

OSC 12
Ohio Safety Congress & Expo

**WELL AT HOME.
SAFE AT WORK.**

481 A Proactive Approach To Machine Safety

Paul Prince, CSP

Thursday, March 29, 8 to 9 a.m.

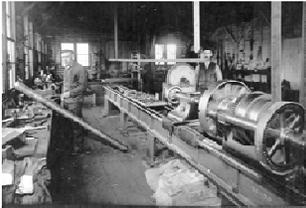
Ohio Bureau of Workers' Compensation

OMEGA
Occupational Machine and Equipment Guarding Assessment



*Paul J. Prince, CSP
Senior Loss Control Consultant
Bureau Veritas North America*

- A management systems approach to machine hazard identification and risk reduction.
 - Proactive in lieu of reactive.



- Reactive vs. Proactive



Case Study

- Reactive vs. Proactive



Case Study

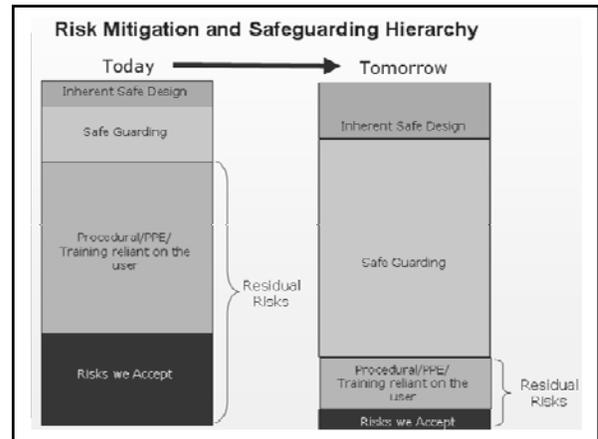
- Behavioral control around machinery can not be relied upon.
- Machine hazards can be pro-actively identified and higher levels of controls, i.e. machine guarding implemented.



Lessons Learned

Overview - Philosophy

- To Prevent Injury By Preventing Contact With Machine Hazard Sources
 - Mechanical motion
 - Electricity
 - Heat
 - Chemical
 - Radiation
 - Pressure systems (hydraulic/pneumatic)



- Three parts to the process.
 - Develop written standards.
 - Conduct a gap analysis.
 - Identification and application of risk reduction options.

OMEGA – Management System Approach

- Remove all the “grey” as to what constitutes proper guarding.
- Mandate an approach that incorporates risk assessment and gap analysis.
- Mandate a process of continuous improvement.
- Standards are developed for existing equipment and new equipment/process specifications.



Written Standards.

- Uses a risk assessment approach where machine hazards are identified and numerically quantified.
- Conducted on all equipment (works from machine inventory list)
- Used to help decide where limited resources can be allocated to reduce risk in the shortest amount of time.



Gap Analysis

Gap Analysis -Risk Assessment

- Not all machines have the same potential for injury.
- We want to establish a methodology to consistently assess “risk” associated with machine hazards.



Gap Analysis -Risk Assessment
 Even when all precautions have been taken, some risk remains. i.e. People are still injured/die crossing our roads

Crossing the Road?

		
Hazard	Traffic – Collision with vehicle	Traffic – Collision with vehicle
Risk	Low	High
Mitigation	Low speed limit	Barriers to prevent pedestrians entering road and alternative means to cross (Bridge/underpass)

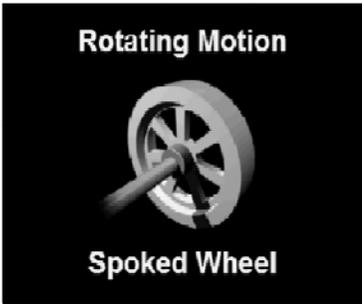
Gap Analysis – Risk Assessment

- What is the hazard?
 - Struck-By (SB)
 - Strike against (SA)
 - Contact with (CW)
 - Caught on (CO)
 - Caught between (CBT)



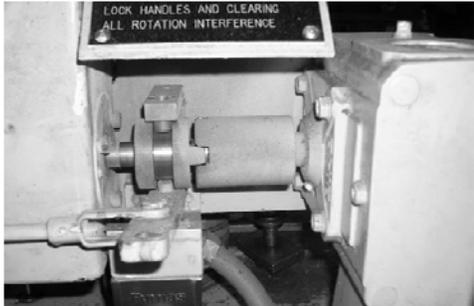
What is the hazard?

Rotating Motion



Spoked Wheel

Hazardous Mechanical Motions



Rotating shaft and coupling

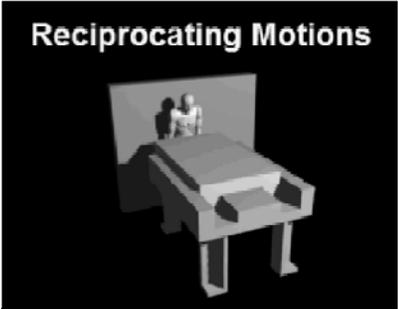
What is the hazard?

In-running Nip Point



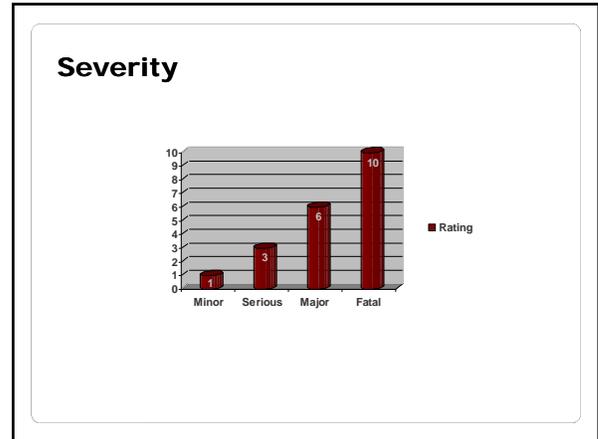
What is the hazard?

Reciprocating Motions



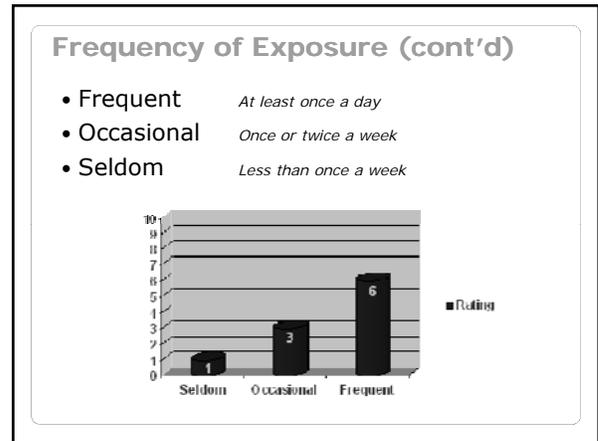
Risk Assessment (cont'd)

- Rate the severity
 - Fatal
 - Major *Normally irreversible, permanent disability, i.e. loss of sight, amputation.*
 - Serious *Normally reversible, cuts, broken bones, burns.*
 - Minor *Bruising, cuts, first aid care.*

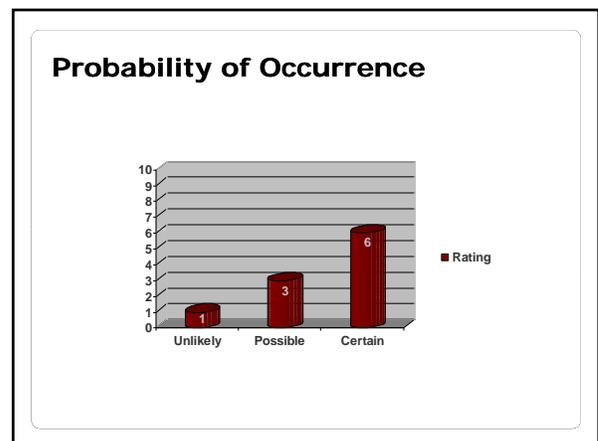
Frequency of Exposure

- How often does the worker get exposed to the hazard?
- How many workers are exposed?
- Obviously the longer the exposure to the hazard, the greater the possibility of an incident.

Probability of Occurrence

- When we consider the employee's involvement with the machine, what is the probability of injury?
 - Certain *Procedural Controls and PPE are the only protection.*
 - Possible *Guarding and PPE only partially protects the operator.*
 - Unlikely *Safeguarding effectively protects the operator.*



Gap Analysis - Could vs. Would

- When assessing hazards it is critical to focus on the hazard.
- The issue is not whether anyone would access the hazard but **could** they access the hazard.

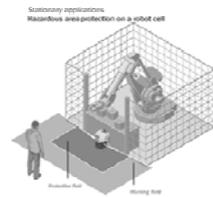


Hazard Assessment Tool

Machine Safety Prioritization Assessment					
General Description	Injection Mold Machine				
Department	Mold				
Location (Bldg / Flr)	Bldg # 2	Date of review			
Names of Reviewers	P. Prince				
Remaining equipment life in years	5				
Number of hours per week of operation	36			Individual hazard risk level requires immediate action	
Number of operators on line during turns	1				
Risk Ratings of Current Hazards in Normal Operation					
Describe hazard point and type of injury	Risk Rating for Specific Hazard			Total	Yes
	Severity	Frequency	Probability		
1 P.O.O. open access from below to platens	10	6	3	19	Yes
2 Power transmission, aux equip, pinch point convey	6	3	3	12	Yes
3 Material transfer arm, pick & place robot	6	6	6	18	Yes
4				0	-
5				0	-

Risk Reduction

- Process is applied to high score hazards first.
 - This can be the most difficult aspect to the process, which takes time and resources.



Risk Reduction

- Most often achieved through application of guards and devices.
 - Guards: physical barriers that prevent access.
 - Device: Electro/mechanical devices that prevent access during danger portion of the machine cycle.

Fundamental Requirements of Guards

- For guards to be effective we must consider the following factors:
 - Accessibility
 - Fasteners
 - Opening size
 - Visibility
 - Strength/Durability
 - Hazards from the guards



What qualifies as proper guarding?

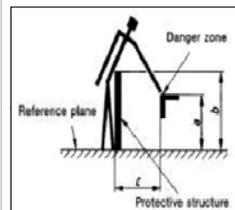
Risk Reduction - Fundamental Requirements of Safeguards

- Prevent access to the machine hazard(s).
 - Should not be able to get in, under, around or through the guarding.
 - Guard, or Devices, or "Guards and Devices" should not permit access.
 - Would vs. Could

Low Enough?

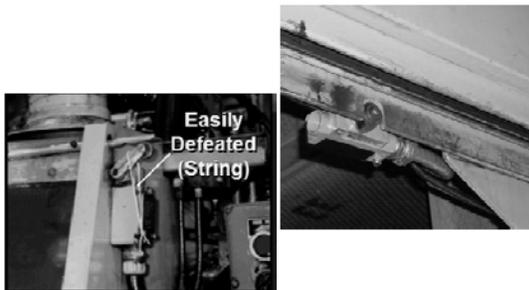


Perimeter Guarding



- The height of the perimeter guard "b" is based upon the vertical height of the hazard "a" and the horizontal distance "c" from the perimeter guard position. The table presented in table E-1 of ANSI B15.1 can be used to determine a proper perimeter guard height.
- Ideally, no gap at the bottom. If a gap is needed for hoses, cables or cleaning, then it should not exceed 6 inches from the floor to the guard.
- For international companies a similar and more conservative standard exists in EN 294.

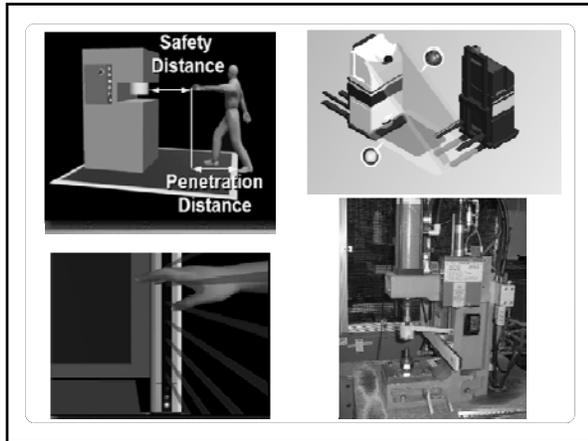
Unacceptable Interlocks



Devices

- Light curtains
- Pressure sensitive mats
- Two hand controls
- Radio frequency
- Gates
- Drop probe devices
- Laser sensors





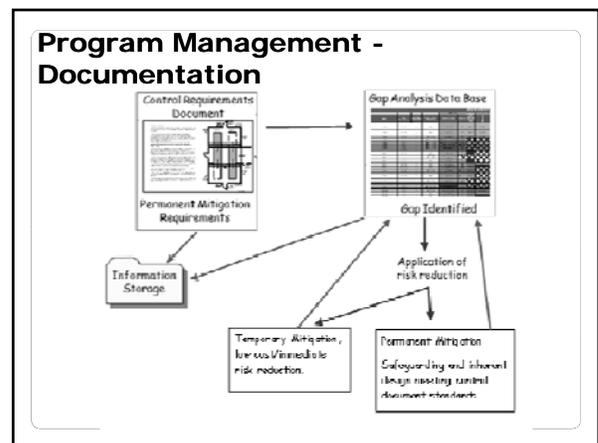
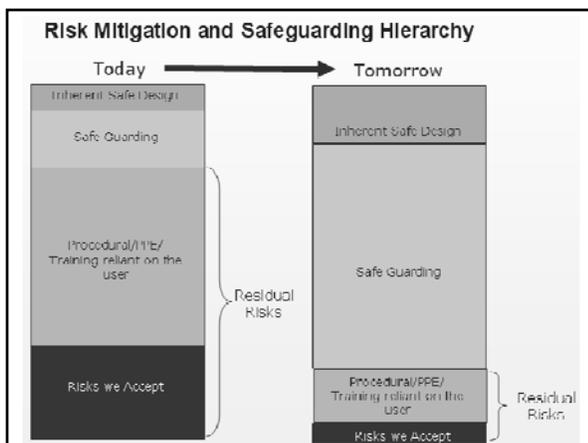
Basic Guarding Checklist Review

MACHINE GUARDING CHECKLIST		YES	NO
I. SPECIFIC GUARDING REQUIREMENTS			
A. Points of Operations:			
1. Is there a guard or safety device provided for each point-of-operation of the machine?			
Notes:			
<ul style="list-style-type: none"> • A machine may have more than one point of operation. • Where are the operator(s) located? • How are parts, materials fed into the machine and removed. 			
2. Do these guards allow the operator's hands, arms or other body parts to make contact with dangerous moving parts by reaching over, under, around or through the guard?			
Notes:			
<ul style="list-style-type: none"> • Guards and/or devices must completely block off access to the hazards presented at the point of operation. • For guards remember the opening scale. • Look at guard materials, are they substantial enough? 			

The Need to Train

Operators, Maintenance and Set-up Personnel should be trained on:

- Machine hazards
- Machine safeguards and how they provide protection
- How to use safeguards
- When safeguards can be removed and by whom



Questions?



Paul J. Prince, CSP
paul.prince@us.bureauveritas.com
(615) 423.0337

If you would like more
information, or have Machine
Guarding questions, contact me.

THANK YOU!

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