OSHA adds value to business, work and life.
An OSHA View on Robot Safety

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Outline

• OSHA’s Role and Mission
• OSHA Inspection Process
• Machine Guarding
• Control of Hazardous Energy
• OSHA Findings and Inspections
• Resources
OSHA’s Role and Mission

- The Occupational Safety and Health Administration was created in 1970
- Intended to help employer and employees reduce job-related injuries, illnesses and deaths
- To promote a safe and healthful working environment for the nation’s workforce
Employer Responsibility

It is every employer’s *legal responsibility* to recognize workplace hazards and to provide safe and healthful working conditions for their employees.
How We Operate

Inspections:

• Every establishment covered by the OSH Act is subject to inspection by OSHA compliance safety and health officers (CSHO's).

• Inspections are conducted without advance notice.

• If we identify a violation citations are issued and penalties assessed where appropriate.
Inspection Priorities

• Imminent Danger
• Fatalities and Catastrophes
• Complaints and Referrals
• Programmed Inspections
• Follow-up Inspections
Inspection Process

• Presentation of credentials
• Opening conference
• Walk-through inspection
  – Measurements
  – Sampling
  – Employee/Employer interviews
  – Photos/Videos
• Closing conference
U.S. Safety Standards

OSHA CFR Title 29 Part 1910 General Industry

- Subpart O – Machinery and Machine Guarding
- Subpart P – Hand and Portable Powered Tools and Other Hand-Held Equipment
- Subpart Q – Welding, Cutting and Brazing
- Subpart R – Special Industries

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Part 1910 Subpart O – Machinery and Machine Guarding

1910.211 - Definitions

1910.212 - General requirements for all machines

1910.213 - Woodworking machinery requirements

1910.214 - Cooperage machinery [Reserved]

1910.215 - Abrasive wheel machinery

1910.216 - Mills and calenders in the rubber and plastics industries

1910.217 - Mechanical power presses

1910.218 - Forging machines

1910.219 - Mechanical power-transmission apparatus
29 CFR 1910.212(a)(1)
General Machine Guarding

“One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are-barrier guards, two-hand tripping devices, electronic safety devices, etc.”
Review Commission

The guarding required must be provided by a “device” that does not allow reliance upon the skill or attentiveness of employees. It is “intended to eliminate danger from unsafe operating procedures, poor training or employee inadverence.”

Cincinnati Incorporated, OSHRC Docket No. 00-0955, Final Order Date 10/02/00
OSHA’s Citations

• 90% of Machine Guarding is addressed under 29 CFR 1910.212 General Machine Guarding.

• OSHA states “Robots are machines, and as such must be safeguarded in ways similar to those presented for any hazardous remotely controlled machine.”

• May also address through 5(a)(1) of the Act. “General Duty Clause”

- Reference Industry Standards for guidance.
U.S. Safety Standards

American National Standards Institute (ANSI)

- ANSI B11.1 2009 Mechanical Power Presses
- ANSI B11.3 2002/R2007 Power Press Brakes
- ANSI B11.4 2003/R2008 Shears
- ANSI B11.18 2006 Machines for Processing Strip, Sheet, or Plate from Coiled Configuration
- ANSI B11.19 2010 Performance Criteria for Safeguarding
- ANSI/ASME B20.1 2012 Conveyors and Related Equipment
U.S. Safety Standards

ANSI/RIA R15.06 - Industrial Robots and Robot Systems - Safety Requirements

- Requirements for industrial robot manufacture, remanufacture and rebuild; robot system integration/installation; and methods of safeguarding to enhance the safety of personnel associated with the use of robots and robot systems.
The Control of Hazardous Energy

29 CFR 1910.147
The Purpose of LOTO

• Prevent the unexpected start-up or release of stored energy
• Reduce the number of fatalities and injuries
• Establish a program and procedures controlling hazardous energy
Definitions

• **Set-up** - Work to prepare a machine to perform its normal production operation

• **Lockout** – Placement of lockout device on an energy isolating device

• **Lockout device** – Device that uses a physical means to prevent energizing of a machine or equipment

1910.147(b)
Definitions (continued)

Energy Isolation Devices:

A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following:

– A manually operated electrical circuit breaker;
– A disconnect switch;
– A manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors.
Energy Isolation Devices:

Push buttons, selector switches and other control circuit type devices are not energy isolating devices

1910.147(b)
Definitions (continued)

**Energized** - Connected to an energy source, or containing *residual or stored energy*
Power Circuits and Control Circuits

• The **power circuit** is what actually distributes power from the source to the connected load (motor).

• The **control circuit** is used to “control” the distribution of power.
  – Push buttons, selector switches, etc. are part of the control circuit, and they only interrupt the circuit. The power circuit is not isolated.
Energy Isolating Device

Is this an acceptable point to Lockout?
Core Components of an Energy Control Program

- Energy control procedures for each type of machine
- Training and retraining to ensure employees understand the program
- Periodic inspection to ensure procedures are being followed

ABC Co. Energy Control Program

Purpose.____________________
____________________
____________________

Compliance with this program
____________________
____________________
____________________

Sequence of Lockout
(1)____________________
____________________

OSHA® Occupational Safety and Health Administration
Energy Control Procedures 1910.147 (c)(4)

- Must be specific to each type of machine and equipment you are working on
- Must include
  - Statement of intended use of the procedure
  - Steps for shutting down and securing machines and equipment
  - Steps for placing, removing, and transferring of lockout devices
  - Requirements for testing and verifying effectiveness of lockout devices
LOTO Applies When:

Service and maintenance that takes place during normal production, if employee:

- Must remove or bypass a guard or safety device; or
- Must place any part of their body into the danger zone.
Minor Servicing Exemption
During Normal Production Operations

The activity must be:

– **Routine**: The activity must be a regular course of procedure and be in accordance with established practices.

– **Repetitive**: The activity must be repeated as part of the production process or cycle.

– **Integral**: The activity must be inherent to the production process.

– Must use alternative measures which provide effective protection.
OSHA’s Citations

• Servicing and/or maintenance where employees may be exposed to unexpected start-up or release of hazardous energy:
  • Constructing
  • Installing and setting up
  • Adjusting, inspecting, modifying
  • Lubricating, cleaning or un-jamming
  • Tool changes

Note: LOTO applies to all workers performing these tasks, regardless of their job titles.
Robotic Systems and LOTO

• Reasons heard for not locking out robotic cells
  – Long start-up
  – Loss of programming

• Possible Solutions
  – A well designed system should be capable of being restarted from a power down situation in a relatively short time
  – Obtain engineering and technical expertise
  – Maintain the memory back up batteries.
  – PLC could be put on a separate circuit
OSHA Findings:

- OSHA investigations find that many robot accidents do not occur under normal operating conditions.
- Accidents occur during non-routine operating conditions, such as programming, maintenance, testing, setup, or adjustment.
- The proper selection of an effective robotics safety system must be based on hazard analysis of the operation involving a particular robot.
What to Provide to OSHA if Inspected

- Risk Assessments
- Job Hazard Analysis/Job Safety Analysis
- Drawings & Schematics
- Safety device specifics
- Minor servicing task list and justification
- Lock out tag out program and procedures
- The employer needs to know their system and know how to explain to OSHA and the compliance officers.
- The employer needs to know with confidence how their system functions and why it is safe.
Compliance Safety and Health Officers

- Trained to identify hazards in the workplace.
- Area offices and CSHO’s have varying knowledge of Robotics.
- Will concentrate on machine guarding (1910.212) and lock out tag out (1910.147)
- Have access to all industry standards
- Have access to industry experts and industry and trade partnerships if needed.
- Do contact machine manufacturers for assistance.
RESOURCES

• Your local area OSHA office

• OSHA Onsite Consultation
  – Available in each state
  – Primarily targeted for smaller, high-hazard businesses
  – No enforcement & No penalties
  – Invite them in and use as a tool to be in compliance.
  – Cannot take place during an enforcement inspection, and may not take place until citations, if any, have been issued and become final order
  – The consultant will only report hazard information to OSHA if the employer fails to correct an imminent danger or serious hazards
State Plans

- 26 States operate OSHA-approved State Plans
- Consultation Services are available in all States including State Plan States
- State Plans have extensive compliance assistance resources, which provide services tailored to state standards and industries
- State Plans have a variety of cooperative programs similar to those of Federal OSHA
  - Voluntary Protection Programs (VPP), Partnerships, Alliances, Other Training and Outreach Services
OSHA Website

Free fact sheets, guidance documents, pocket guides and hundreds of other publications.

Industry and hazard specific information.

www.osha.gov
QuickTakes

Twice monthly newsletter helps you track the latest trends and learn about new safety and health tools and services.
OSHA QuickStart

Step-by-step guide to help identify major OSHA requirements for your business
Cooperative Programs
Questions?