

**NSSGA Comments on MSHA's Guide to Equipment Guarding**  
**(Draft, Rev. 2003)**  
*November 3, 2003*

All of the statements incorporated in the guidebook should be intended to be recommendations or providing guidance and should in no way be used as an enforcement tool. NSSGA reemphasizes the importance of using "unintentional contact" when referring to individuals coming into contact with moving parts. It might also be helpful to include arrows depicting the areas of concern in the illustrations so that the readers easily recognize the hazards.

**Guarding Considerations & Recommendations (pg.4-5)**

This section is written as a brief discussion of effective guard design and is not a requirement for compliance.

The input and ideas of equipment manufacturers, machine operators, maintenance personnel, and supervisors can enhance design, construction and installation of guards. Before constructing a guard, these considerations should be addressed;

Do the design, construction, selection of materials and guard installation prevent contact with all moving machine part hazards?

Does the guard provide protection by itself, and not rely on visual or tactile awareness of a hazard, administrative controls or procedures such as warnings, signs, lights, training, supervision or personal protective equipment?

Are the guard materials, fastening methods and construction suitable to withstand the wear, corrosion, vibration and shock of normal operations?

If drive belts inside a guard fail, will the whipping action of broken belts be contained within the guard?

Is the guard recognizable as a guard?

**NSSGA Comment:** We suggest striking this statement "Is the area guard recognizable as a guard" from the guide or the agency should clarify the intent of this statement. A guard either effectively protects against moving parts or it doesn't. The objectivity behind guarding is to effectively protect employees from coming into contact with moving parts, not to be easily recognized. This could be an interpretation problem if an operator has an effective guard in place and an inspector feels that it is not "easily recognized".

Is the guard installed securely?

Is the guard design adequate for the application and specific hazard(s)?

**NSSGA Comment:** The statement is vague and could lead to confusion and conflicts in interpretation. The question should be, “Does the guard adequately prevent unintentional contact with moving or whipping parts?” “Are openings in the guard material limited so that contact with moving parts is prevented?”

Are openings in the guard material such that contact with the hazard is prevented by the distance between the guard and the hazard?

Is the guard constructed to not interfere with the normal operation, inspection, lubrication or servicing of the equipment?

Is the guard designed and constructed such that adjustments to the guarded components can be made without loss of protection or modifying the guard?

Do the design, materials and guard construction prevent the guard from being a hazard itself (*i.e.* free of burrs, sharp edges, pinch points, etc.)?

**NSSGA Comment:** The statement should emphasize unintentional contact by incorporating the following revision, “Do the design, construction, selection, of materials and guard installation prevent **unintentional** contact with all moving machine parts?”

Is the guard of a size, shape, weight and balance that permits safe manual handling when it is removed or replaced, or does it have integral components that facilitate handling with mechanical tools or equipment?

Is the guard constructed so that it cannot be easily circumvented, by-passed or overcome?

Can the guarded components be inspected without removing the guard?

Is the guard constructed and located not to hinder clean-up efforts?

Is the guard maintained in serviceable condition?

Has the guard design considered the use of new technology, if applicable?

## **Figure 1 (pg.6)**

Figure 1 shows an inadequate conveyor tail pulley guard. The rear and top of the pulley are fully exposed providing access to moving machine parts.

### **Figure 2 (pg.7)**

The guard in Figure 2 covers the pinch point and the moving parts of the tail pulley. If properly maintained this design can prove very effective in preventing contact during work-related activities.

**NSSGA Comment:** The rollers under the conveyor belt in the illustration should be guarded as well.

### **Figure 3 (pg.8)**

Figure 3 shows an elevated tail pulley. Because the underside of the pulley is accessible, it needs to be guarded. The guards may have openings large enough to allow fines to fall through, but not large enough to allow a miner to reach the moving machine part.

### **Figure 4 (pg.9)**

The reason for guarding return idlers is shown in Figure 4.

Return idlers should be guarded wherever miners could contact them. Guarding return idlers may be required where miners work or travel beneath the belt.

**NSSGA Comment:** The text for this illustration refers to a return roller, but it shows a “bend roller or bend pulley”. It is recommended that the illustration be changed to appropriately identify the hazard described in the text. The image depicted in this figure does not appear to be a return roller and needs to be properly identified. An appropriate illustration of this hazard at a return roller needs to be shown separately, or the text changed to point out that they are similar. Figure 4 does show a serious hazard. There is also an unguarded take up pulley in the illustration. The agency needs to show how to guard this equipment so miners can't access the area. This is one place where an area guard is very appropriate.

### **Figures 5,6,7 (pg.10)**

If return idlers require guarding the figures below show three examples of guards for return idlers. Notice that the grease fittings can be accessed without removing the guard. The guards may have openings large enough to allow fines to fall through, but not large enough to allow a miner to reach the moving machine part.

**NSSGA Comment:** There should be a better illustration used on this page that shows various types of effective guards that do not plug up. Figures 6 and 7 appear to be truss conveyors, and the agency does not normally require return rollers to be guarded on them. The illustrations need to be limited to channel conveyors or a truss conveyor that clearly shows a potential for accidental contact with rollers. Change text to point out that each situation can be different. One type guard does not fit all situations. In some

cases, return rollers only need to be guarded on the sides. However, some rollers need to be enclosed on the sides, the leading edge, and on the bottom to prevent accidental contact. There are exceptions where these rollers need guarding to prevent unintentional contact, but again each situation is different. The illustrations depicted in Figures 6 & 7 could also fill up with fines creating maintenance, which could result in additional hazards.

### **Figure 8 (pg.11)**

An unguarded head pulley and drive unit are shown in Figure 8. The conveyor pulley and the drive pulleys and belts are exposed, providing access to hazards.

### **Figure 9 (pg.12)**

The head pulley and drive guards in Figure 9 are constructed to protect the miner from the pinch points, drive shafts and V-belts.

**NSSGA Comment:** The statement should place an emphasis on unintentional contact by incorporating the following revision, "The head pulley and drive guard in Figure 9 are constructed so that the miner cannot *unintentionally* contact pinch points, drive shafts, and V-belts."

### **Figure 10 (pg.13)**

Unguarded conveyors next to travel ways must be equipped with emergency stop *cords* "or safety rails". FOR METAL? NONMETAL ONLY: a railing is an acceptable alternative to a stop cord. The stop cord must also be sufficiently tight to assure the conveyor drive motor will be readily deactivated when the cord is pulled. There is no specific location required for the stop cord, however, it needs to be located so that a person falling on or against the conveyor can easily reach it. Figure 10 shows an emergency stop cord along a conveyor belt with a walkway.

**NSSGA Comment:** The statement, "There is no specific location required for the stop cord, however, it needs to be located so that a person falling on or against the conveyor can easily reach it" should be removed and replaced with, "There is no specific location required for the stop cord, however, it be positioned so that a person falling into/against the conveyor will contact the stop cord thus causing the disconnect". NOT, "that it can be easily reached or pulled"...what if both hands were entangled, a miner could not reach the stop cord to deactivate the conveyor?"

### **Figure 11 (pg.14)**

FOR METAL & NONMETAL ONLY

Figure 11 shows a railing installed along the conveyor in lieu of an emergency stop cord. The railing is positioned to prevent persons from falling on or against the conveyor.

### **Figure 12 (pg.15)**

Figure 12 shows an unguarded take up pulley system. The figure shows exposed bend pulleys and a take up pulley, which can easily be contacted. The pictured conveyor structure does not provide a sufficient guard.

### **Figure 13 (pg.16)**

Guards (as shown in Figure 13) can be installed to prevent access to the take up pulley. The guard needs to prevent access to the pinch points and the moving machine parts.

**NSSGA Comment:** The text on this page needs to clarify that the top area along the bend pulleys (where the individual depicted hand is resting) need to be evaluated to determine if unintentional contact can be made. If it is possible, it needs to either be enclosed or raised to prevent unintentional contact. A statement should be incorporated to say, "The bend pulley in-running nip point (area behind the individual's right leg) should be adequately protected against unintentional contact". If the guard does not extend far enough, someone could unintentionally contact the nip point.

### **Figure 14 (pg.17)**

The moving machine parts of take up pulleys are often located a sufficient distance above the ground to prevent contact, and are therefore considered "guarded by location." They may be equipped with heavy counterweights that pose a suspended load hazard. Precautions, such as the guard in Figure 14, should be taken to prevent access below the suspended load. (note redraw with longer uprights)

**NSSGA Comment:** Figure 14 and its respective text should mention and depict safety cables to prevent someone from coming into contact with the moving parts of the take-up pulley, if they were to fall from an elevated level. Clarification should also be made that if the gravity take up pulley can be unintentionally contacted by body parts, tools, equipment, etc., it needs to be elevated or guarded.

The pulley in the text should either be raised so it is obviously higher than 7 ft. from ground surface or it should be guarded so that the reader is not misled or confused.

### **Figures 15 & 16 (pg.18)**

Shafts and shaft ends need guarding if they present a hazard. Rotation speed, size, location, keyways, burrs, and other factors need to be considered when determining which shafts need guarding. Not all shafts and shaft ends require guarding. Rotating shafts and shaft ends with protruding set screws, keys, key ways, etc... (Figure 15), can present a hazard such as by grabbing clothing, and may need to be guarded. Figure 16 shows examples of guards for rotating shafts and shaft ends.

### **Figures 17 & 18 (pg.19)**

Figure 17 shows a drive coupling. Couplings need to be enclosed to prevent contact. An example guard is shown in Figure 18.

***NSSGA Comment:*** The statement should emphasize accidental contact by incorporating the following revision, “Figure 17 shows a drive coupling. *When there is a potential for unintentional contact, couplings should be enclosed to reduce the risk of exposure to moving parts.* An example guard is shown in Figure 18.”

### **Figure 19 (pg.20)**

Figure 19 shows a guard for a drive belt and pulleys. This guard would not be acceptable because the belt and pulleys can still be contacted by a miner.

### **Figure 20 (pg.21)**

Where contact with belts, pulleys, sprockets, chains, etc., is possible from both sides, they must be guarded to prevent contact from both sides. An example is shown in Figure 20.

### **Figure 21 & 22 (pg.22)**

Where hazards are created by belt breakage, as shown in Figure 21, a guard must be provided to contain the broken belt. An example is shown in Figure 22.

### **Figure 23 (pg.23)**

Fan blades need to be guarded where they can be contacted.

### **Figures 24, 25, & 26 (pg.24)**

Figure 24 shows a flywheel guarded by location. Build-up of material may place the flywheel within easy reach, as shown in Figure 25. To protect miners from contacting the flywheel, the build-up must be removed or the flywheel guarded. An example guard is shown in Figure 26.

### **Figure 27 (pg.25)**

Figure 27 is an example two separately controlled conveyors are guarded by a single guard. In this case a single guard covers the pinch points and moving machine parts of

both belt conveyors. Before removing the guard, both belts would need to be Locked-out and tagged out.

### **Figure 28 (pg.26)**

Moving machine parts on mobile equipment may need to be guarded to prevent contact. For example, Figure 28 shows a guard provided to prevent contact with the cooling fan and alternator of a front-end loader. In cases where moving machine parts are located under hoods, behind doors, guarded by location and/or covered by maintenance panels, additional guarding may not be needed.

***NSSGA Comment:*** The statement for figure 28 should include the following revision, "For example, Figure 28 shows a guard provided to prevent contact with the cooling fan and alternator *with and older piece of equipment.*"

### **Figure 29 (pg.27)**

Figure 29 shows a kiln with a railing restricting access to the trunnion area. This railing is unacceptable as a guard because miners access the area beyond the railing while the kiln is in operation. The rotating trunnions are exposed, presenting a hazard to miners.

The railing is not easily recognizable as a guard, is easily defeated and does not secure the area from entry.

### **Figure 30 (pg.28)**

Figure 30 shows the trunnions with point-of-contact guards. This method of guarding permits easy access, yet protects against contacting the moving machine parts. If the lubricating system is accessible with the guard in place, servicing can be done while the kiln is in motion.

### **Area Guarding (pg.29)**

An area guard is a barrier, which prevents entry of a miner into an area containing moving machine parts, thus preventing contact with the moving parts. Effective area guards may require additional administrative controls and practices in addition to the physical barrier. When designing, installing and/or using area guards, consider:

- Security of the area
  - Is the area guard difficult to defeat?
  - Is it locked or bolted?
  - Is an extraordinary effort needed to enter the guarded area so that the miner will know that special procedures and practices will be needed to prevent injury?

***NSSGA Comment:*** The term "extraordinary effort" should either be stricken from the text or defined by the agency. "Extraordinary efforts" can be interpreted differently by individuals and could potentially lead to discrepancies among inspectors as well as

industry. We suggest providing examples of “special procedures and practices” as well so that operators have an idea of what the agency is looking for.

- How will the moving machine parts be shut down before entry?
  - Will the guard be interlocked with the hazardous equipment so entry will automatically shut down the moving parts?
  - Will manual shutdown be used?

**NSSGA Comment:** Note that interlocks are not a substitute for de-energizing and locking out the power source.

- Is the area guard easily recognized as a guard?
  - Warning signs, color coding

**NSSGA Comment:** We suggest striking this statement “Is the area guard easily recognized as a guard” from the guide or the agency should clarify the intent of this statement. A guard either effectively protects against moving parts or it doesn’t. The objectivity behind guarding is to effectively protect employees from coming into contact with moving parts, not to be easily recognized. This could be an interpretation problem if an operator has an effective guard in place and an inspector feels that it is not “easily recognized”.

- Frequency of entry into the guarded area
  - Frequently accessed areas may not be suitable to area guarding

**NSSGA Comment:** The agency should define or give an example of “frequent travel” with respect to an area guard.

- Number of people requiring access into a guarded area
  - If a large number of people need to access to an area, then area guarding may not be suitable.

**NSSGA Comment:** The agency should reword the text within this section or define “large number of people”. Vague language allows for too much interpretation for the inspectors and could potentially increase discrepancies among inspectors as well as industry with respect to how individuals define “large number of people”.

- Education and training in proper procedures
  - Does the workforce understand who may enter are guards?
  - Have lock-out tag-out procedures been addressed?

## **Figures 31 & 32 (pg.30)**

Figure 31 shows an example of an area guard used to prevent contact with multiple belt tailpieces. Figure 32 shows an alternative using point-of-contact guards.

An advantage of the area guard is that it may be less expensive and provides easy access. A disadvantage is both belts must be locked-out and tagged-out before entering the guarded area.

The advantages of the point-of-contact guards are that one belt can be maintained while the other belt continues to run, the belts can be cleaned around without lock-out/tag-out and maintenance on the chutes is possible without lock-out/tag-out.

**NSSGA Comment:** It still looks like the belts can be accessed from the back- side. Suggest drawing wall outlines for the figure for the purpose of reducing confusion that the illustration may present to readers.

### **Figure 33 (pg.31)**

Figure 33 shows classifiers guarded to prevent persons from coming in contact with the screws. This guard adequately protects the miner because it is tall enough and far enough from the hazard to prevent contact during work-related activities.

### **Figures 34 & 35 (pg.32)**

The example guard designs shown in Figures 34 and 35 protect the miner from contacting the pinch points, the moving machine parts of the head pulley, and the moving shafts and drive pulleys and belts. If properly maintained alternative designs can prove very effective in preventing contact during work-related activities.