Definition of Safety

**Safety**
Freedom from unacceptable risk

**Functional Safety**
Part of the safety of the machine and the machine control system which depends on the correct functioning of ---

- the safety related electrical control system
- other technology safety-related systems
- external risk reduction facilities
Top 10 OSHA Violations for 2017

1. Fall Protection - 6,072
2. Hazard Communication - 4,176
3. Scaffolding - 3,288
4. Respiratory Protection - 3,097
5. Lockout/Tagout - 2,877
6. Ladders - 2,241
7. Powered Industrial Trucks - 2,162
8. Machine Guarding - 1,933
9. Fall Protection Training Requirements - 1,523
10. Electrical Wiring Methods - 1,405

Evolution of Safety

As our relationship to machines has changed, so has society’s emphasis for machine safety

Properly designed safety never needs to be bypassed

Lock-Out Tag-Out is still relevant, but alternative methods can boost production without compromising safety
Machinery Safety Legislation and Standards

- There are a variety of standards you can use when designing a safety system
- Legislation is specific to countries and regions
- The common themes of all new international machinery safety standards are...
  - risk assessments, risk quantification, life cycle design considerations and usage of electronic Safeguarding products

Safety Organizations
Why is So Many Standards?

Safety Standards Overview

ISO (TYPICAL STANDARDS)
GENERAL PRINCIPLES FOR DESIGN - RISK ASSESSMENT AND RISK REDUCTION

- Risk
  - Determination of minimum work area
  - Determination of minimum working area
  - Determination of minimum workplace
  - Determination of minimum working height

- Vibration & Noise
  - Evaluation of vibration of machinery and equipment
  - Determination of vibration of machinery and equipment
  - Determination of sound power level
  - Determination of sound power level

- Thermal Hazards
  - Identification of hazardous temperature
  - Determination of hazardous temperature
  - Determination of hazardous temperature

- PPE
  - Personal protective equipment
  - Personal protective equipment
  - Personal protective equipment

- Electrical Hazards
  - Determination of electrical hazards
  - Determination of electrical hazards
  - Determination of electrical hazards

- Radiation Hazards
  - Determination of radiation hazards
  - Determination of radiation hazards
  - Determination of radiation hazards

- Type B Standards
  - Type B Standards
  - Type B Standards
  - Type B Standards

- Type C Standards
  - Type C Standards
  - Type C Standards
  - Type C Standards

- Type D Standards
  - Type D Standards
  - Type D Standards
  - Type D Standards

- Type E Standards
  - Type E Standards
  - Type E Standards
  - Type E Standards

There are many standards that are created for specific machinery or equipment types. These are typically associated with the use of these specific machines. For more information, see: http://example.com/standards
Machine Safety Lifecycle

**STEP 1**
Risk or Hazard Assessment
- Provides Safety Performance Level – Design Target
- Creates the Foundation of the Safety System Functional Requirements, System Design & Validation Protocol
- Shows “Due Diligence” & Compliance to Industry Standards
- Incorporates input from the people that actually use the machine and considers how they use it
- Output - safeguarding concept that answers several questions

**STEP 2**
Safety System Functional Requirements

**STEP 3**
Safety System Design & Verification

**STEP 4**
Safety System Installation & Validation

**STEP 5**
Maintain & Improve Safety System

Risk Assessment

- Provides Safety Performance Level – Design Target
- Creates the Foundation of the Safety System Functional Requirements, System Design & Validation Protocol
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Principles of Risk Assessments
Risk Reduction

Performing Risk Assessments

Risk
- How Bad?
  - Consequences
- How Often?
  - Frequency
- How Likely?
  - Chances
Hierarchy of Protective Measures

- Design it out
- Fixed enclosing guard
- Monitoring Access / Interlocked Gates
- Awareness Means, Training and Procedures (Administrative)
- Personal protective equipment

Keeping People Safe Around Machinery

- LOTO / Isolate Hazardous Energy
- Machine Guarding
Energy Isolation vs Machine Guarding

Minor servicing must be routine, repetitive and integral to the operation of the system.

How do I Know a Product is Safe?

All safety rated products are developed to meet specific standards for safety.

Most safety rated products are certified by professional 3rd party organizations to demonstrate compliance to specific safety standards.

- Examples of third party certification organizations include TUV Rheinland, TUV Nord and BG.
Questions?