This guide provides compliance information to help the metal and nonmetal mining industry meet current requirements of the Mine Safety and Health Administration's (MSHA's) guarding standards addressing conveyor belts. This document is also intended to enhance awareness of guarding compliance for miners' representatives, miners, independent contractors, and MSHA's Metal and Nonmetal enforcement personnel with compliance issues related to guarding conveyor belts. This guide should be used to supplement existing guarding guidance contained in "MSHA's Guide to Equipment Guarding" issued in 2004, and in MSHA's existing Program Policy Manual.

Navigating this Presentation

Most of the slides in this PowerPoint® presentation have explanatory notes that are critical to understanding the content of this presentation. Be sure to adjust the PowerPoint® display on your computer screen to be able to read the notes, or print the slides using the "Notes Pages" option.

Guarding Conveyor Belts
at Metal & Nonmetal Mines

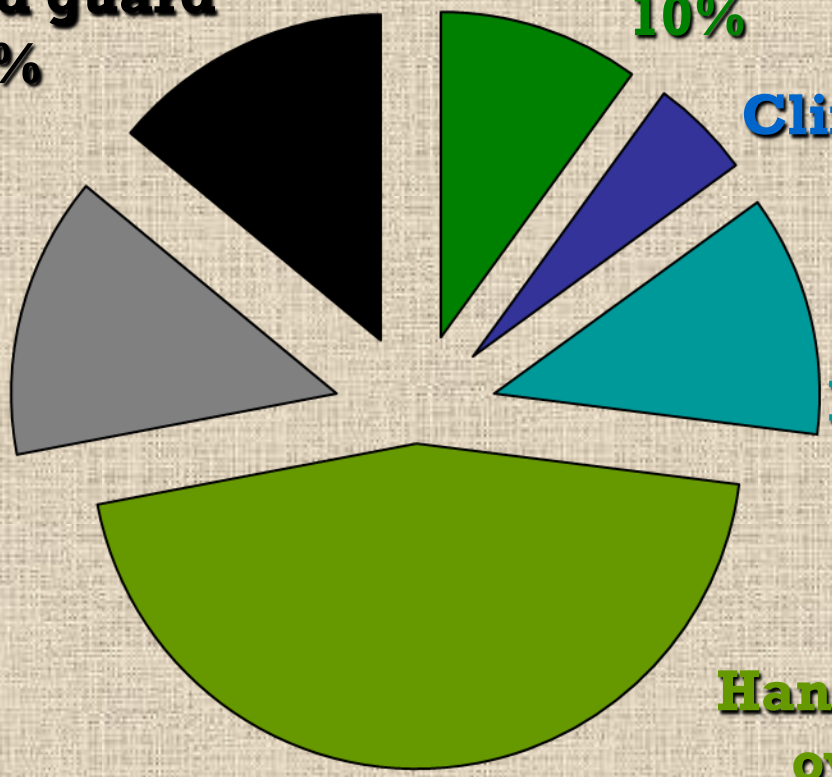
Mine Safety & Health Administration – June 2010

MSHA's Goals & Objectives

- **Improve inspection and enforcement consistency to ensure proper guarding compliance**

- **This will result in … *REDUCED* :**
  - **Serious and Fatal accidents**
  - **Risk of injury posed to miners**

Injuries Related to Equipment Guarding



30 CFR § 56/57.14107
Moving Machine Parts

MNM's most-cited standard

Citations Issued	S&S
11,687	Y
23,966	N
35,653	

*Data is from 2005-May 20, 2010

30 CFR § 56/57.14107
Moving Machine Parts

(a) Moving machine parts shall be guarded to protect persons from ***contacting gears, sprockets, chains, drive, head, tail and take-up pulleys, flywheels, couplings, shafts, fan blades*** and similar moving parts that can cause injury.

(b) Guards shall not be required where the exposed moving parts are at least seven feet away from walking or working surfaces.

Preamble: § 56/57.14107
[FR, Page 32509]

Guards are meant to protect persons from:

- "inadvertent, careless, or accidental contact" or
- "deliberate or purposeful ***work-related*** actions…" (inspection, testing, cleaning, maintenance, troubleshooting, lubrication, adjustment, servicing, etc…)
- Standard does not address deliberate or purposeful, NON-work-related actions

Belt Conveyor Components to Guard

- Head & tail pulleys
- Take-up & bend pulleys
- Return rollers ***(Subject to miner's exposure)***
- Drive & power transmission components

Types of Guarding

- Point-of-contact guarding
- Location guarding
- Area guarding

Point-of-Contact Guards

OK

Point of Contact Guards

Guarding by Location

The distance from the head drive pulley to the ground is greater than 7 feet.

Guarded by Location?

8 feet

Area Guarding

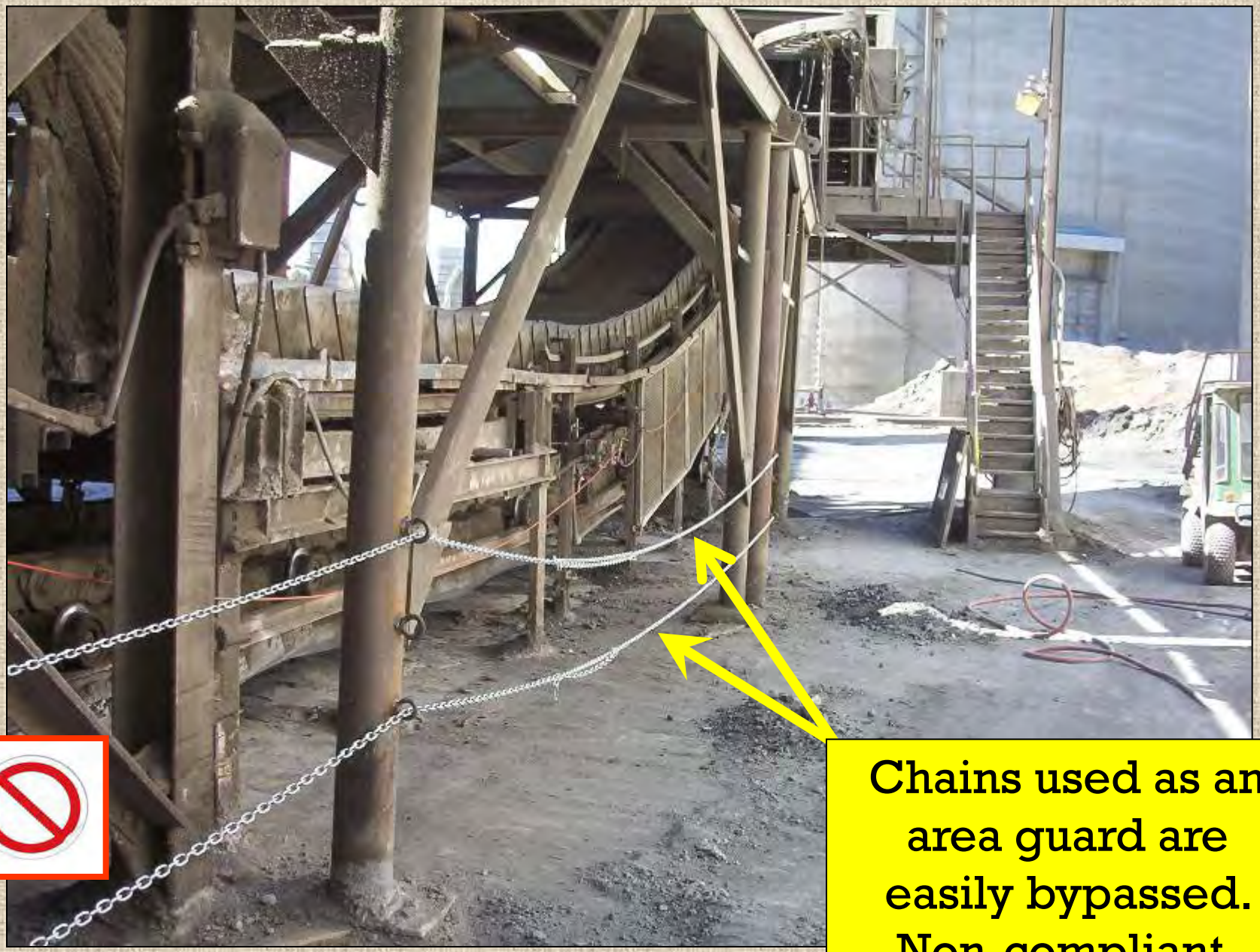
from MSHA's 2004 "Guide to Equipment Guarding" Handbook

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 practices and provisions, such as signage, locks, color coding, etc., 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?
  - Does the guard prevent entry into the area and is the guard difficult to defeat?
- 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?
- Is the area guard easily recognized as a guard?
  - Are warning signs or color coding in use?
- Frequency of entry into the guarded area
  - Frequently accessed areas may not be suitable for area guarding.
- Number of people requiring access into guarded area
  - If a large number of people need access to an area, then area guarding may not be suitable.
- Education and training in proper procedures
  - Does the work force understand who may enter area guards?
  - Have lock-out, tag-out procedures been addressed?

Area Guarding

OK



Chains used as an area guard are easily bypassed. Non-compliant.

Area Guarding

This area guard is not securely fastened and it is easily bypassed.

Area Guarding

Noncompliant and ineffective. Frequent access is required under the unguarded return roller.

Inadvertent Contact

Work-Related Contact

Head pulley must be guarded.

Inadvertent or Work-Related Contact

Tail pulley must be guarded underneath to prevent inadvertent contact.

Inadvertent or Work-Related Contact

Tail pulley guards must extend closer to the ground along sides and in front.

Inadvertent or Work-Related Contact

The tail pulley can be accessed by the unguarded opening.

Purposeful Non-Work-Related Actions

Purposeful Non-Work-Related Actions

OK

Materials for Guard Construction

Preamble: § 56/57.14107
[FR, Page 32509]

- "… the standard is intended to clarify the ***performance objective*** of guards. The standard does not specify the type of material to be used for guarding, but expanded metal or transparent ***safety*** plastics are ***examples*** of alternatives…"

Metals

OK

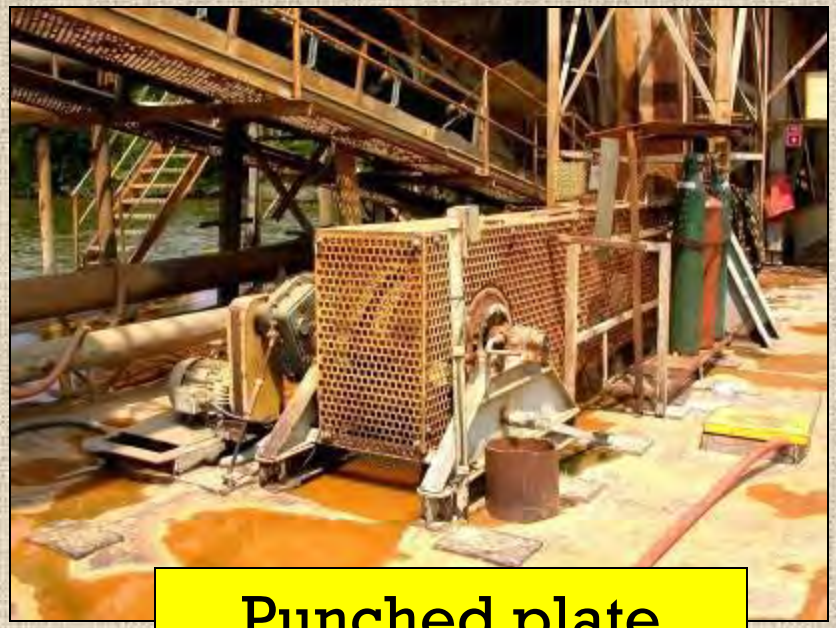
Metal floor grating

Sheet metal

Expanded metal mesh

Metals

OK



Punched plate

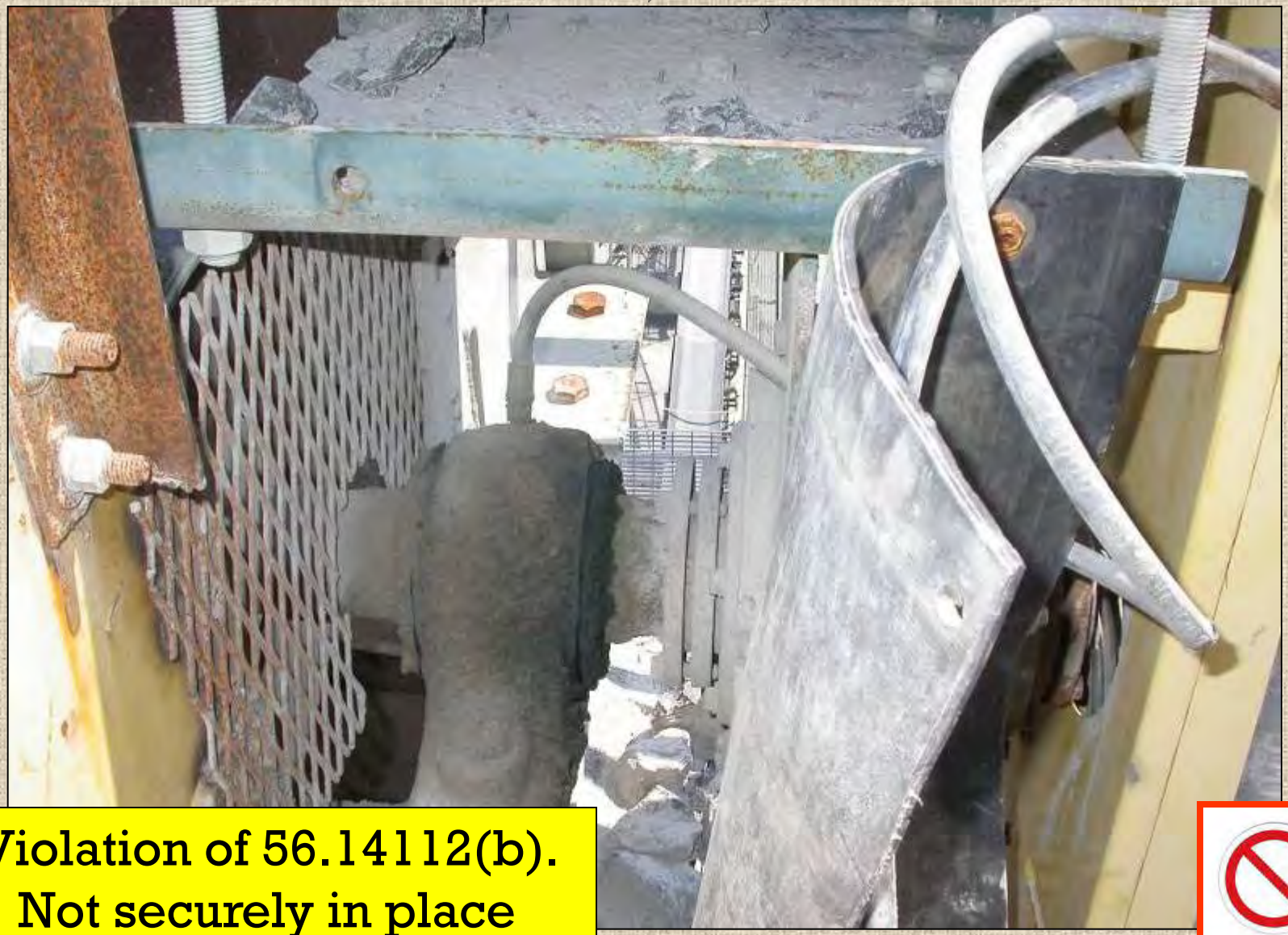
Chain link fence

Metal mesh

Screen Cloth

OK

Rubber



Violation of 56.14112(b).
Not securely in place

Rubber

Violation of 56.14112(b).
Not securely in place

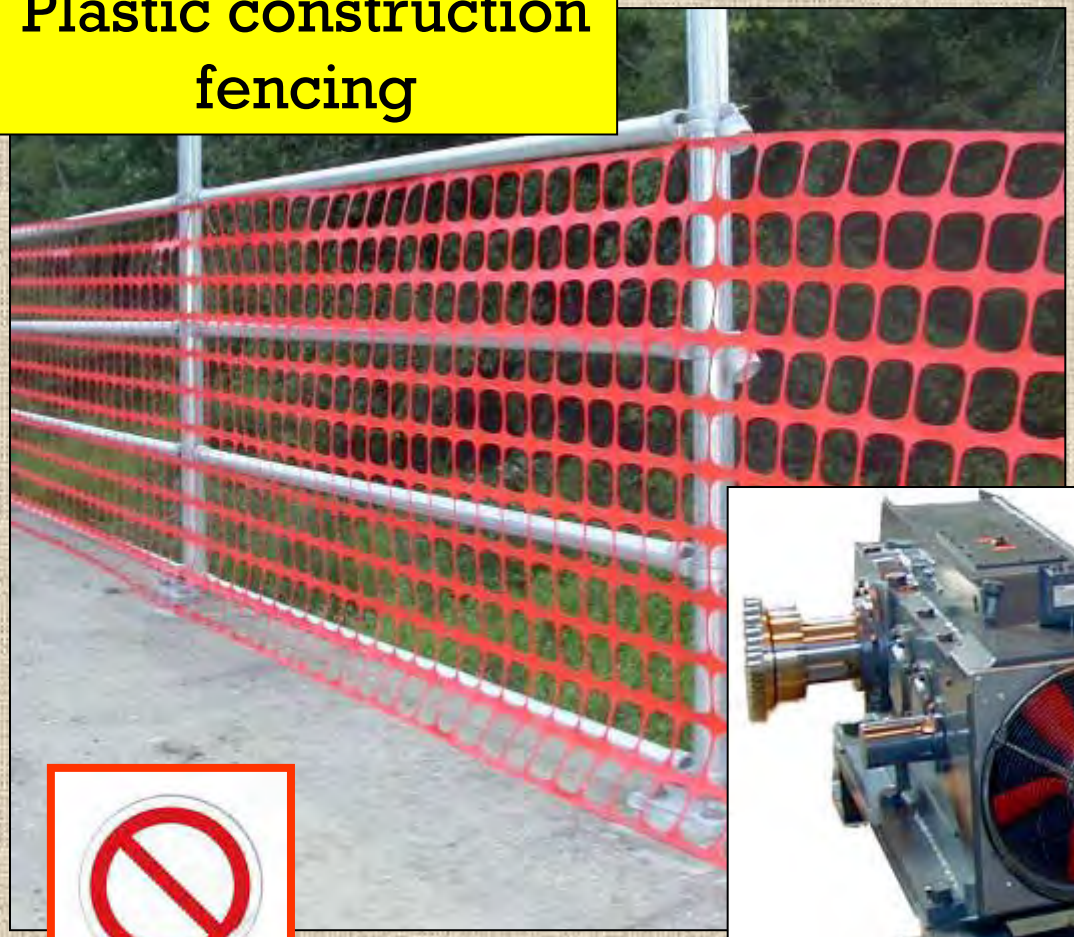
Tensar

Tensar ® is a high strength polyethylene mesh used for roof and rib control in underground salt or coal mines. Here the Tensar is stretched over a sturdy aluminum tube frame and well-secured with heavy-duty plastic wire ties.

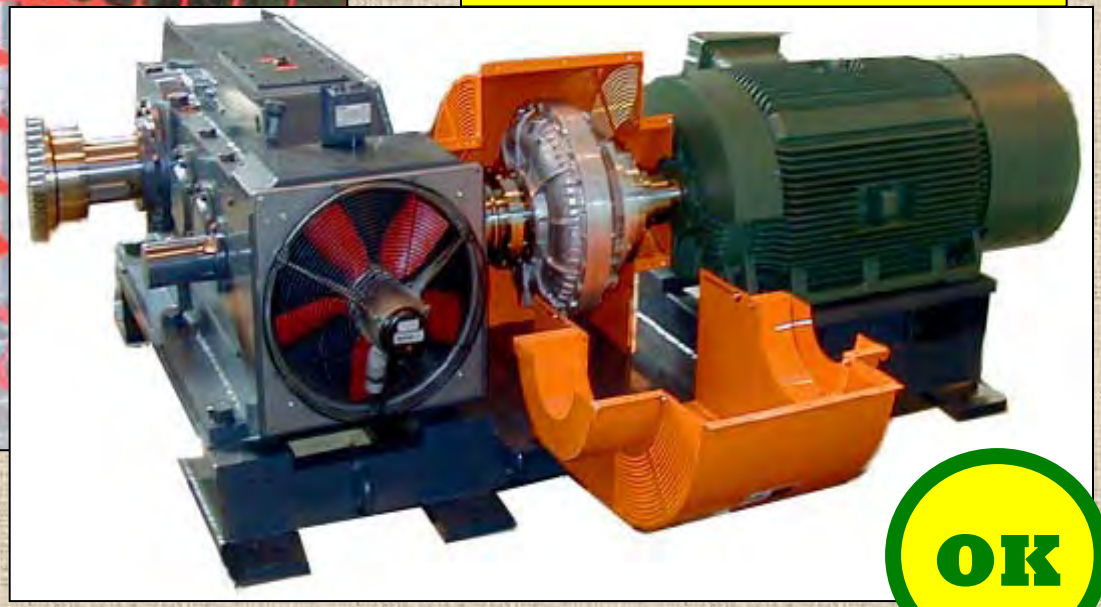
*** Please note that Tensar can degrade in direct sunlight or in contact with limestone.**

Plastics

Plastic construction fencing



Custom shapes or cut-to-fit plastic



OK

Wood

Head pulley guard

Deteriorating and delaminating

OK

Tail Pulley Guards

Return Rollers

- Considered to be "similar moving parts" and are to be guarded when miners are exposed to injury during work or travel activities.
  - For instance, when cleaning or working under, or crossing under an operating belt conveyor that is not guarded by location.

Return Rollers

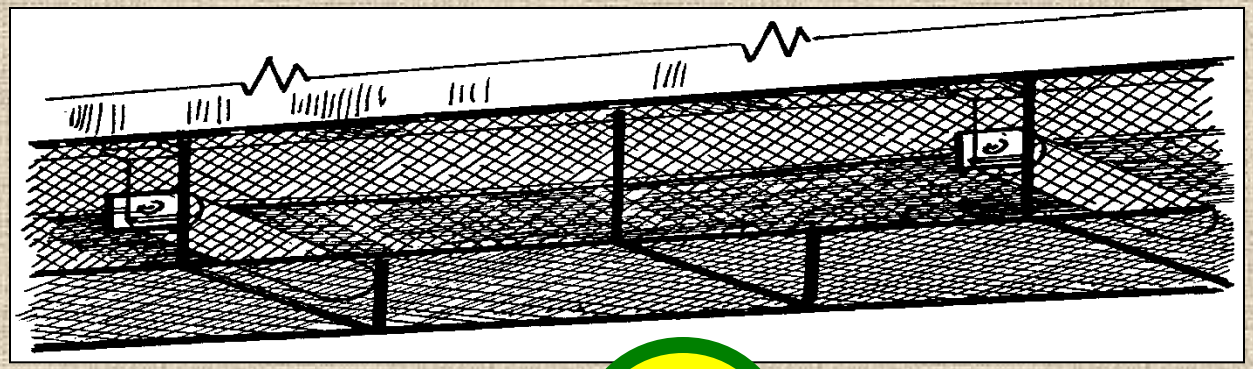
Not guarded

Return Roller Location

Return Roller Location


OK

Alternative Methods for Guarding Return Rollers



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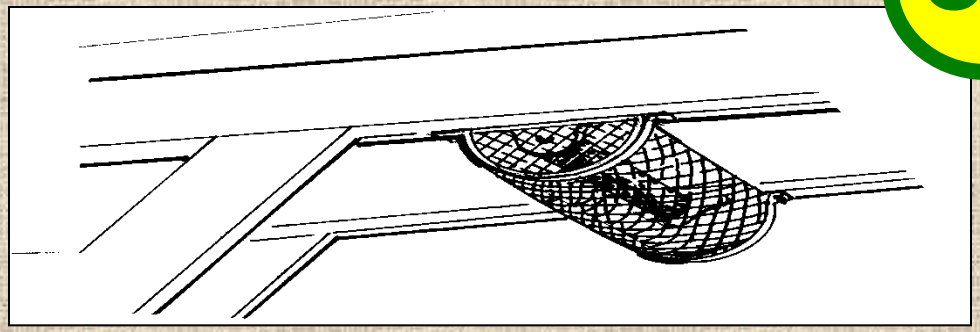
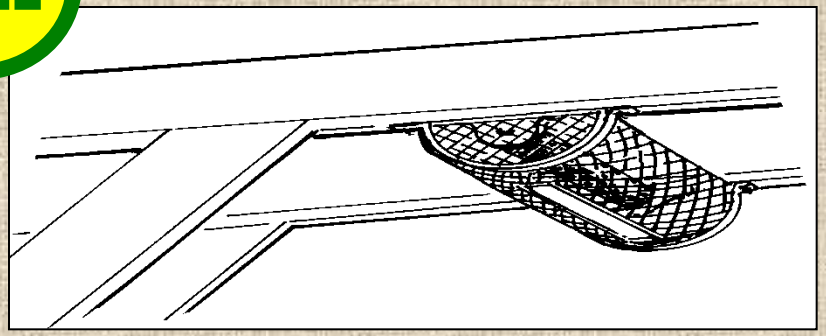




Illustrations from *Guide to Equipment Guarding* Handbook - 2004

Alternative Return Roller Guarding Methods

Alternative Methods for Guarding Return Rollers

OK

In-running nip point guarded full width of belt. Note that guard extends past end of roller.

Alternative Methods for Guarding Return Rollers

OK

Belting location. Adjust guard to minimize gaps.

Other standards to consider when inspecting belt conveyors

1

- 56/57.14108 Overhead drive belts

2

- 56/57.14109 Unguarded conveyors with adjacent travelways

3

- 56.57.14112 Construction and maintenance of guards

Whipping Action of V-Belts

56/57.14108 – Overhead drive belts.

Overhead drive belts shall be guarded to contain the whipping action of a broken belt if that action could be hazardous to persons.

§ 56/57.14109 - Unguarded conveyors w/ adjacent travelways

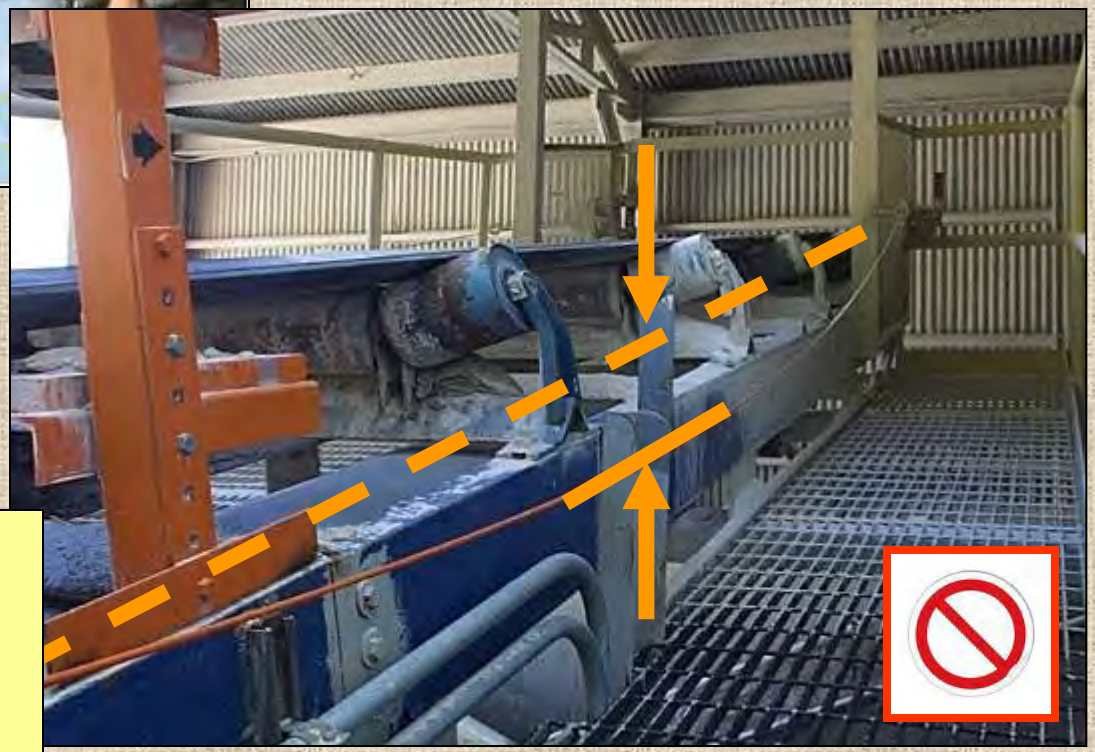
Unguarded conveyors next to travelways shall be equipped with –

(a) Emergency stop devices to readily deactivate the drive motor…

or…

(b) Railings positioned to prevent persons from falling on or against the conveyor…

Emergency Stop Devices



How low or slack & still compliant? Able to readily deactivate.

Conveyor Railings

OK

56/57.14112 – Construction and maintenance of guards

(a) Guards shall be constructed and maintained to –

(1) Withstand the vibration, shock and wear to which they will be subjected **during normal operations**; and

(2) Not create a hazard by their use

56/57.14112 – Construction and maintenance of guards

(b) Guards shall be securely in place while machinery is being operated, except when testing or making adjustments which cannot be performed without removal of the guard.

Consider also: 56/57.14105 – Procedures during repairs or maintenance

Securely in Place
- not easily dislodged -

- Fastened
- Held in place by its own weight, bulk or method of attachment

Securely in Place

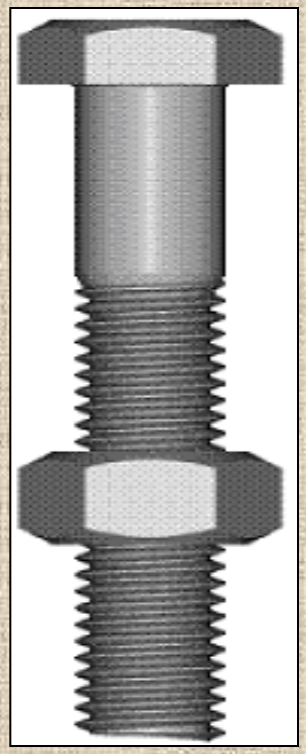
This Tensar mesh guard is not secure at the bottom and is easily bypassed.

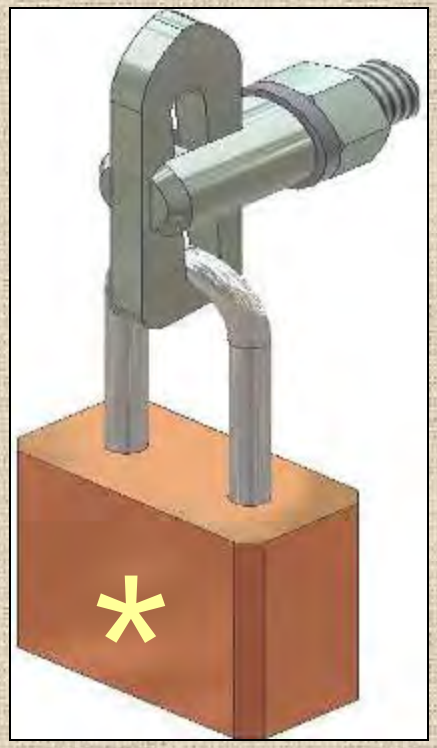
The grease line must be extended outside the guard.

*** Please note that Tensar can degrade in direct sunlight or in contact with limestone.**

Fasteners & Fastening Systems

- Many types of fasteners are acceptable

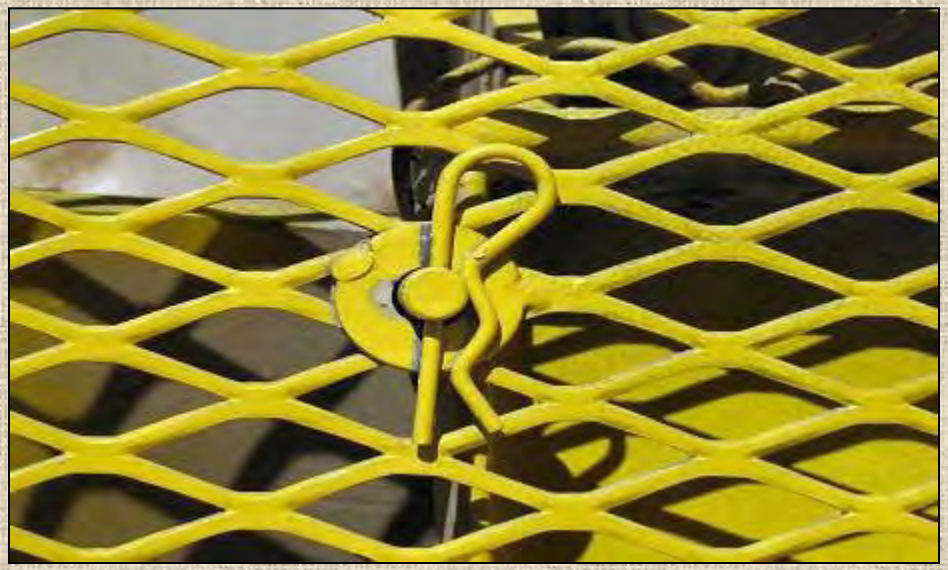




* Fastener locking devices are not required.
Tools are not required to remove a fastener.

Fasteners & Fastening Systems

OK



Pins & Sleeves

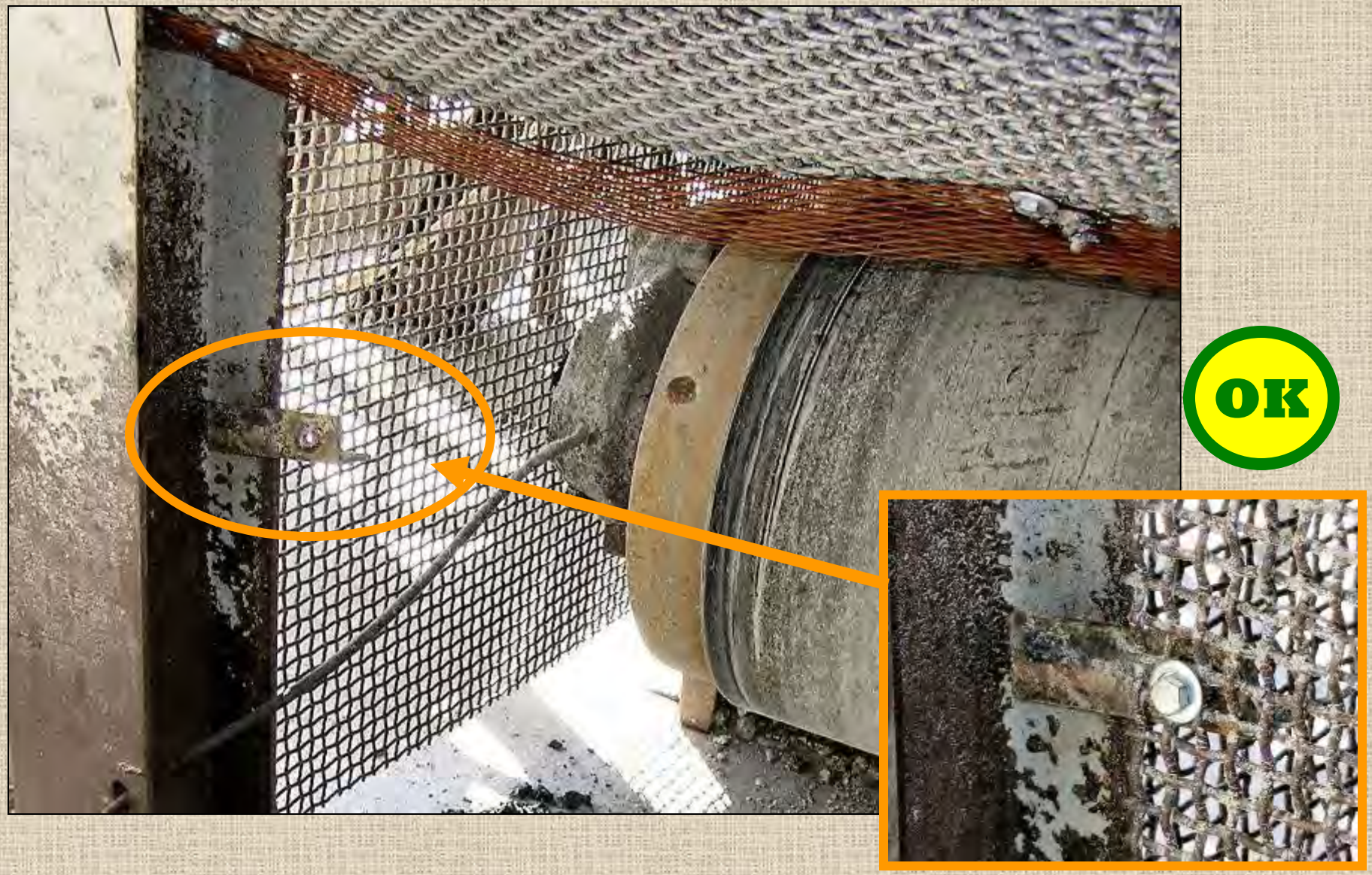
Clamps, Bars & Wedges

OK

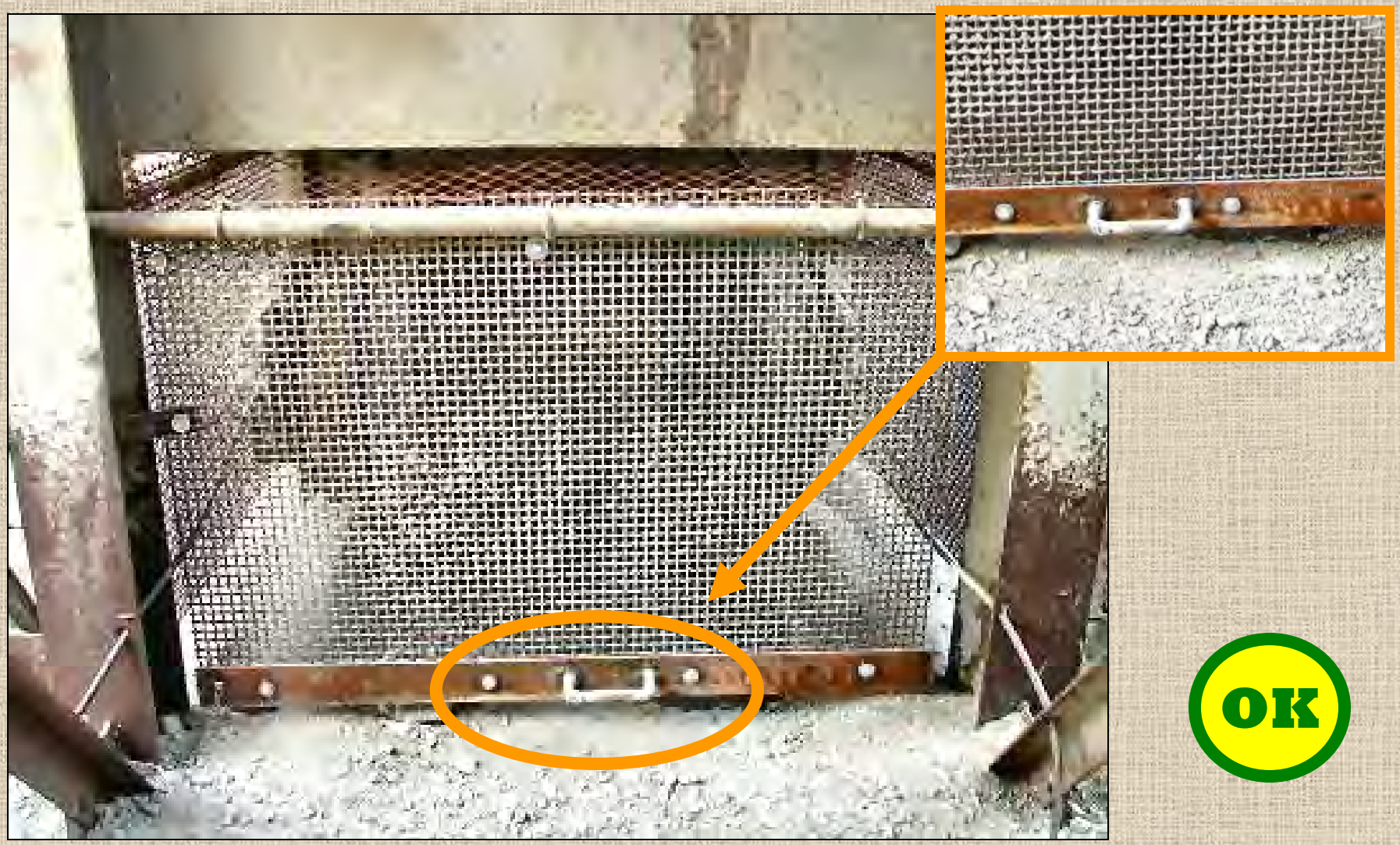
Plastic Wire Ties

Hinging

Hinging - Improvement 1

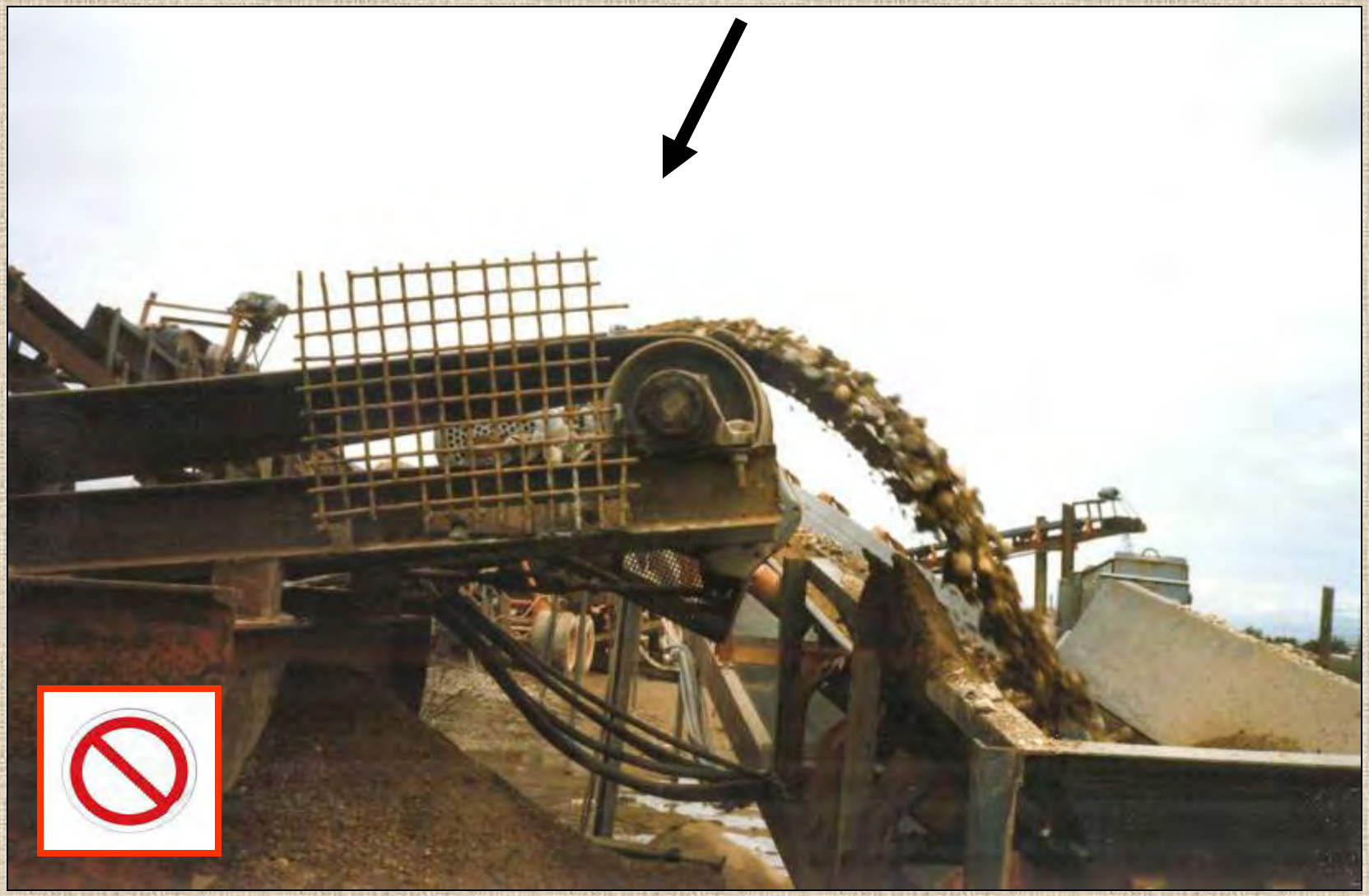


Hinging - Improvement 2



OK

Guard a Hazard in Itself



Tripping Hazard

We Can Build Better Guards

Aim High !!

Go *Beyond* Compliance