right angles to the wire.
- e. The pull-wire support brackets (dog ears) should be installed at regular intervals and positioned at distances that limit sagging (nominal installation methods should not exceed one support bracket every 15 feet).
- f. Modern systems use either a covered steel cable, or weatherproof cables that encase the control lines, communication lines and other instrumentation. This cable shall be kept in operable condition and not create a hazard by its use.
- g. Pull cord installations are only approved as protective devices along unguarded conveyor belt installations, other moving machine parts such as gears, sprockets, chains, drive, head, tail, and take-up pulleys, flywheels, couplings, shafts, fan blades, and similar moving parts must be physical guarded to prevent contact.
- h. Pull Cord circuits, when activated, shall remove electrical energy directly from the power source or from the power source switching device.
- i. Pull cord systems shall be visually inspected by a competent individual at least once per month. In service functional use tests, or an alternative inspection process using approved testing equipment that can verify a functional status, must be performed and documented for all pull cord systems annually.

Standard Pull Cord Installation	Standard Railing Installation
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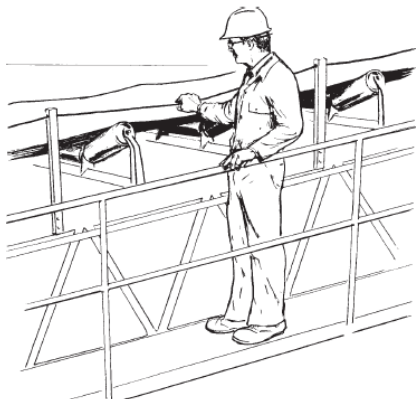


Figure 10

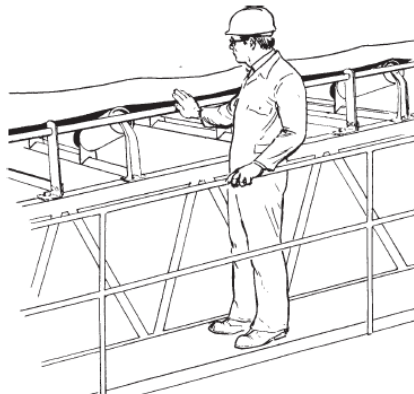


Figure 11

MSHA Guide to Equipment guarding (OT 3, Revised 2004)

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