



VAN METER



smart

SOLUTIONS SUMMIT

**SETTING THE STANDARD
FOR SAFETY**

WELCOME



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WHY ARE YOU HERE?

Industry Safety Related Issues

	Customer Issue	Safety Issue	Financial Issue	Solution
Aware and care	Company reputation Social media multiplier		X	Culture / Digital Processes
	OSHA Fines / Personal Liability / Other cost Bumble Bee Tuna - \$6M fine and prosecution of plant manager and EHS manager OSHA Maximum penalty for willful / repeated violation is \$161,323 Cost to company per death in 2020 was \$1,310,000		X	Culture / Digital Processes
	Team members - Workforce Issue / Turnover issue Not interested in working in an unsafe environment Lack of involvement in a process for safety Bypassing safety devices	X	X	Culture / Digital Processes
Unaware	Unnecessary LOTO vs Alternate Means – Compliance Financial - Lost production due to time consuming LOTO procedures Safety - Incorrect procedures or lack of following procedures	X	X	Culture / Digital Processes
	No Safety data Troubleshooting Complex Hard Wiring (Production Loss / Downtime)		X	Technology / Data
	No Safety data Excessive or Infrequent use of devices (Production Loss / Quality)		X	Technology / Data
	No safety data Mission time of safety devices (useful life)	X		Technology / Data



WHY VAN METER AND ROCKWELL AUTOMATION FOR SAFETY?

WHY ROCKWELL FOR SAFETY?



#1

MACHINE SAFETY PROVIDER GLOBALLY



600+

**TUV CERTIFIED PROFESSIONALS
WORLDWIDE**



1,000+

**CUSTOMER SAFETY PROJECTS
EVERY YEAR**

WHY VAN METER?



#1

**PROVIDE A HOLISTIC
APPROACH TO SAFETY**



45+

**INDUSTRIAL SPECIALISTS AND
SERVICES RESOURCES**



25

**LOCATIONS ACROSS THE
MIDWEST**



WHY SAFETY?

DIGITAL TRANSFORMATION

COMPANIES ARE INVESTING MILLIONS IN NEW TECHNOLOGY...

- Collaborative applications
- AMR's – Autonomous Mobile Robot
- AGV's – Automated Guided Vehicle
- IMR's – Industrial Mobile Robot
- ICT – Flexible Manufacturing

What happens when you implement these technologies incorrectly?



COLLABORATIVE WORKSPACE

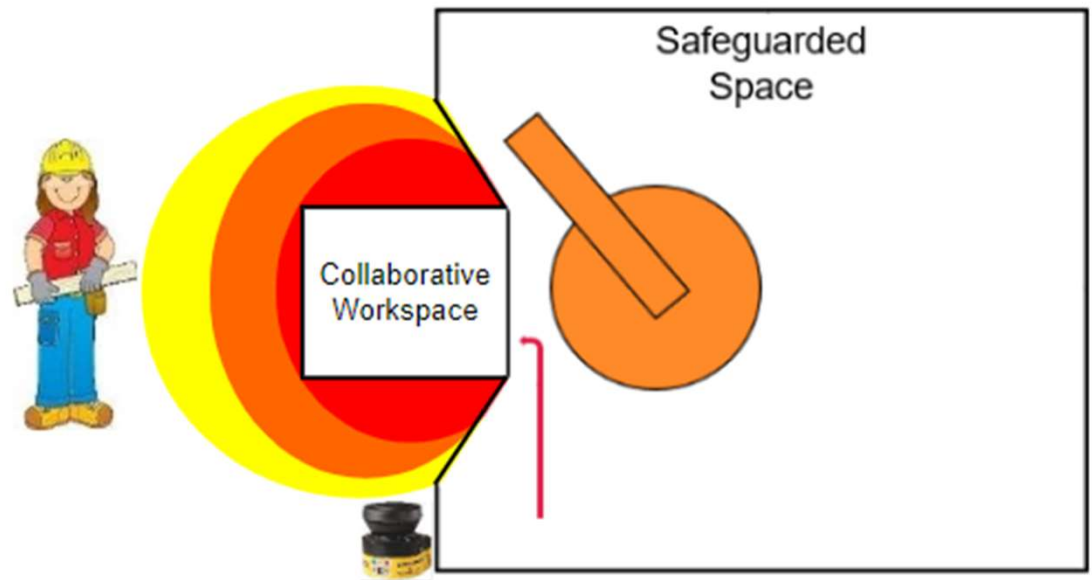
ANSI/RIA 15.06 – 2012 3.5

Workspace within the safeguarded space where the robot and a human can perform tasks simultaneously during production operation.

More than technology:

- People
- Task
- Location
- Ergonomics
- Mechanical Design

Not just maintenance and setup, but during
NORMAL PRODUCTION OPERATION!

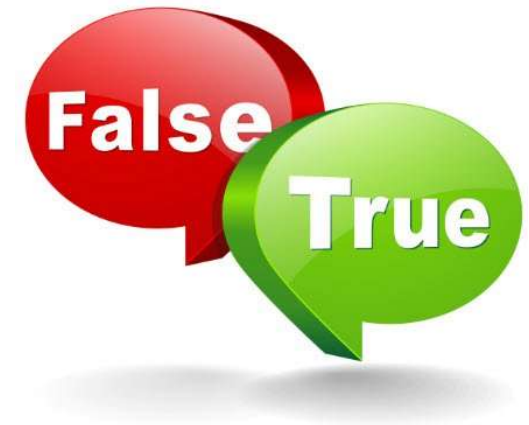


MISCONCEPTIONS OF COLLABORATIVE APPLICATIONS

- Technology is inherently safe - no safety controls needed
- No Risk Assessment required
- No guarding required
- Legacy equipment easily adapted
- No engineering necessary
- Direct replacement for an operator

The collaborative operation application shall be determined by the **risk assessment** performed during the application system design.

A robot with Power and Force Limiting (PFL) functionality is **not to be considered safe** “out of the box” as the PFL robot is a component within a collaborative application.

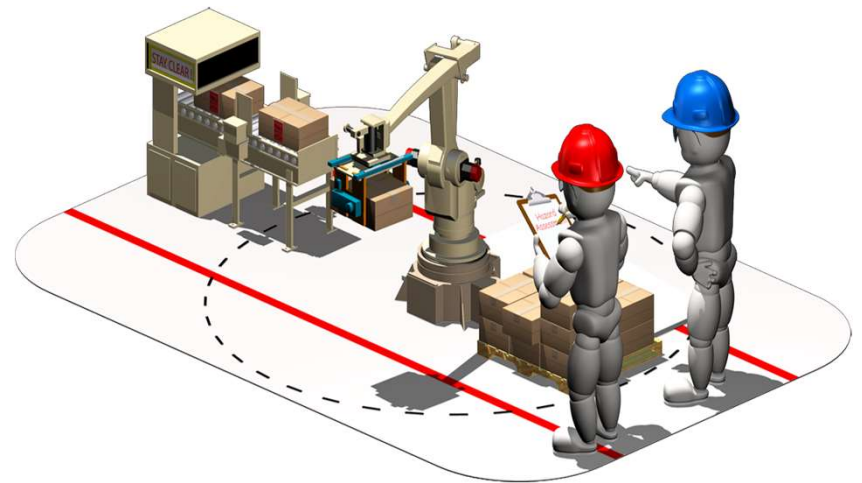


RIA R15.06-2012, 5.10

RIA TR R15.806-2018, 1

SAFETY AND PRODUCTIVITY

- Accommodate operator, maintenance, others
- The easy way is the safe way
- Remove the incentive to bypass
- People and machinery working together safely and efficiently!





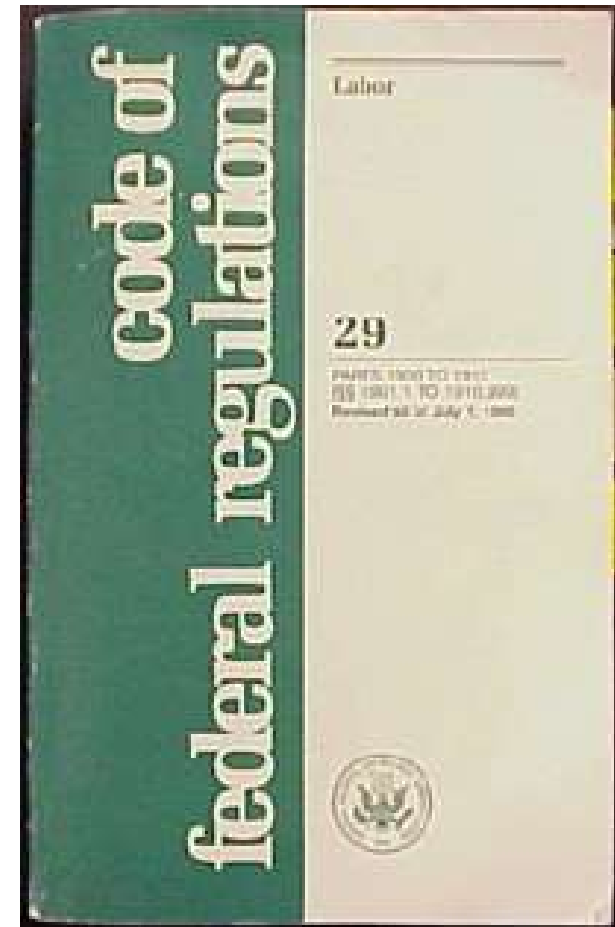
OSHA

OSHA

Code of Federal Regulations

View all OSHA standards in Title 29 of the CFR, the Department of Labor's section of the Code of Federal Regulations.

General Industry = Standard Number 1910



OSHA Act 1970

FUNCTIONAL SAFETY

LAW VS. STANDARD

Laws are:

- Legal Requirements
- Minimums for Health and Safety
- Changed by an “Act of Congress”

Standards are:

- Voluntary
- Industry Best Practice
- Changed / Updated Frequently

What must I do?

Follow the LAW

How should I do it?

Follow a STANDARD

UNITED STATES LEGISLATIVE STANDARD

Accountability for safety in the in USA

OSH Act of 1970 SEC.5. Duties:

(a) Each employer --

- (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
- (2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

“LEGAL RESPONSIBILITY IN THE USA”

Criminal Courts

User/buyer
Personnel/employees

Civil Courts

Supplier of Equipment/Machine
Integrator/Modifier/Rebuilder

The Obligation of Safety

WHO OWNS IT TODAY? - USA

- Recently, the standards offer the concept of joint responsibility
- Suggests that this is determined in contractual layout (Ts & Cs)
- ANSI B11.26-2018
 - Supplier of Equipment/Machine
 - Integrator/Modifier/Rebuilder
 - User/buyer
 - Personnel/employees

ANSI B11.26-2018



OSHA – FINANCIAL IMPACT OF INJURY

Abatement Cost (fix the problem)

- Failure to abate fine = **\$16,131 per day**
- Cost of implementing abatement = \$
- Production impacts due to abatement = \$

Repeat Violation

- Repeat violation fine = **\$161,323**
- Addressing abatement of issue across facility(s) = \$

Willful Effect – (Intentionally and knowingly disregarding issue)

- Willful violation fine = **\$161,323**
- Severe Violator Enforcement Program – Publicly identified – Brand Reputation

Collateral Litigation – Civil lawsuits

- e.g. - Bumble Bee Tuna – **\$6M fine** and prosecution of plant manager and EHS manager



STANDARDS

STANDARDS – WHY?

- We use standards to show compliance!



EXAMPLE OF MACHINERY STANDARDS

Type A standards – General principles for design - ISO 12100:2010 – Safety of machinery. Risk assessment and Risk Reduction; IEC 61508 – Functional Safety of Electrical/electronic/programmable electronic safety-related systems

Type B standards

B1 – General safety aspects

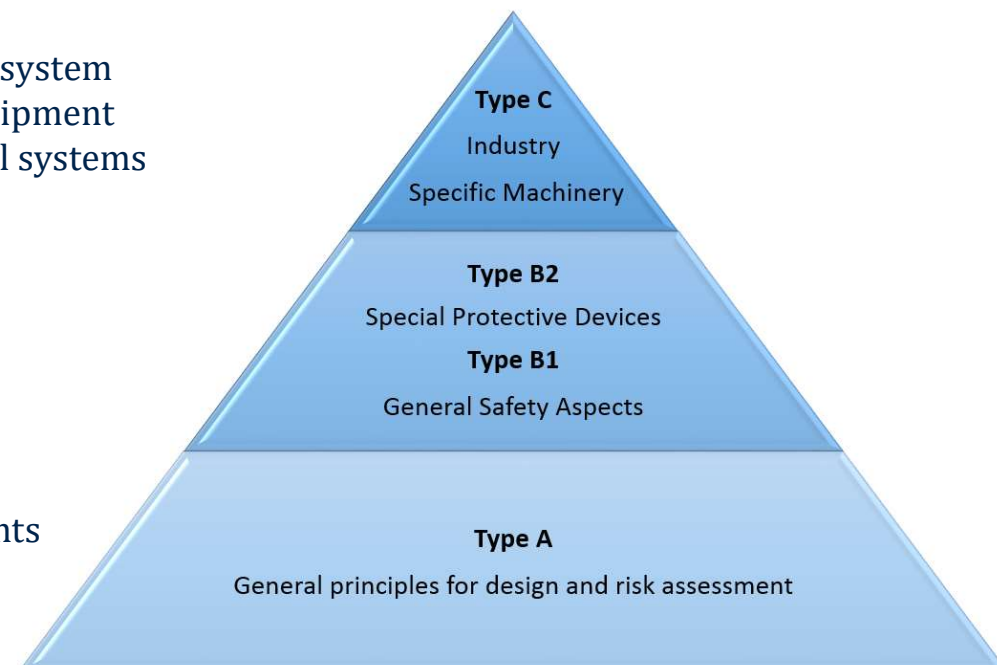
- ISO 13849-1/2 – Safety related parts of a control system
- IEC 60204-1 – Safety of machinery. Electrical equipment
- IEC 62061 – Functional safety of electrical control systems

B2 – Special protective devices

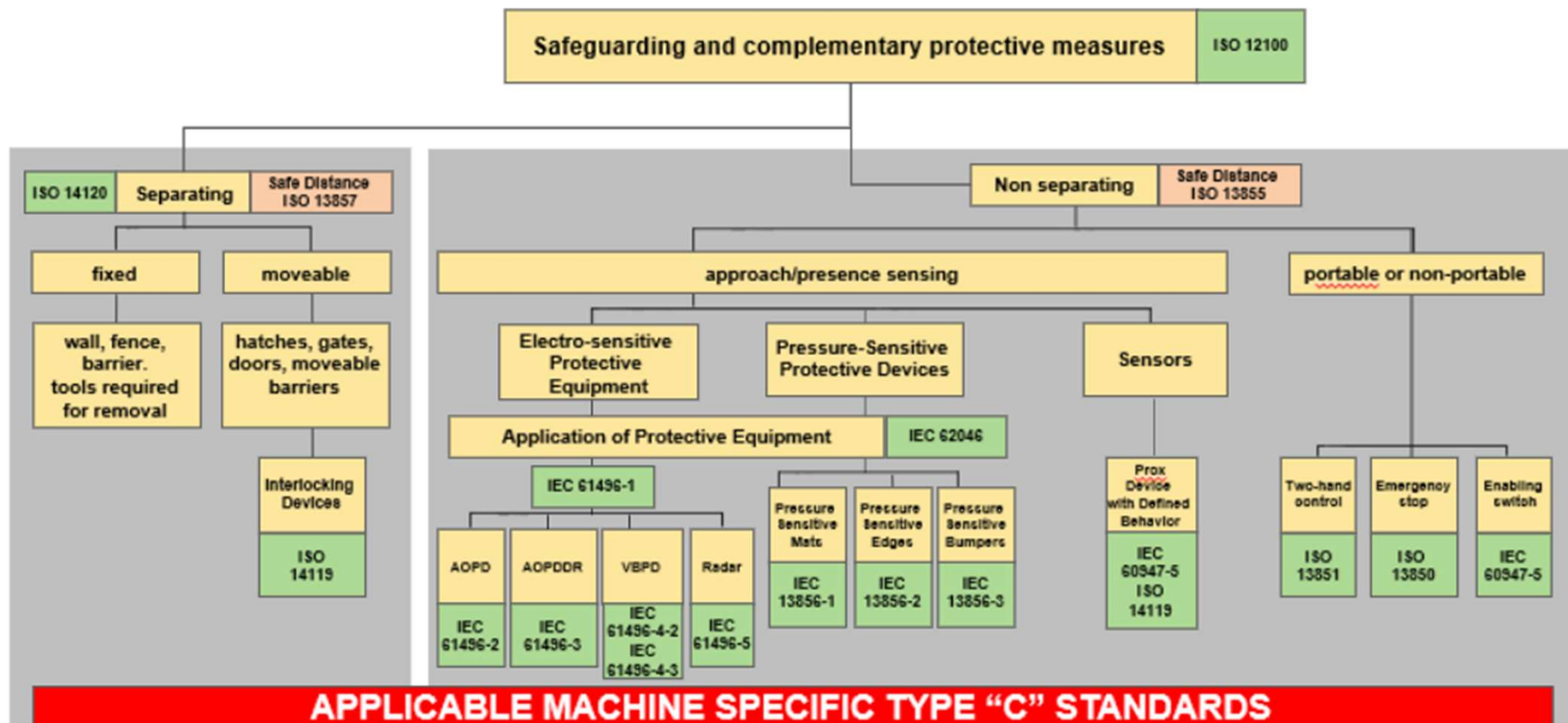
- ISO 13850 – Emergency stop function
- ISO 13851 – Two hand controls
- ISO 14119 – Interlocking devices

Type C standards – Industry specific

- ISO 10218-1/2 – Robots for industrial environments
- EN 415 (series) – Safety of packaging machines



A STANDARD FOR EVERYTHING



QUESTION...



WHAT STANDARDS SHOULD I USE?

- If you are working on a machine that has a Type C standard, then that standard takes precedence over all the rest.
- For example: B11.3 Power Press Brake standard.
- **NOTE: It references B11.0 (37) times and B11.19 (46) times.**
- You will typically use B11.0, B11.19, and ISO13849 on all machine types.
- If you prefer to use other Risk Scoring system other than the one in B11.0 then purchase that standard as well. For example: RIA TR 15.306

INFORMATION IN STANDARDS

NORMATIVE TEXT

Normative information is requirements.

This information is typically found in the numerical clauses of a standard and can also be found in annexes. Some standards use the terms “mandatory information”.

INFORMATIVE TEXT

Informative information is guidance.

This type of information is normally found in the annexes of a standard. Some standards use the terms “non-mandatory information” and place this information in an Appendix instead of an Annex.

SOME STANDARDS HAVE NORMATIVE INFORMATION IN THE ANNEXES. DO NOT DISCOUNT INFORMATION IN THE ANNEXES.

IEC 61496-2:2020
Annex A

Annex A
(normative)

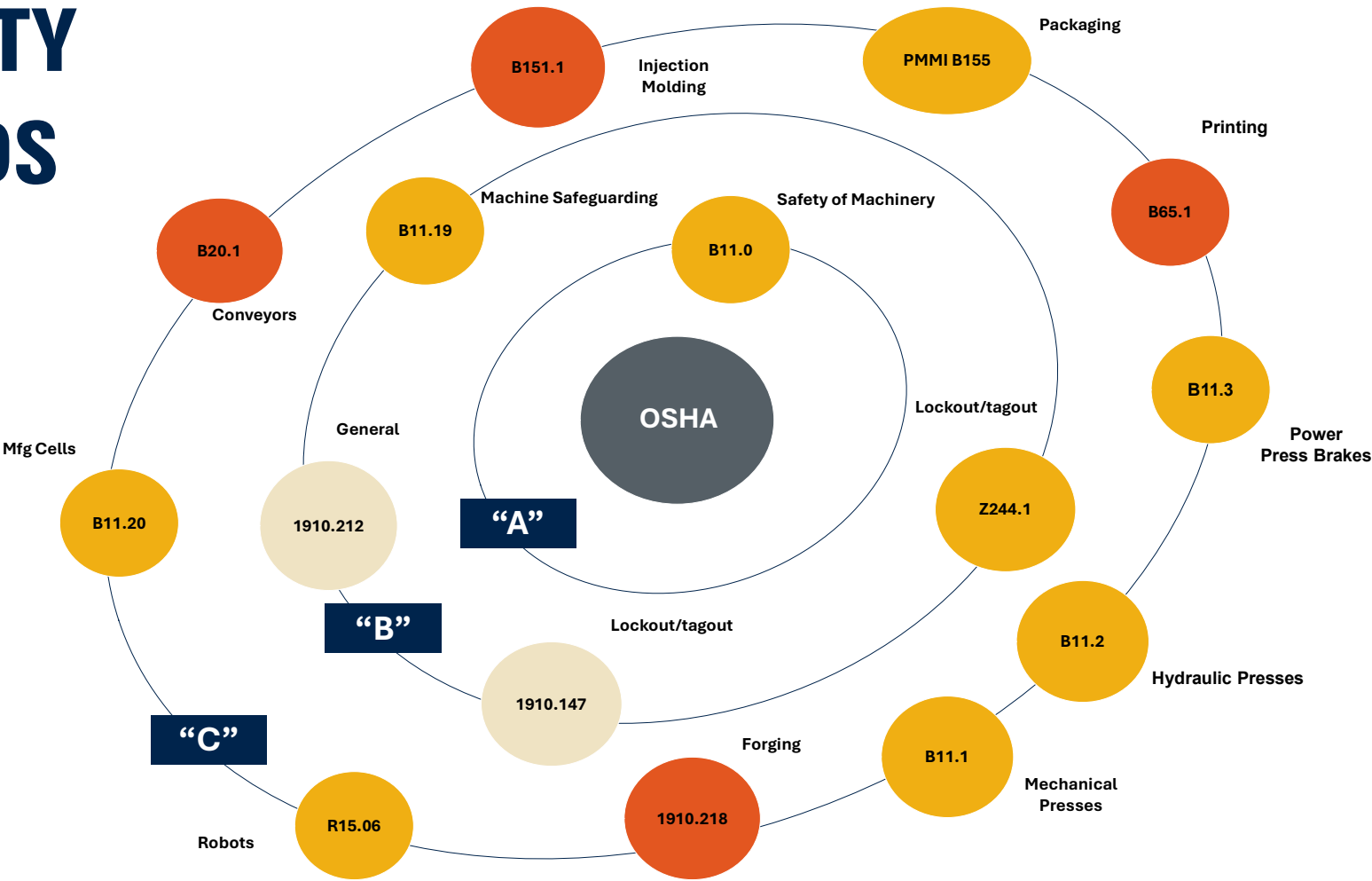
Optional functions of the ESPE

ISO 12100:2010
Annex B

Annex B
(informative)

Examples of hazards, hazardous situations and hazardous events

ANSI SAFETY STANDARDS



ANSI B11.0



SAFETY OF MACHINERY

- Details the Risk Assessment process.
- Details the Risk Reduction Hierarchy.
- Details Risk Reduction Requirements.
- Defines responsibilities for suppliers and users.
- Defines responsibilities when modifications are made to equipment.
- Informative information for using Alternate Methods to Lockout /Tagout

ANSI B11.0

DO YOU HAVE RESPONSIBILITIES?

- **Machinery suppliers and users** have responsibilities for defining and achieving acceptable risk.

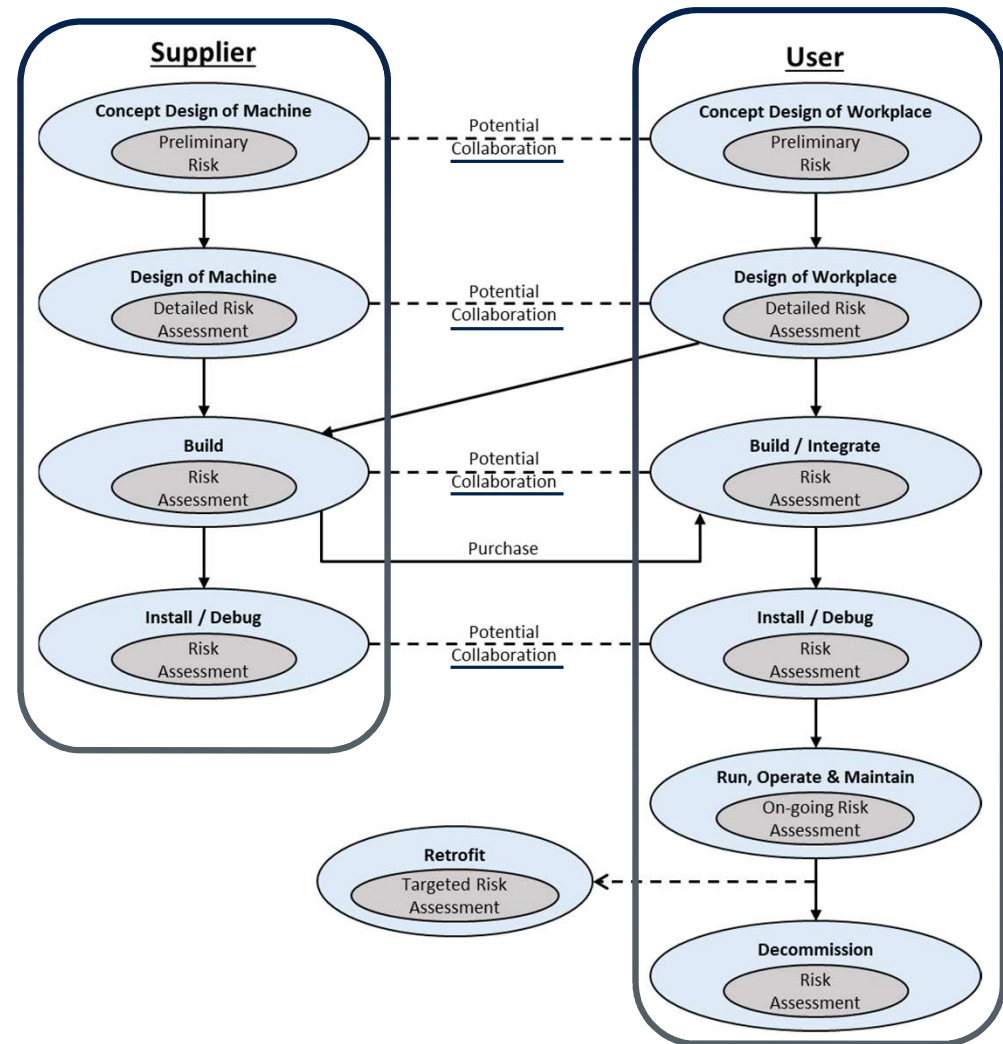


Figure 5 - Example of Machinery Lifecycle Responsibilities

ANSI B11.19

PERFORMANCE REQUIREMENTS FOR RISK REDUCTION MEASURES

- Combines information previously found in many different standards into one location.
- Safe Distance Calculation (ISO13855)
- Reaching distances (ISO13857)
- Fencing heights
- Guard design & construction
- Gaps & Guard opening sizes (ISO13854)
- Whole body access
- Muting
- Bypassing
- Safety devices



ISO 13849 - 1,2 (PL)

SAFETY-RELATED PARTS OF CONTROL SYSTEMS

- Details requirements for Performance Levels (PLa to Ple)
- Specification of Safety Functions
- Design Considerations for SRP/CS – (Safety-Related Parts of Control System)
- Safety Software Requirements
- Verification and Validation of Safety Functions

IEC 62061 (SIL)

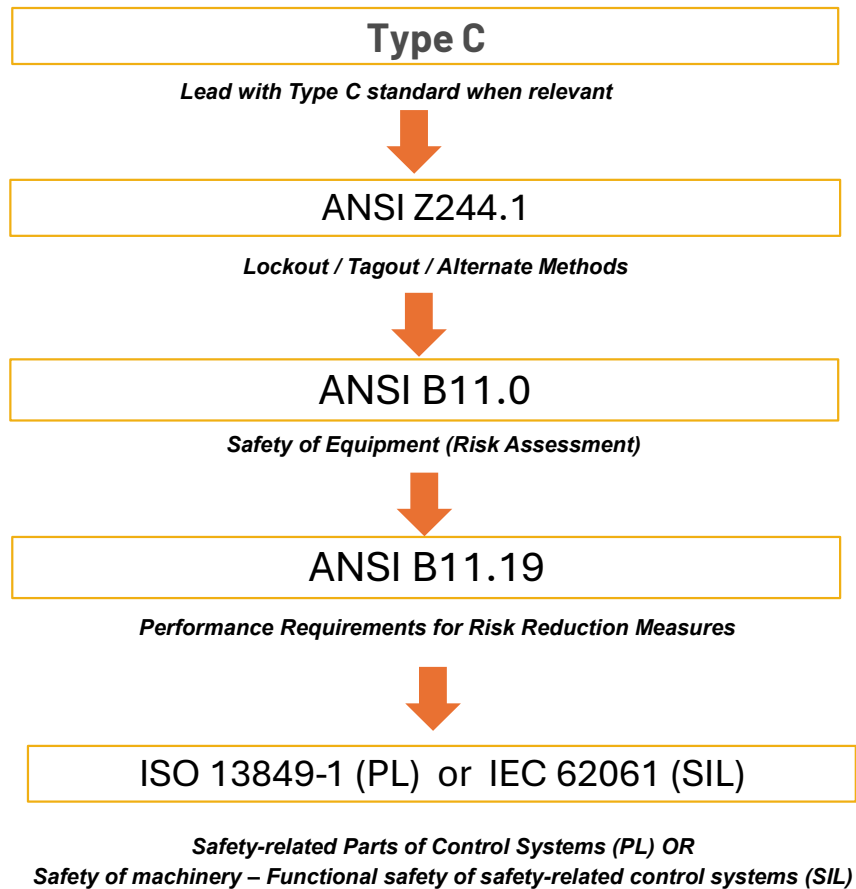
SAFETY OF MACHINERY – FUNCTIONAL SAFETY OF SAFETY-RELATED CONTROL SYSTEM

- Details requirements for Safety Integrity Levels (SIL 1-3)
- Specification of Safety Functions
- Design Considerations for SCS (Safety Related Control System)
- Safety Software Requirements
- Verification and Validation of Safety Functions

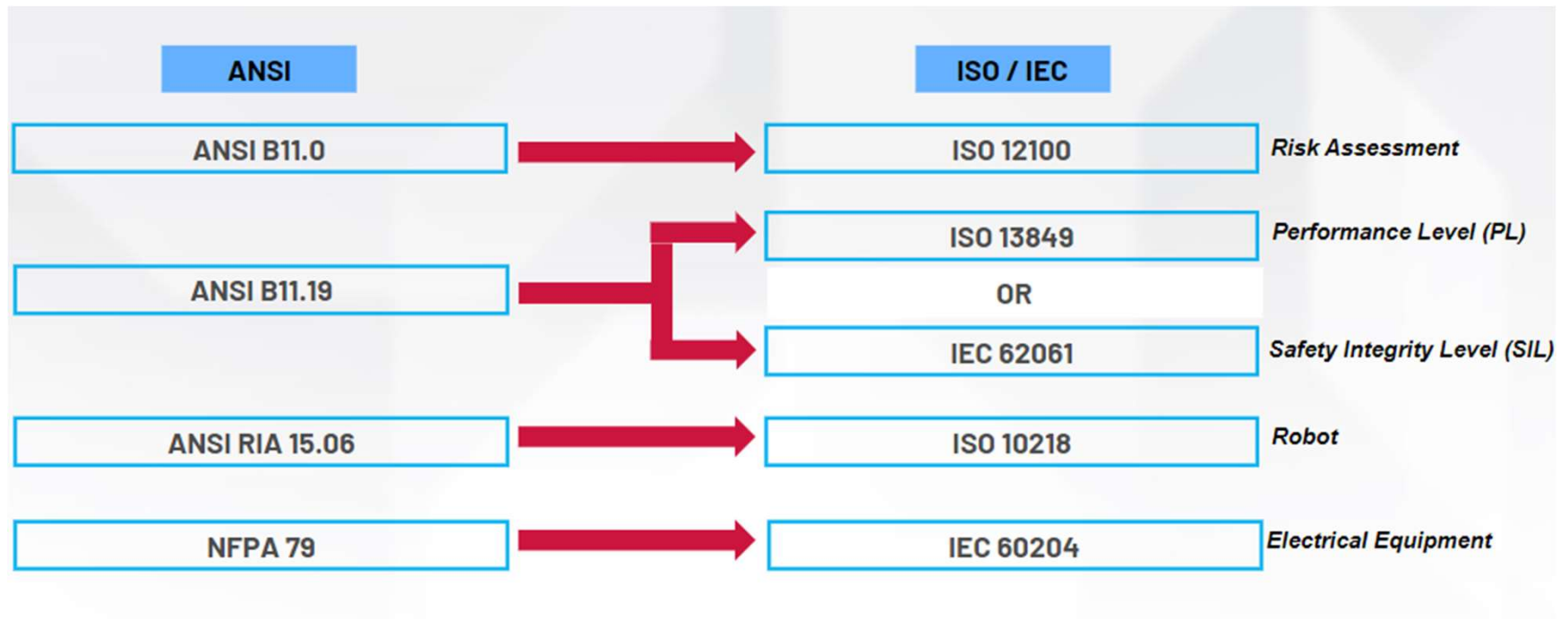
A QUICK COMPARISON

EN ISO 13849-1 Performance Level (PL)	Average probability of a dangerous failure per hour [1/h]	EN 62061 Safety Integrity Level (SIL)
a	$\geq 10^{-5}$ to $< 10^{-4}$	no special safety requirements
b	$\geq 3 \times 10^{-6}$ to $< 10^{-5}$	1
c	$\geq 10^{-6}$ to $< 3 \times 10^{-6}$	1
d	$\geq 10^{-7}$ to $< 10^{-6}$	2
e	$\geq 10^{-8}$ to $< 10^{-7}$	3

TYPICAL STANDARDS WORKFLOW



ANSI/ISO RELATIONSHIPS





TRENDS & OTHER STANDARDS

ISO 14119:2013



SAFETY OF MACHINERY – EMERGENCY STOP FUNCTION – PRINCIPLES FOR DESIGN

- ANSI/ISO 12100 references ISO 14119 (10x)
- Defines 4 types of interlocking devices
 - Updating to add 5th type: Trapped Keys
- Guard Locking Requirements
 - Power to Unlock vs. Power to Lock
 - Supplementary release
 - Mechanical requirements
 - Product certification requirements
 - Minimum Safe Distance Formula required
 - Performance Level requirements and restrictions that affect Diagnostic Coverage

BS EN ISO 13850:2015



INTERLOCKING DEVICES ASSOCIATED WITH GUARDS – PRINCIPLES FOR DESIGN AND SELECTION

- The purpose of the emergency stop function is to avert actual or impending emergency situations arising from the behavior of persons or from an unexpected hazardous event.
 - Emergency stops are complimentary safety functions, NOT a protective device
- The emergency stop function cannot be considered as measure of prevention of unexpected start ups described in ISO 12100.
 - Can I use Lockable ESTOPS??
- Stopping categories 0 or 1
- An emergency stop device shall be located:
 - At each operator control station, except where the risk assessment indicates that this is not necessary
 - At other locations, as determined by the risk assessment
- Determination of the Performance Level (PL) or SIL required should take into account the purpose of the emergency stop function, but the minimum required is **PLr c or SIL 1**.

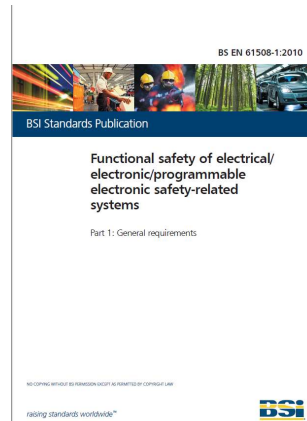
INTERNATIONAL STANDARDS GIVING REQUIREMENTS FOR SAFETY FUNCTIONS

ISO 13849-1:2015 TABLE 9

Safety function/ characteristic	Requirement(s)		For additional information, see:
	This part of ISO 13849	ISO 12100:2010	
Safety-related stop function initiated by safeguard ^a	5.2.1	3.28.8, 6.2.11.3	IEC 60204-1:2005, 9.2.2, 9.2.5.3, 9.2.5.5 ISO 14119 ISO 13855
Manual reset function	5.2.2	—	IEC 60204-1:2005, 9.2.5.3, 9.2.5.4
Start/restart function	5.2.3	6.2.11.3, 6.2.11.4	IEC 60204-1:2005, 9.2.1, 9.2.5.1, 9.2.5.2, 9.2.6
Local control function	5.2.4	6.2.11.8, 6.2.11.10	IEC 60204-1:2005, 10.1.5
Muting function	5.2.5	—	IEC/TS 62046:2008, 5.5
Hold-to-run function		6.2.11.8 b)	IEC 60204-1:2005, 9.2.6.1
Enabling device function		—	IEC 60204-1:2005, 9.2.6.3, 10.9
Prevention of unexpected start-up	—	6.2.11.4	ISO 14118 IEC 60204-1:2005, 5.4
Escape and rescue of trapped persons	—	6.3.5.3	
Isolation and energy dissipation function	—	6.3.5.4	ISO 14118 IEC 60204-1:2005, 5.3, 6.3.1
Control modes and mode selection	—	6.2.11.8, 6.2.11.10	IEC 60204-1: 2005, 9.2.3, 9.2.4
Interaction between different safety-related parts of control systems	—	6.2.11.1 (last sentence)	IEC 60204-1:2005, 9.3.4
Monitoring of parameterization of safety-related input values	4.6.4	—	—
Emergency stop function ^b	—	6.3.5.2	ISO 13850 IEC 60204-1:2005, 9.2.5.4

TRENDS - SAFETY AND SECURITY

CYBER SECURITY – IEC 62443



4 The situation

4.1 General

Industrial automation and control systems operate within a complex environment. Organizations are increasingly sharing information between business and industrial automation systems, and partners in one business venture may be competitors in another. However, because industrial automation and control systems equipment connect directly to a process, loss of trade secrets and interruption in the flow of information are not the only consequences of a security breach. The potential loss of life or production, environmental damage, regulatory violation, and compromise to operational safety are far more serious consequences. These may have ramifications beyond the targeted organization; they may grievously damage the infrastructure of the host region or nation.

7.4.2.3 The hazards, hazardous events and hazardous situations of the EUC and the EUC control system shall be determined under all reasonably foreseeable circumstances (including fault conditions, reasonably foreseeable misuse and malevolent or unauthorised action). This shall include all relevant human factor issues, and shall give particular attention to abnormal or infrequent modes of operation of the EUC. If the hazard analysis identifies that malevolent or unauthorised action, constituting a security threat, as being reasonably foreseeable, then a security threats analysis should be carried out.

NOTE 1 For reasonably foreseeable misuse see 3.1.14 of IEC 61508-4.

NOTE 2 For guidance on hazard identification including guidance on representation and analysis of human factor issues, see reference [11] in the bibliography.

NOTE 3 For guidance on security risks analysis, see IEC 62443 series.



HOW CAN WE HELP?

COMPETENCY

TÜV TRAINING

TÜV 0

TECHNICIAN CERTIFICATION

- 2-day class
- 1-hour timed exam (70% to pass)
- Covers Basic Safety Principles
- Must have 2 years of industrial machinery experience.

TÜV 1

ENGINEER PREP CLASS

- 3-day class
- No exam
- In depth discussion on safety standards
- Intended as prep class to be successful in TÜV 2 Engineering class.

TÜV 2

ENGINEER CERTIFICATION

- 5-day class
- 4-hour timed exam (70% to pass)
- Deeper understanding of safety standards and their application
- Must have 3 years of functional safety experience



QUESTIONS?
THANK YOU!