
VAN METER
smart
SOLUTIONS SUMMIT
HOW RISKY IS YOUR BUSINESS?
INTRODUCTION TO RISK ASSESSMENTS
& SAFETY FUNCTION DESIGN

smart
SOLUTIONS SUMMIT

VAN METER

WELCOME

MATT WAGNER

Smart Device Specialist
mwagner@vanmeterinc.com

smart
SOLUTIONS SUMMIT

VAN METER

WELCOME

MATT HENNING

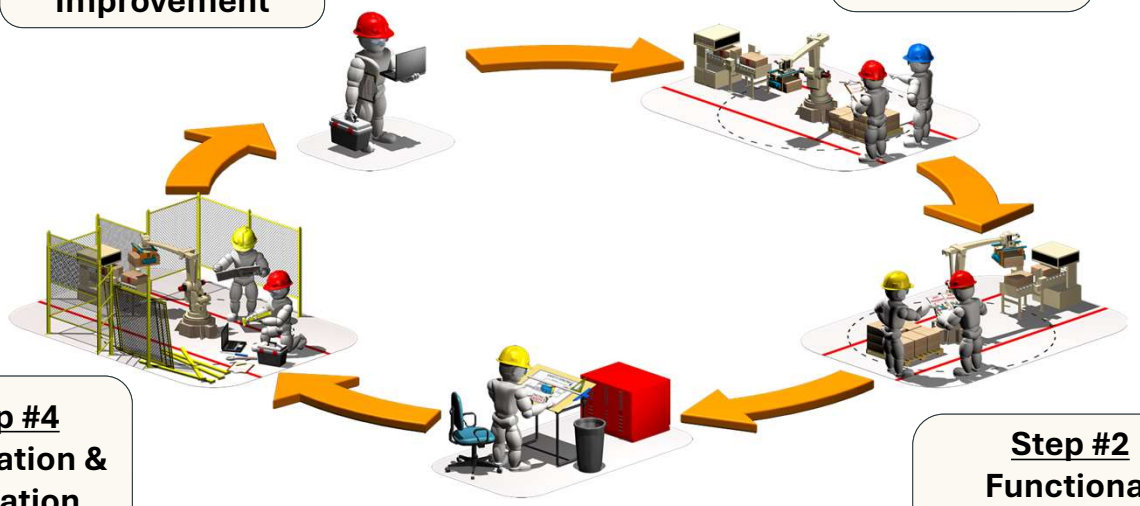
Smart Device Specialist
mhenning@vanmeterinc.com

MACHINE SAFETY – SAFETY LIFE CYCLE

it's not difficult :)

just follow the steps!

=



Step #1
Risk Assessment

Step #2
Functional Requirements Specification

Step #3
Design & Verification

Step #4
Installation & Validation

Step #5
Maintenance & Improvement

MACHINE SAFETY LIFE CYCLE...

Step #1
Risk Assessment

Step #5
Maintenance & Improvement

THE DIAGNOSIS

Step #2
Functional Requirements Specification

Step #4
Installation & Validation

Step #3
Design & Verification

MACHINE SAFETY LIFE CYCLE

Step #1
Risk Assessment

Step #2
Functional Requirements Specification

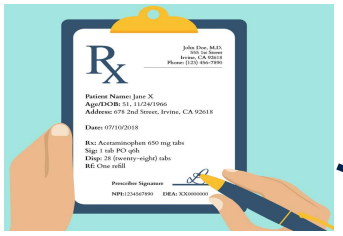
Step #3
Design & Verification

Step #4
Installation & Validation

Step #5
Maintenance & Improvement

THE PROCEDURE

THE PRESCRIPTION



MACHINE SAFETY LIFE CYCLE

Step #1
Risk Assessment

Step #5
Maintenance & Improvement

MANAGING CHANGE

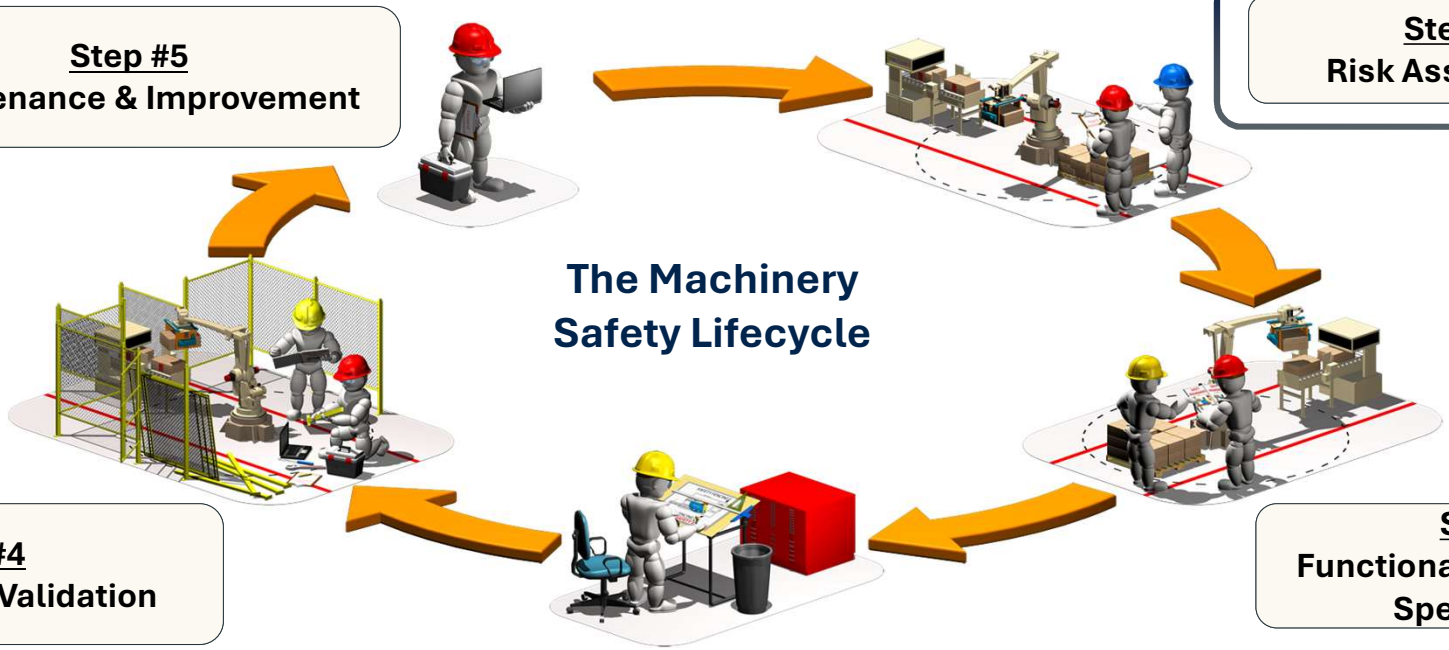
Step #2
Functional Requirements Specification

Step #4
Installation & Validation

Step #3
Design & Verification

MACHINE SAFETY LIFE CYCLE

An awareness of machine hazards and risk is important in all phase of the machinery lifecycle



Step #1
Risk Assessment

Step #2
Functional Requirements Specification

Step #3
Design & Verification

Step #4
Installation & Validation

Step #5
Maintenance & Improvement

WHY RISK ASSESSMENT?

REQUIRED BY MANY REGULATORY BODIES

National regulatory agencies reference risk assessment for essential health and safety requirements. **"Risk should be assessed and reduced"**

- **Standards referencing Risk Assessment**
  - ANSI B11.0
  - ISO 12100
  - ANSI Z244.1
  - ANSI B11.19
  - ANSI RIA 15.06
  - NFPA 79
  - And the list goes on…

BECAUSE WE NEED A GOOD ANSWER AS TO WHY WE DESIGNED THE SYSTEM THE WAY WE DESIGNED IT…

Examples of bad answers…

- I don't know.
- The other machines are all wired that way.
- We have always done it that way.
- The OEM takes care of that for us.

ARE RISK ASSESSMENTS REQUIRED? YES!

IEC 610508-1 – Functional safety of electrical/electronic/programmable electronic safety-related systems
For hardware safety integrity it is necessary to apply quantified reliability estimation techniques in order to assess whether the target safety integrity, as determined by the risk assessment, has been achieved, taking into account random hardware failures (see IEC 61508-2, 7.4.5).

RIA 15.06 – Industrial Robots and Robot System Requirements
"A Risk Assessment **shall be** performed and is no longer optional"
"Selection of a category 0 or category 1 stop (in accordance with IEC60204-1) function shall be determined from the risk assessment"

NFPA 79 – Electrical Standard for Industrial Machinery
"The risks associated with the hazards identified by the risk assessment shall be reduced such that the safety performance determined by the risk assessment is met"

ISO 13849 – Safety of Machinery (PL)
"From the risk assessment (see ISO 12100) at the machine, the designer shall decide the contribution to the reduction of risk which needs to be provided by each relevant safety function which is carried out by the SRP/CS(s)."

IEC 62061– Safety of Machinery (SIL)
"**5.2.4.1** The safety integrity requirements for each SRCF shall be derived from the risk assessment to ensure the necessary risk reduction can be achieved. In this standard, a safety integrity requirement is expressed as a target failure value for the probability of dangerous failure per hour of each SRCF."

ANSI B11.19 – Performance Requirements for Safeguarding
"Selection of the safeguarding requires task and hazard identification, and the application of documented risk assessment and risk reduction of the total production system."

RISK DEFINITION

RISK

is a function of

severity of harm

only changes with design

and

Probability of Occurrence

- Exposure of person to hazard
- Occurrence of hazardous event
- Possibility to avoid or limit harm

ANSI/ISO 12100: 2012; Figure 3

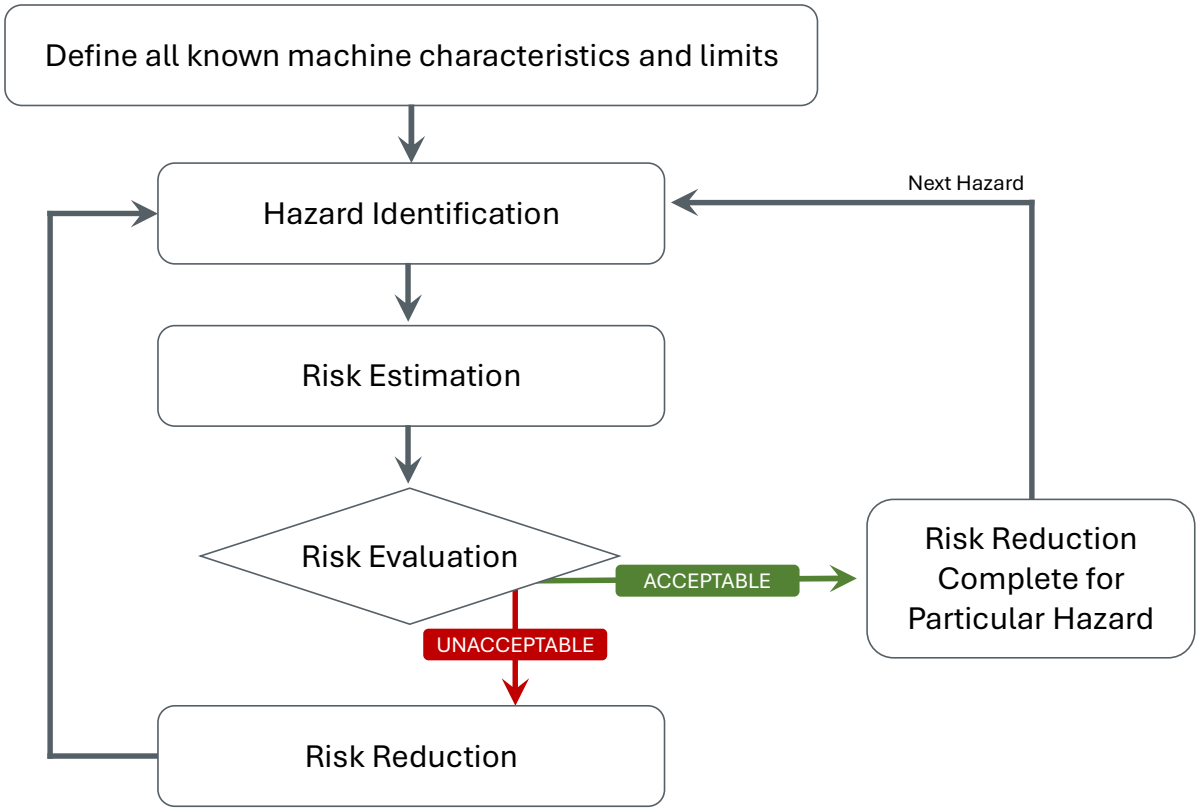
THE PURPOSE OF RISK ASSESSMENT

- The process serves as an effective tool for properly **identifying** and **assessing** the **real hazards** involved in operating a particular machine.
- Risk assessment provides a method for determining **equivalent levels of protection** when designing safeguards and stating OSHA's minor service exception.
- The process **takes away the guesswork** when estimating risk and prescribing safety system performance.
- Risk assessment is an active, **documented process** that can be filed and maintained for the entire life of the machine, and serves as documented proof of your "due diligence".
- Risk assessment establishes the **foundation** and early **framework** for the design and implementation of an **effective machine safety program**.

WHY ARE TEAM BASED RISK ASSESSMENTS POWERFUL TOOLS IN REDUCING RISK IN THE WORKPLACE?

- Knowledgeable people involved in the team-based process
- The process is repeatable
- Identifies hazards that are associated with the workplace
- Identifies different approaches to reducing risk
- Document for review and future changes
- Industry Safety Standards ***require*** that the hazards be identified and reduced

THE PROCESS


Define all known machine characteristics and limits
Hazard Identification
Next Hazard
Risk Estimation
Risk Evaluation
ACCEPTABLE
Risk Reduction Complete for Particular Hazard
UNACCEPTABLE
Risk Reduction

Slide 14

JJ0 Can you please make this bigger to fill the slide?
Joyce, Jessica, 2025-04-01T16:48:14.204

DEFINE MACHINE CHARACTERISTICS AND LIMITS

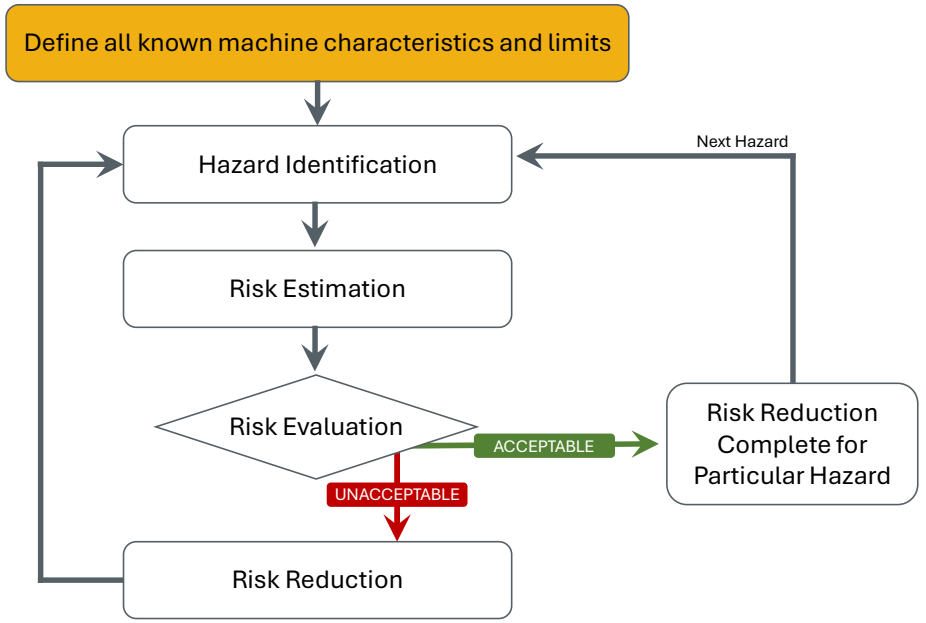
BASIC PROJECT MANAGEMENT - TEAM GATHERS DATA AND DEFINE A CLEAR PROJECT SCOPE.

Scope

- Operational states (auto, manual)
- Specific tasks (loading/unloading, maintenance)
- A specific portion of the lifecycle (installation, operation)
- Who can be harmed (public, personnel)
- What can be damaged (people, equipment, environment).

Limits

- Use limits (operating modes, number of persons)
- Space limits (material flow, access points)
- Time limits (production cycles, device wear)
- Environmental (temperature, humidity)



HAZARD IDENTIFICATION

A CRITICAL STEP. IDENTIFY 'REASONABLY FORESEEABLE' TASKS AND HAZARDS

Tasks

How people interact with the machine to identify how they could be harmed. Intended use and reasonably foreseeable misuse of the machine

Example tasks:

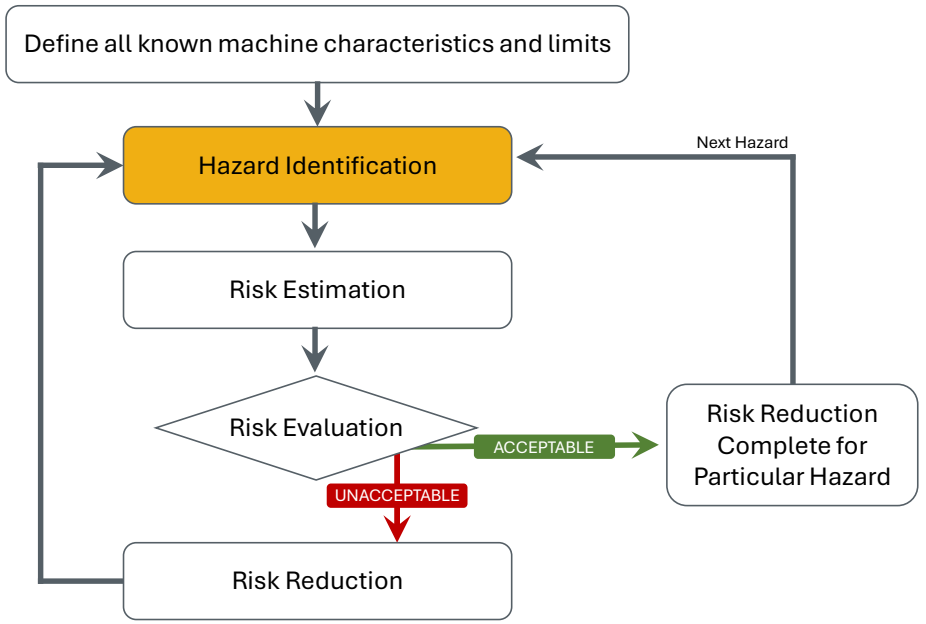
- Packing and transportation
- Unloading / unpacking
- Systems installation and assembly
- Start-up / commissioning
- Set-up / changeover
- Operation (all modes)
- Maintenance

Hazards

Reasonably foreseeable hazards and hazardous situations shall be identified.

Example hazards:

- Mechanical hazards
- Energy sources
- Slips and falls
- Hot surfaces
- Sharp edges
- Example hazardous situations: Equipment failure, Operator error



HAZARD IDENTIFICATION

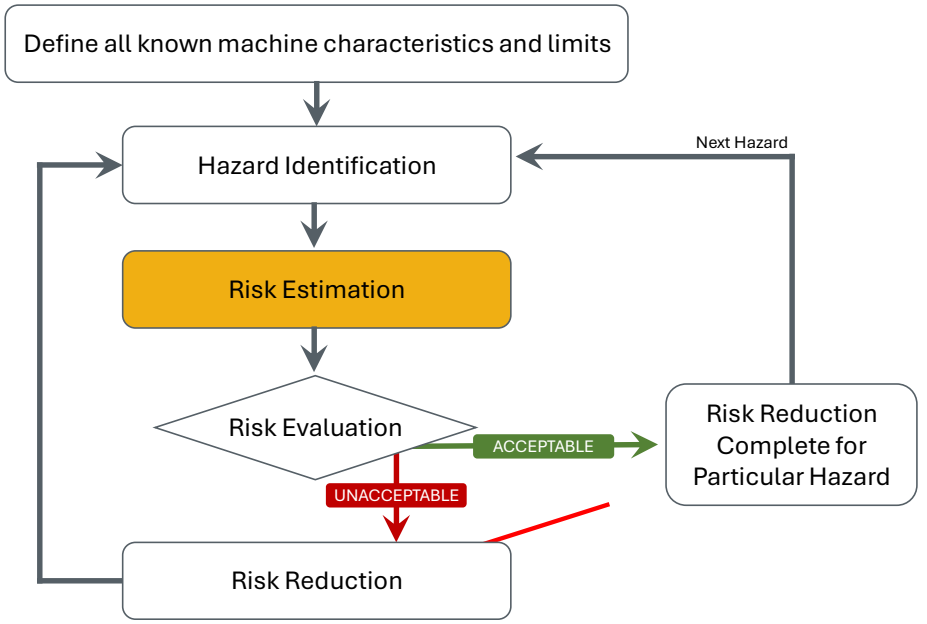
- Machine Hazards Lists:
  - ISO 12100:2010 – Annex B
  - ANSI B11.0:2020 – Annex D

Table B.1

No	Type or group	Examples of hazards		Subclause of this International Standard
		Origin[a]	Potential consequences[b]	
1	Mechanical hazards	— acceleration, deceleration; — angular parts; — approach of a moving element to a fixed part; — cutting parts; — elastic elements; — falling objects; — gravity; — height from the ground; — high pressure; — instability; — kinetic energy; — machinery mobility; — moving elements; — rotating elements; — rough, slippery surface; — sharp edges; — stored energy; — vacuum.	— being run over; — being thrown; — crushing; — cutting or severing; — drawing-in or trapping; — entanglement; — friction or abrasion; — impact; — injection; — shearing; — slipping, tripping and falling; — stabbing or puncture; — suffocation.	6.2.2.1 6.2.2.2 6.2.3 a) 6.2.3 b) 6.2.6 6.2.10 6.3.1 6.3.2 6.3.3 6.3.5.2 6.3.5.4 6.3.5.5 6.3.5.6 6.4.1 6.4.3 6.4.4 6.4.5
2	Electrical hazards	— arc; — electromagnetic phenomena; — electrostatic phenomena; — live parts; — not enough distance to live parts under high voltage; — overload; — parts which have become live under fault conditions; — short-circuit; — thermal radiation.	— burn; — chemical effects; — effects on medical implants; — electrocution; — falling, being thrown; — fire; — projection of molten particles; — shock.	6.2.9 6.3.2 6.3.3.2 6.3.5.4 6.4.4 6.4.5
3	Thermal hazards	— explosion; — flame; — objects or materials with a high or low temperature; — radiation from heat sources.	— burn; — dehydration; — discomfort; — frostbite; — injuries by the radiation of heat sources; — scald.	6.2.4 b) 6.2.8 c) 6.3.2.7 6.3.3.2.1 6.3.4.5

RISK ESTIMATION

- Needs to happen BEFORE risk reduction
- A combination of severity of harm and the probability of occurrence
- **Risk Scoring - Each task/hazard pair** must be scored to derive a risk level.



HRN – Hazard Rating Number

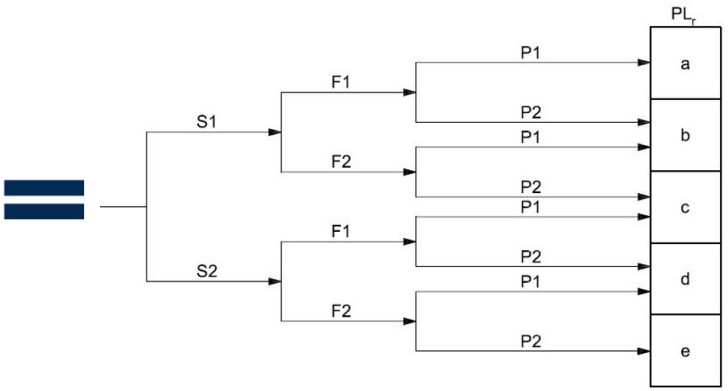
PE Probability of Exposure			Frequency of Exposure	
0	Impossible	Cannot happen	0.1	Infrequently
1	Unlikely	Though conceivable	0.2	Annually
2	Possible	but unusual	1	Monthly
5	Even chance	could happen	1.5	Weekly
8	Probable	not surprised	2.5	Daily
10	Likely	to be expected	4	Hourly
15	Certain	no doubt	5	Constantly

MPH Maximum Probable Loss		NP Number of Persons at risk	
0.1	Scratch or bruise	1	1-2 persons
0.5	Laceration or mild ill health effect	2	3-7 persons
1	Break of a minor bone or minor illness (temporary)	4	8-15 persons
2	Break of a major bone or minor illness (permanent)	8	16-50 persons
4	Loss of Limb, eye / serious illness of a temporary nature	12	50 + persons
8	Loss of Limbs, eyes / serious illness of permanent nature		
15	Fatality		

RISK	Negligible	Very Low	Low	Significant	High	Very High	Extreme	Unacceptable
HRN	0-1	1-5	5-10	10-50	50-100	100-500	500-1000	Above 1000

Table 1

Performance Level Required PLr



ISO 13849 - PLR

Severity of the hazard.

- S1: Slight (normally reversible injury)
- S2: Serious (normally irreversible injury or death)

Frequency and/or exposure to hazard.

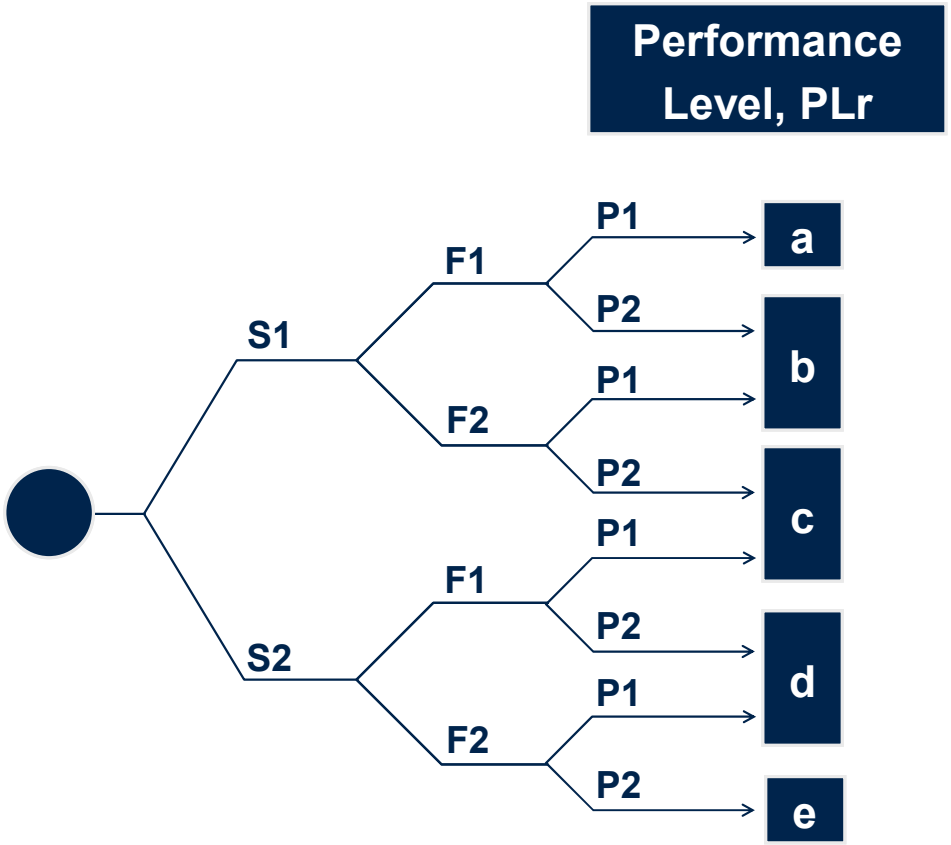
- F1: Seldom to less often and/or exposure time is short
- F2: Frequent to continuous and/or exposure time is long

Possibility of avoiding the hazard or limiting harm.

- P1: Possible under specific conditions
- P2: Scarcely possible

*Note: ISO 13849-1 is not considered an assessment methodology

13849-1/Annex A, Figure A.1



HAZARD RATING NUMBER (HRN)

LO Likelihood of Occurrence		
0	Impossible	cannot happen
0.1	Almost unlikely	possible in extreme circumstances
0.5	Highly unlikely	though conceivable
1	Unlikely	but could occur
2	Possible	but unusual
5	Even chance	could happen
8	Probable	not surprised
10	Likely	to be expected
15	Certain	no doubt

FE Frequency of Exposure	
0.1	Infrequently
0.2	Annually
1	Monthly
1.5	Weekly
2.5	Daily
4	Hourly
5	Constantly

LO x FE x DPH x NP=H.R.N.

DPH Degree of Possible Harm	
0.1	Scratch or bruise
0.5	Laceration or mild ill health
1	Break of a minor bone or minor illness (temporary)
2	Break of a major bone or minor illness (permanent)
4	Loss of limb/eye/serious illness of a temporary natury
8	Loss of limbs/eyes/serious illness of a permanent nature
15	Fatality

NP Number of Persons	
1	1-2 persons
2	3-7 persons
4	8-15 persons
8	16-50 persons
12	50+ persons

Risk	Negligible	Very Low	Low	Significant	High	Very High	Extreme	Unacceptable
HRN	0-1	1-5	5-10	10-50	50-100	100-500	500-1000	Over 1000

IEC 62061 - SIL

Severity (Se)	Class (Cl)				
	4	5-7	8-10	11-13	14-15
4	SIL 2	SIL 2	SIL 2	SIL 3	SIL 3
3		(OM)	SIL 1	SIL 2	SIL 3
2			(OM)	SIL 1	SIL 2
1				(OM)	SIL 1

Cl = Fr + Pr + Av

Frequency and duration of exposure (Fr)	
Frequency of exposure	**Frequency, Fr (see A.2.4.1)**
[A1] ≥ 1 per h [A1]	5
< 1 per h to ≥ 1 per day	5
< 1 per day to ≥ 1 per 2 weeks	4
< 1 per 2 weeks to ≥ 1 per year	3
< 1 per year	2

Probability of occurrence	Probability (Pr)
Very high	5
Likely	4
Possible	3
Rarely	2
Negligible	1

Consequences	Severity (Se)
Irreversible: death, losing an eye or arm	4
Irreversible: broken limb(s), losing a finger(s)	3
Reversible: requiring attention from a medical practitioner	2
Reversible: requiring first aid	1

Probabilities of avoiding or limiting harm (AV)	
Impossible	5
Rarely	3
Probable	1

RIA TR15.306

Factor	Rating	Criteria (Examples) – choose most likely *Read criteria from the top for each factor*
Injury Severity	**Serious S3**	Normally non-reversible; likely will not return to the same job after recovery from incident: – fatality – limb amputation – long term disability – chronic illness **If any of the above are applicable, the rating is SERIOUS**
	Moderate S2	Normally reversible; likely will return to the same job after recovery from incident: – broken bones – severe laceration – short hospitalization – short term disability – loss time (multi-day) – fingertip amputation (not thumb) **If any of the above are applicable, the rating is MODERATE**
	Minor S1	First aid; no recovery required before returning to job: – bruising – small cuts – no loss time (multi-day) – does not require attention by a medical doctor **If any of the above are applicable, the rating is MINOR**
Exposure	**Prevented E0**	– Exposure to hazard(s) is effectively mitigated by design. – Use of guards prevents exposure or access to the hazard(s) (see Part 2, 5.10). If an interlocked guard is selected, the third bullet must also be met. – If functional safety is used as a risk reduction measure, the functional safety performance (PL) meets or exceeds the required functional safety performance (PL$_r$). See Part 2, 5.2. **If any of the above are applicable, the rating is PREVENTED**
	High E2	– Typically more than once per day or shift – Frequent or multiple short duration – Durations/situations which could lead to task creep and does not include teach **If any of the above are applicable, the rating is HIGH**
	Low E1	– Typically less than or once per day or shift – Occasional short durations **If either of the above are applicable, the rating is LOW**
Avoidance	**Not possible A3**	– Insufficient clearance to move out of the way and safety-rated reduced speed control is not used – The robot system or cell layout causes the operator to be trapped, with the escape route toward the hazard – Safeguarding is not expected to offer protection from the process hazard (e.g. explosion or eruption hazard) **If any of the above are applicable, the rating is NOT POSSIBLE**
	Not likely A2	– insufficient clearance to move out of the way and safety-rated reduced speed control is used – obstructed path to move to safe area – hazard is moving faster than reduced speed (250 mm/sec) – inadequate warning/reaction time – the hazard is imperceptible **If any of the above are applicable, the rating is NOT LIKELY**
	Likely A1	– sufficient clearance to move out of the way – hazard is incapable of moving greater than reduced speed (250 mm/sec) – adequate warning/reaction time – positioned in a safe location away from the hazard **If any of the above are applicable, the rating is LIKELY**

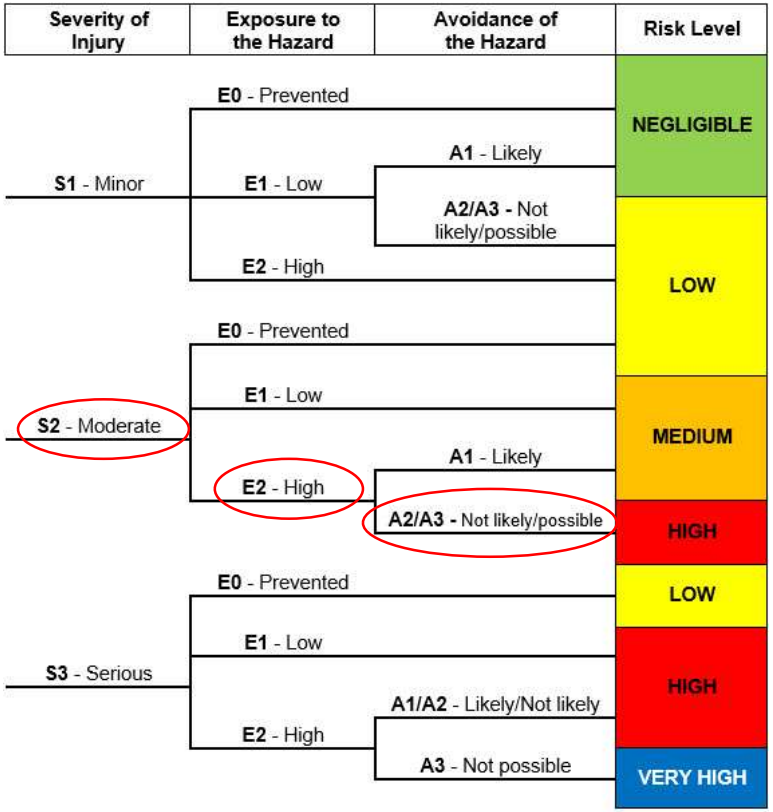


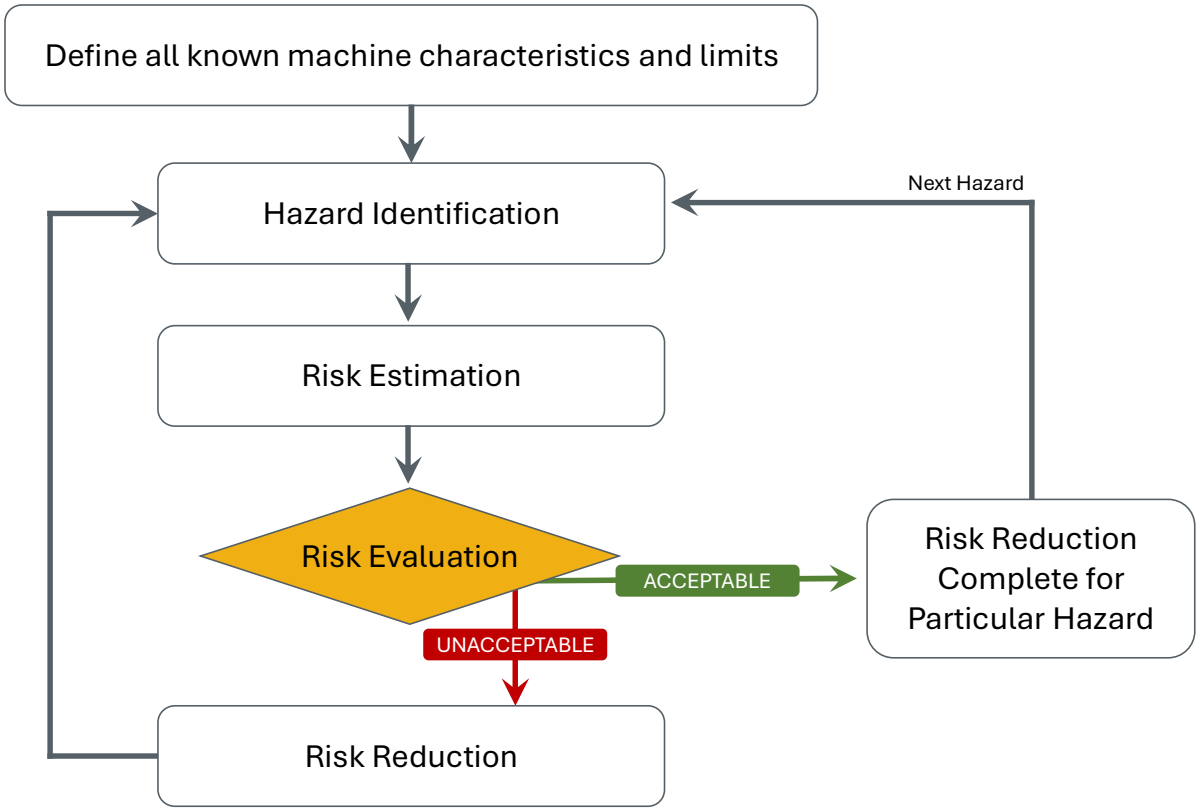
Table 5 – Minimum functional safety performance

Risk Level	PL$_r$	Structure Category
NEGLIGIBLE (see 6.5.3.1)	b	-
LOW	c	2
MEDIUM	d	2
HIGH	d	3
VERY HIGH (see 6.5.3.2)	e	4

RISK ASSESSMENT EXAMPLE

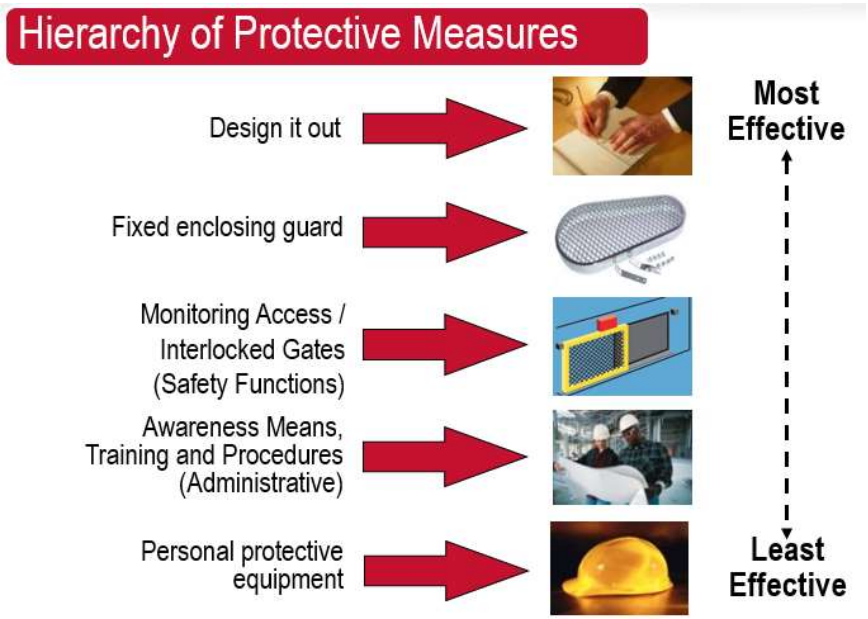
Task Type	Area	Task Specific	Injury Type	Body Parts Affected	Origin / Cause	Energy / Hazard Source	S	E	A	Initial Risk Rating	PLr	Cat. Structure	Current Safeguards	Recommendations	S	E	A	Residual Risk Rating
Normal Operation	3. East Side	3. Normal Operation	Mech: Entanglement	Fingers, hands	18. Spur gears	Electrical	S3	E1	A3	HIGH	PLd	3	[Engineered Solution] - Fixed guarding on side of machine prevents full body access to spur gears. Possibly able to reach over guarding to hazard. [Training/Procedures] - Building has restricted access during normal operation. LOTO procedures in place - central location that operators have access to, pre-harvest training (once per year) on all applicable procedures, SOP (work instruction) in place, pre-startup safety review annually [Awareness] - None [PPE] - Safety glasses, hard hat, gloves, safety shoes, hearing protection	[System Redesign] - Upgrade circuitry to Cat 3 [Engineered Solution] - Add movable guarding with gate door to extend between machines with mechanical means of escape. Add locking gate switch that requires both adjacent machines to be shut down before entering area. Must move electrical disconnect to outside of guarding. Install trapped key system to gate switches. Add compliant Estops. [Training/Procedures] - Include new guarding in training and procedures for machine. If guarding is removed, machine must be under LOTO [Awareness] - Post signage for hazard, paint guards safety yellow [PPE] - N/A	S3	E0	A1	LOW
Normal Operation	3. East Side	3. Normal Operation	Mech: Entanglement	Fingers, Hands	19. Roller drive gear box shafts	Electrical	S3	E1	A3	HIGH	PLd	3	[Engineered Solution] - Fixed guarding on side of machine prevents full body access to shafts. Possibly able to reach over guarding to hazard. [Training/Procedures] - Building has restricted access during normal operation. LOTO procedures in place - central location that operators have access to, pre-harvest training (once per year) on all applicable procedures, SOP (work instruction) in place, pre-startup safety review annually [Awareness] - None [PPE] - Safety glasses, hard hat, gloves, safety shoes, hearing protection	[System Redesign] - Upgrade circuitry to Cat 3 [Engineered Solution] - Add movable guarding with gate door to extend between machines with mechanical means of escape. Add locking gate switch that requires both adjacent machines to be shut down before entering area. Must move electrical disconnect to outside of guarding. Install trapped key system to gate switches. Add compliant Estops. IF new guarding is placed behind ladder, add fixed guarding to prevent access to hazards. [Training/Procedures] - Include new guarding in training and procedures for machine. If guarding is removed, machine must be under LOTO [Awareness] - Post signage for hazard, paint guards safety yellow [PPE] - N/A	S3	E0	A1	LOW

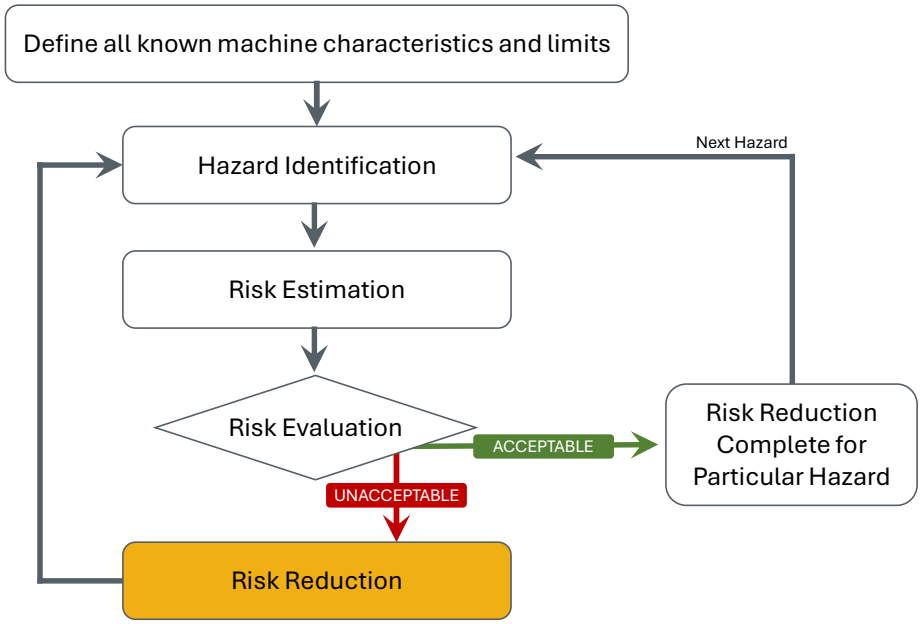
THE PROCESS


Define all known machine characteristics and limits
Hazard Identification
Next Hazard
Risk Estimation
Risk Evaluation
ACCEPTABLE
Risk Reduction Complete for Particular Hazard
UNACCEPTABLE
Risk Reduction

REDUCE RISK: SAFELY AND EFFICIENTLY

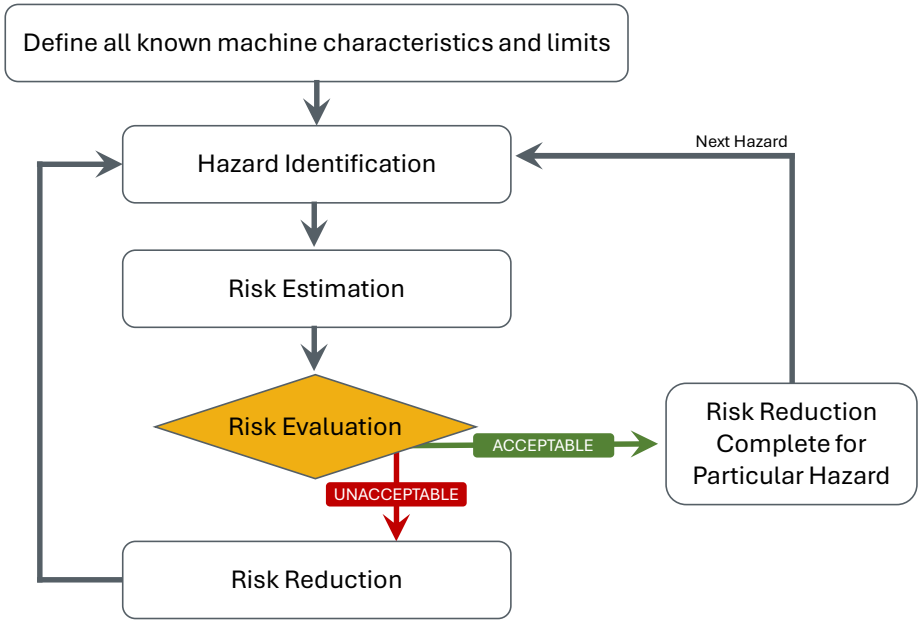
If the risk level is not acceptable, risk reduction measures can be implemented using the Hazard Control Hierarchy.





RESIDUAL RISK WITH RISK REDUCTION

Residual risk - The risk remaining after risk reduction measures are taken.



HRN – Hazard Rating Number

PE Probability of Exposure			Frequency of Exposure	
0	Impossible	Cannot happen	0.1	Infrequently
1	Unlikely	Though conceivable	0.2	Annually
2	Possible	but unusual	1	Monthly
5	Even chance	could happen	1.5	Weekly
8	Probable	not surprised	2.5	Daily
10	Likely	to be expected	4	Hourly
15	Certain	no doubt	5	Constantly

MPH Maximum Probable Loss		NP Number of Persons at risk	
0.1	Scratch or bruise	1	1-2 persons
0.5	Laceration or mild ill health effect	2	3-7 persons
1	Break of a minor bone or minor illness (temporary)	4	8-15 persons
2	Break of a major bone or minor illness (permanent)	8	16-50 persons
4	Loss of Limb, eye / serious illness of a temporary nature	12	50 + persons
8	Loss of Limbs, eyes / serious illness of permanent nature		
15	Fatality		

RISK	Negligible	Very Low	Low	Significant	High	Very High	Extreme	Unacceptable
HRN	0-1	1-5	5-10	10-50	50-100	100-500	500-1000	Above 1000

Table 1

ISO 13849 RISK REDUCTION

ENTER RESIDUAL RISK INTO WORKSHEET

Task Type	Area	Task Specific	Injury Type	Body Parts Affected	Origin / Cause	Energy / Hazard Source	S	E	A	Initial Risk Rating	PLr	Cat. Structure	Current Safeguards	Recommendations	S	E	A	Residual Risk Rating
Normal Operation	3. East Side	3. Normal Operation	Mech: Entanglement	Fingers, hands	18. Spur gears	Electrical	S3	E1	A3	HIGH	PLd	3	[Engineered Solution] - Fixed guarding on side of machine prevents full body access to spur gears. Possibly able to reach over guarding to hazard. [Training/Procedures] - Building has restricted access during normal operation. LOTO procedures in place - central location that operators have access to, pre-harvest training (once per year) on all applicable hearing protection	[System Redesign] - Upgrade circuitry to Cat 3 [Engineered Solution] - Add movable guarding with gate door to extend between machines with mechanical means of escape. Add locking gate switch that requires both adjacent machines to be shut down before entering area. Must move electrical disconnect to outside of guarding. Install trapped key system to gate switches. Add compliant Estops. [Training/Procedures] - Include new guarding in training and procedures for machine. If guarding is removed, machine must be under LOTO [Awareness] - Post signage for hazard, paint guards safety yellow [PPE] - N/A	S3	E0	A1	LOW
Normal Operation	3. East Side	3. Normal Operation	Mech: Entanglement	Fingers, Hands	19. Roller drive gear box shafts	Electrical	S3	E1	A3	HIGH	PLd	3	[Engineered Solution] - Fixed guarding on side of machine prevents full body access to shafts. Possibly able to reach over guarding to hazard. [Training/Procedures] - Building has restricted access during normal operation. LOTO procedures in place - central location that operators have access to, pre-harvest training (once per year) on all applicable hearing protection	[System Redesign] - Upgrade circuitry to Cat 3 [Engineered Solution] - Add movable guarding with gate door to extend between machines with mechanical means of escape. Add locking gate switch that requires both adjacent machines to be shut down before entering area. Must move electrical disconnect to outside of guarding. Install trapped key system to gate switches. Add compliant Estops. IF new guarding is placed behind ladder, add fixed [illegible]zards. [illegible]ew guarding in [illegible]hine. If guarding is removed, machine must be under LOTO [Awareness] - Post signage for hazard, paint guards safety yellow [PPE] - N/A	S3	E0	A1	LOW

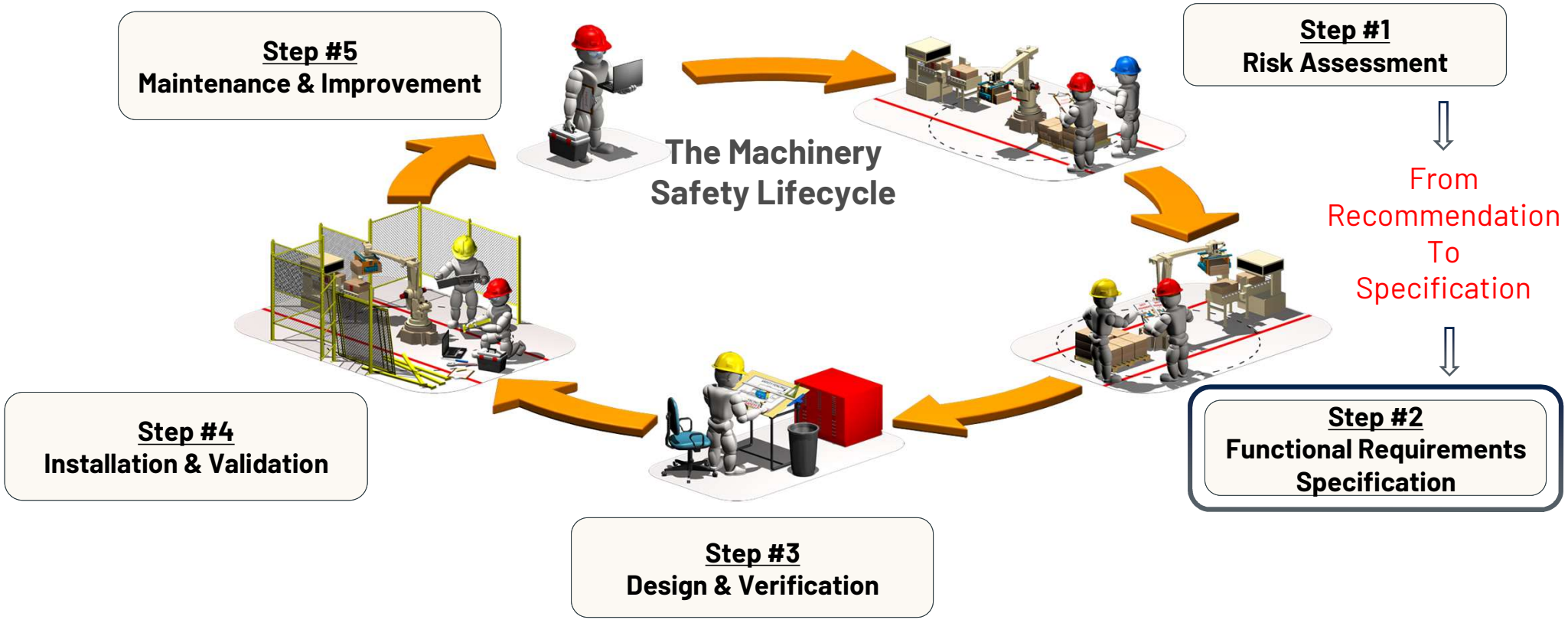
1. With safeguard recommendations in place

2. Adjust the risk parameters affected by the final safeguards

3. Evaluate the residual risk, and determine if acceptable

MACHINE SAFETY LIFE CYCLE

An awareness of machine hazards and risk is important in all phase of the machinery lifecycle



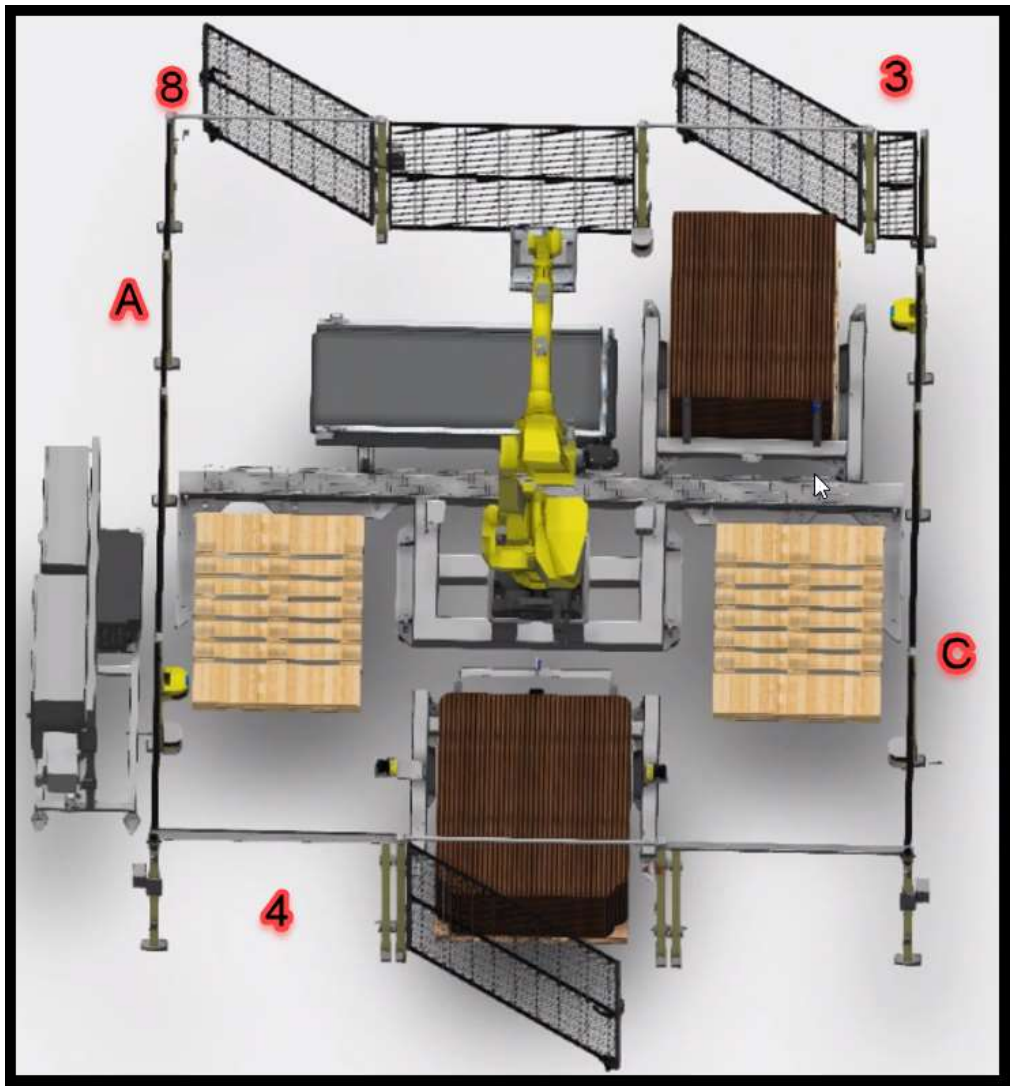
SAFETY SYSTEM FUNCTIONAL REQUIREMENTS

DETAILS THE INFORMATION FROM THE RISK ASSESSMENT

Detailed design document used by the engineer to understand how to….

- Design circuits and software to the appropriate Performance Level as well as hard guarding requirements
- Design the circuit to function correctly in all modes of operation.
  - Manual, Auto, Teach, when muted, how to reset etc..
- Serves as a basis for all activities to follow in the safety design process !
- *We create our validation procedures based on this document!*

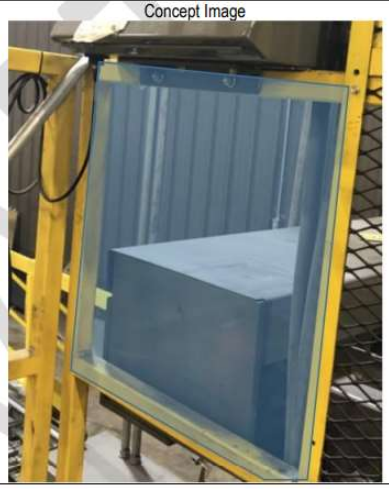
SAFETY SYSTEM FUNCTIONAL REQUIREMENTS



DETAILED SAFETY FUNCTION DESIGN

SF1: SAFETY FUNCTION SPECIFICATION	
Safety Function Name:	Guard Door 1 (op side) Protective stop and prevention of restart of the conveyor when opened
Performance Level Requirement (PLr):	Per ISO 13849-1 Annex A: PLb
Type of Safety Function:	Safety-related stop initiated by safeguard
Operating Modes:	Automatic & Manual
Triggering Event:	Opening of the Guard Door
Safety Reaction:	Initiate a Category 0 Stop
Safe State:	Conveyor Stopped
Number of Operations:	2/Hour @ 365 Days/Year = 17,520/year
Fault Reaction:	Initiate an STO and annunciate the fault
Faults Considered and/or Excluded:	Broken Guard Door Switch Actuator
Response Time/Distance Consideration:	N/A – Locking Guard Door
The conveyor is exposed with a stop time of 1 second. A distance calculation is not applicable due to the minor injury potential.	
Safety Function Requirements: Opening of the guard door will initiate a Category 0 stop of the conveyor and prevent an unintended restart by removal of power to the motors via the drive STO feature. The stop time must not exceed 1 second. Upon closing of the door, motion of the conveyor and bottle feed belts will not resume until the reset pushbutton is pressed and released. Faults at the door interlock switch, wiring terminals or drive will be detected by the safety relay before the next safety demand and inhibit a reset of the safety function.	
Interface to Other Safety Functions:	This will not degrade the Sleever feeder/cutter function and the Emergency Stop will override this safety function
Verification/Validation Document Reference:	TBD – Validation Document Page
Other Document References:	TBD – Electrical Print Numbers

DETAILED GUARDING DESIGN

Item	Initial Risk Ranking	Safeguarding Function
G22	High	New Fixed Guarding, Palletizer Upper Level, Operator Side
Applicable Safety Standards Include:		ANSI B11.19
Mitigation Technique(s)		Expanded metal mesh guarding with metal framing, painted according to [redacted] direction, to be installed at the opening between existing railing, to ensure access is not obtainable into hazardous motion. Ensure minimum gap openings when guarding is installed.
Primary Safety Hardware		Guarding shall be installed with Tool-To-Remove (TTR) fasteners. Guarding shall be approximately 23 inch wide x 22 inches high.
Notes		N/A
Actual Image		Concept Image
		

smart
SOLUTIONS SUMMIT

VAN METER

QUESTIONS?

THANK YOU!