AON

Machine Safeguarding Considerations

Cheese Converters and Original Equipment Manufacturers

The information presented in this resource guide reflects research conducted as of June 30, 2025. The contributors have made every effort to ensure the accuracy and completeness of the information provided. Users are encouraged to verify the information and consult with relevant experts as needed.

This guidance document was developed through a collaborative effort of safety professionals in the cheese manufacturing and cheese converting industries. The concepts and recommendations published herein are meant to be a guideline to assist the reader in developing machine guarding solutions for their unique situation and are not meant to be duplicated exactly as seen in the photographs.

The cheesemaking and cheese converting industries are diverse in operation and technology, and this document focuses on machines that are common to many operations. The lack of attention to any machine that is not found in this document does not imply that guarding is not required. Rather, machine safeguarding design should be a result of a comprehensive risk assessment process that considers routine and non-routine operation, maintenance, cleaning, and ancillary tasks, as well as existing conditions and integration of and between every machine in the manufacturing process.

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Agenda

- Background and Purpose
- Machine Safeguarding Principles
- Tier 1 Equipment Considerations
- Stakeholder Roles and Standards
- Conclusion
- Appendices and Resources
- About the Peer Group

Background and Purpose

Collaboration within the Cheese Industry for Improved Safety

Safeguarding machinery is paramount to ensuring the safety of employees and the efficiency of operations.

Machine safeguarding not only helps prevent and mitigate workplace injuries but also supports compliance with various standards set forth in regulatory requirements like OSHA and consensus standards found in ANSI (American National Standards Institute) documents.

It aims to provide readers with an understanding of various safeguarding approaches for common equipment used in the cheese converting industry.

The document is intended for individuals involved in the design, selection, and manufacturing of cheese converting equipment, offering information to help identify and control workplace hazards from machine-related risks.

The authors of this document, their employers, and OEM machinery manufacturers assume no liability for use of this document in developing machine guarding solutions, nor are the recommendations included herein guaranteed or assumed to meet OSHA regulations in every case.

It is recommended that machinery purchasers consult with a safety engineering expert to conduct machine guarding evaluations prior to exposing any person (i.e., workers, bystanders, contractors) to the hazards of a machine.

Unified Approach

Paul Rutledge

Paul Rutledge, with over 30 years of experience in the food industry, is dedicated to enhancing collaboration among various stakeholders in the cheese manufacturing and converting industry sector. Mr. Rutledge brought together representatives and occupational safety and health professionals from converters, OEM, Aon Commercial Risk Solutions, and non-governmental organizations like the Wisconsin Cheese Manufacturers Association (WCMA) to prepare this document.

Rene Hilgemann
MM, CSP, ARM, ALCM

Rene Hilgemann has held a variety of technical and management positions where she was able to successfully link operational systems to injury reduction efforts and reduce the frequency and severity of losses. Her underlying philosophy is that organizations are designed and operated to achieve the results experienced – both desired and undesired. Ms. Hilgemann helps clients establish goals, develop business cases, benchmark results, and overcome obstacles laying the foundation for the implementation of sustainable and targeted strategies designed to better manage risk and control losses. This approach helps risk management and occupational safety teams achieve goal alignment to attain stated business objectives.

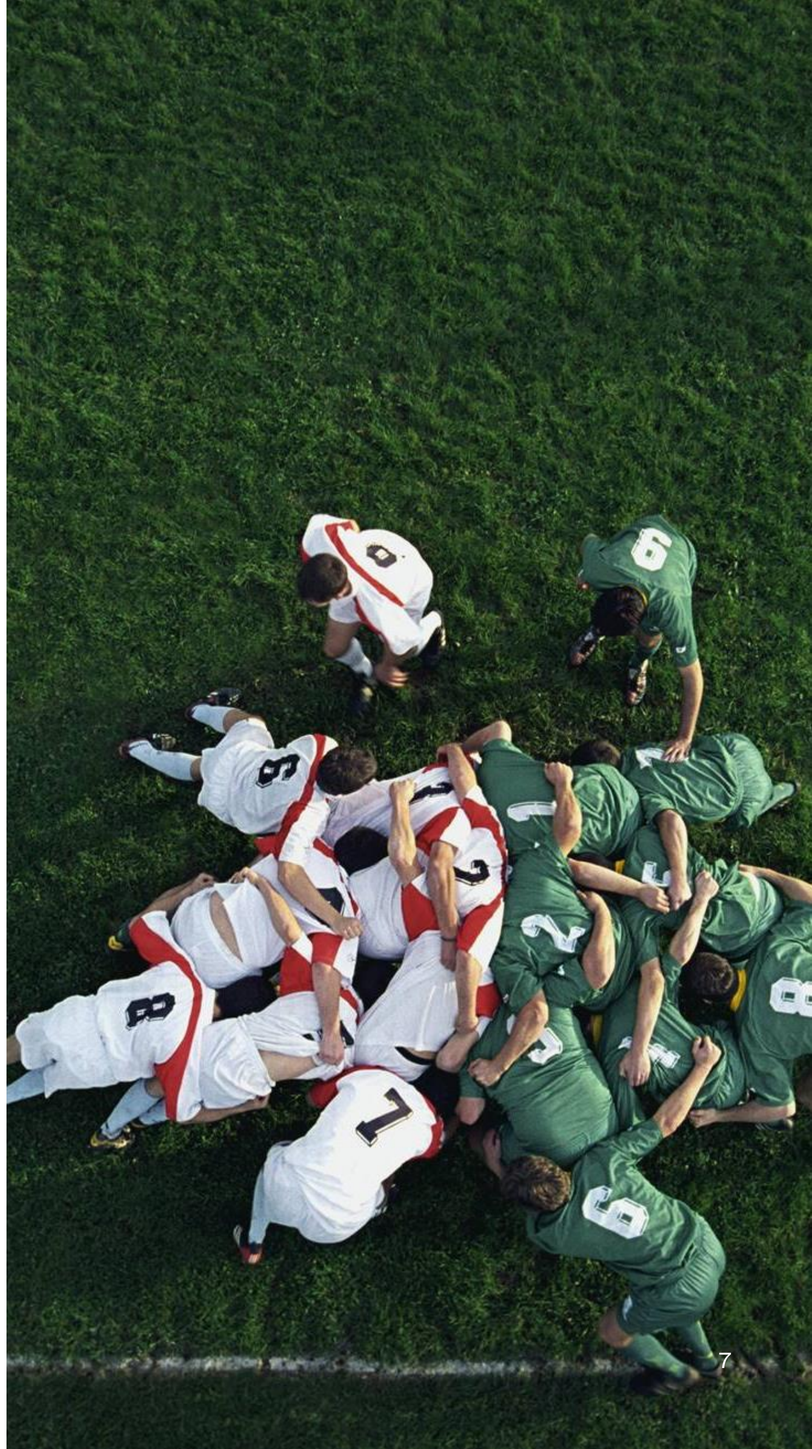
Unified Approach

The goal of this group was to present machine guarding considerations to augment compliance with governmental regulations (e.g., OSHA) and voluntary consensus standards (e.g., ANSI, ISO), and to inform readers about common guarding strategies used in the industry.

Members of the peer group were asked to volunteer their expertise to create this guideline to prevent injuries to employees and bystanders. The peer group reviewed existing regulatory and consensus standards, discussed safeguarding practices, and conducted a survey prepared for members of the WCMA (Wisconsin Cheese Makers Association) in which findings supported the need for this type of document. Prioritizing equipment used allowed the peer group to narrow attention to the most pressing issues in the cheese industry (e.g., pieces of equipment in use today may not meet OSHA standards).

The Tier I Equipment List is a starting point for cheese converters to reference when beginning design discussions with their original equipment manufacturers (OEMs). It is essential both the OEM and cheese converter agree upon the machine safeguarding methods and options, as well as the standards that will be followed.

This type of collaboration will pave the way for future enhancements and innovations within the industry. Should WCMA members express interest in expanding the Tier I Equipment List, the peer group may elect to complete an amended document in the future.



Peer Group Members

Cheese Industry Companies

Wisconsin based organizations that produce, process, convert and/or provide cheese products to institutional and retail food companies.

Original Equipment Manufacturer

Provided insight about their risk management activities throughout the equipment design and manufacturing processes; and implication and adaptation of technology.

Risk Management Consults

Insurance brokers offer workers compensation and product liability insurance placement and insurance program design, as well as, occupational safety and ergonomics injury prevention, and claim consulting services.

The Wisconsin Cheese Makers Association (WCMA)

This non-governmental organization acts to represent the interests of cheese producers and promoting best practices.

United Approach

Machine Safeguarding is Essential for Multiple Reasons

Employee Safety

The primary objective of machine safeguarding is to protect workers and bystanders from hazards associated with machinery.

This includes preventing contact with moving parts, exposure to extreme temperatures, and risks from flying debris.

Reputation Management

Companies prioritizing safety enhance their reputation in the market, attracting potential clients and employees.

Operational Efficiency

Properly safeguarded machines are less likely to cause injuries to workers and bystanders, leading to fewer operational disruptions.

Regulatory Compliance

Adhering to safeguarding standards is a legal requirement.

Non-compliance can result in severe penalties, including fines and shutdowns.

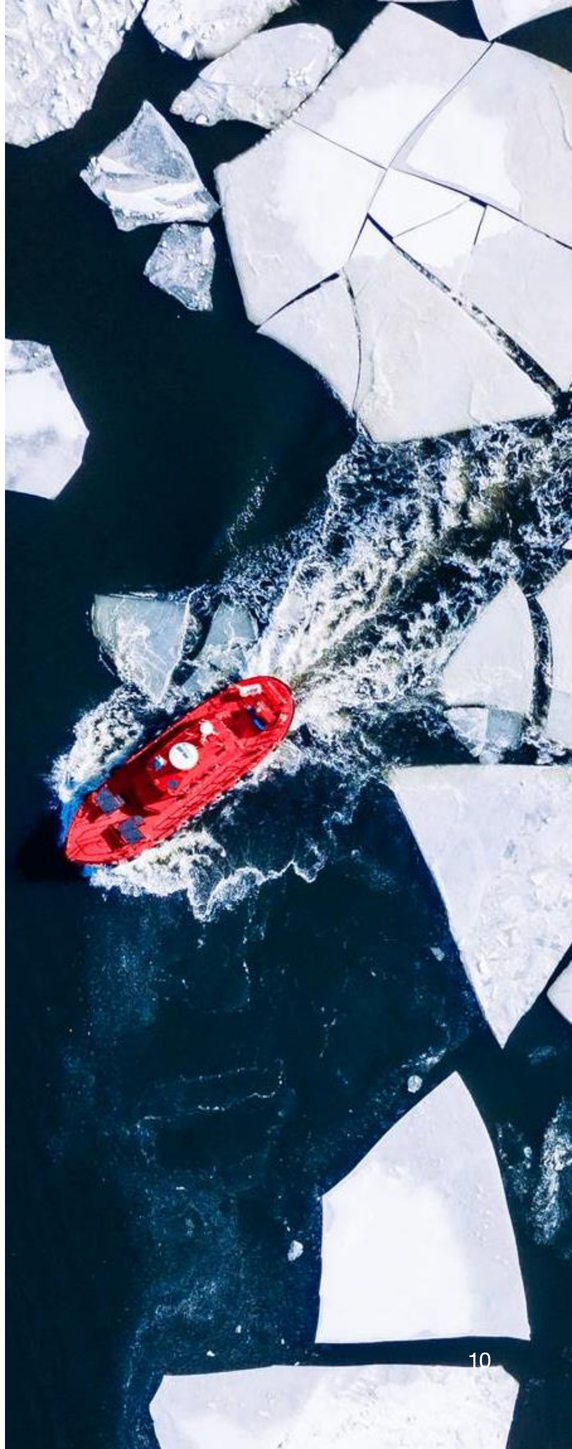
Summary

The document was created as a result of Paul Rutledge's vision for developing a reference document (e.g., available assessment tools, written program elements, machine safeguarding glossary, etc.) for industry-specific equipment and continued communication among assorted industry professionals. Providing this resource will help cheese converters navigate the challenges of equipment safeguarding in the food industry.

Paul Rutledge

Vice President of Risk and Loss Control

Masters Gallery Foods, Inc.



Machine Safeguarding Principles

Safeguarding approaches used by safety professionals

Guarding Principles and Concepts[1]

Areas Requiring Safeguarding

Point of Operation

The area on a machine where work is **actually performed** on the material being processed.

Examples include cutting, slicing, sealing, shaping, forming.

Power Transmission Apparatus

All components of the mechanical system that transmit energy to the part of the machine performing the work.

These components include flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, and gears.

Other Moving Parts

All parts of the machine which move while the machine is working include, but not limited to, reciprocating, rotating, and transverse moving parts, as well as feed mechanisms and auxiliary parts of the machine.

[1] Compiled from Aon Casualty Risk Control resources and various regulatory sources.

Hazardous Mechanical Motions

Rotating motion

This is dangerous because turning parts can grip clothing and through mere skin contact, force an arm, hand, or foot into a dangerous position.

Collars, couplings, cams, clutches, flywheels, shaft ends, spindles, meshing gears, and horizontal or vertical shafting are some examples of common rotating mechanisms which may be hazardous.

The danger increases when projections such as set screws, bolts, nicks, abrasions, and projecting keys or set screws are exposed on the rotating part(s).

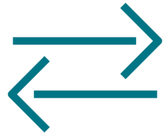
Nip point

Exposure to these kinds of hazards is caused by the in-turning sides of rotating parts. There are three main causes of nip points:

- Parts can rotate in opposite directions while their axes are parallel to each other. These parts may be in contact (producing a nip point) or near each other. In the latter case, the food or packaging materials fed between the rolls produces the nip points. Machines with intermeshing gears or bearings that pose this hazard are film rollers, tumblers or wrappers.
- Parts can rotate in the same direction with each other. Some examples would be the point of contact between a power transmission belt and its pulley, a chain and a sprocket, or a rack and pinion.
- A part can rotate among a fixed part creating a shearing or crushing action. Examples are spoked handwheels or flywheels, or screw conveyors. Tier I Equipment having these types of exposures include tumblers, conveyors, and anti-cake machines.

Hazardous Mechanical Motions

Motions



Reciprocating motions

This is hazardous because, during the back-and-forth or up-and-down motion, a worker may be struck by or caught between a moving and a stationary part.

Transverse motion

This exposure occurs when movement in a straight, continuous line creates a hazard because a worker may be struck or caught in a pinch point or shear point by the moving part.

Hazardous Mechanical Actions

Cutting Action

- The danger of cutting action exists at the point of operation where finger, arm, and body injuries can occur and where flying chips or scrap material can strike the head, particularly in the eyes or face.
  - Such hazards are present at the point of operation when cutting blocks of cheese, packing film, or other materials.
- May involve rotating, reciprocating, or transverse motion.
- Examples of mechanisms involving cutting hazards include cubers, shredders, slicers, dicers, etc.

Shearing Action

- Involves applying power to a slide or knife to trim materials.
- Hazard occurs at the point of operation where the product is inserted, held, and withdrawn.
- Examples of machines used for shearing operations are mechanically, hydraulically, or pneumatically powered shears.

Other Physical Hazards

Thermal burns

Caused by hot parts and processes used on sealing bars that close (seal) plastic packaging, steam piping used in cheese processes, or molten glue used to seal cases.

Ionizing and non-ionizing radiation

Some packaging machines use lasers to print code dates, x-rays to detect foreign objects in products or packaging, or UV light to cure inks.

Sources of radiation must be evaluated and guarded to prevent exposure.

Hierarchy of Controls and Common Machine Safeguarding Concepts

Various methods can be used to safeguard machinery effectively.

- Safety professionals use a concept called Hierarchy of Controls to determine how to prevent exposure to potential and actual hazards.
- The preferred method of preventing workplace injuries is to eliminate the hazard. If the hazard cannot be removed, engineering controls are often used.
- Machine guarding is a type of engineering control.
- Employee training, policy enforcement, and personal protective equipment are administrative controls and are the least effective if used as the sole technique to prevent injuries.

Hierarchy of Controls and Common Machine Safeguarding Concepts

Elimination/Substitution Controls

Prevent exposure (e.g., contact) among actual and potential hazard(s), employees and/or bystanders.

Example: Control Room

Workers perform or monitor production processes in separate/remote work areas.

This method can be used when industrial processes create life threatening situations, excessive temperature (e.g., steam, chemical reactions), noise or airborne contaminates; or when quality assurance practices require the prevention of introducing foreign materials into the production process.

Hierarchy of Controls and Common Machine Safeguarding Concepts

Engineering Controls

A barrier or other device is placed between the worker(s) and the actual and/or potential hazard(s).

Fixed Guards

Permanent barriers that prevent access to dangerous parts of the machine. They must be durable and tamper resistant.

Interlocked Guards

These guards shut off the machine when opened or removed, making them ideal for applications requiring frequent access for cleaning or adjustments tasks.

Adjustable Guards

Flexible guards that can be adjusted to accommodate different product sizes or operations ensuring safety while maintaining efficiency.

Distance

CFR 1910 Subpart O contains a minimum reach distance table based on anthropometric data, that if followed, minimizes the likelihood of worker(s) and bystander(s) to physically reach the point of operation. See Exhibit 1 for the distances.

Exhibit 1

CFR 1910 Subpart O – Machine Safeguarding Reach Distances

Distance from opening to point of operation hazard	Maximum width of openings
½ to 1½ inches	¼ inch
1½ to 2½ inches	⅜ inch
2½ to 3½ inches	½ inch
3½ to 5½ inches	⅝ inch
5½ to 6½ inches	¾ inch
6½ to 7½ inches	⅞ inch
7½ to 12½ inches	1¼ inches
12½ to 15½ inches	1½ inches
15½ to 17½ inches	1 ⅞ inches
17½ to 31½ inches	2 ⅛ inches

Hierarchy of Controls and Common Machine Safeguarding Concepts

Administrative Controls

By themselves, this category of safeguarding is the least effective as reliance on the worker and the management system is needed for control effectiveness. Common administrative controls include:

Pre-Start Up Safety Reviews

- Conducting inspections before starting machinery helps identify hazards missed during installation and production (e.g., ensures safety deficiencies are addressed prior to use). However, when paired with engineering controls they help maintain and overall machine safeguarding program.

Policies and Procedures

- Establishing written machine guarding program with clear policies and procedures helps ensure consistent application of safety measures.

Risk Assessment Process

- Identifying potential hazards and implementing appropriate safeguarding measures to mitigate risks is crucial for maintaining a safe work environment. Risk assessments occur at various stages of equipment design, selection, installation and daily operations.

Regular Inspections and Maintenance

- Routine checks and maintenance of safety devices and guards ensure they remain effective and in good working condition.

Tier 1 Equipment

Potential Hazards and Controls

Tier 1 Equipment[1]

Potential Hazards and Controls

The cheese converting industry has many types of equipment and this section highlights common hazards related to specific production equipment identified by the authors.

The equipment is referenced as Tier I Equipment, and identifies potential hazards associated with each type of equipment. The materials presented in this section can be used by the cheese converters when interacting with their OEMs to promote consensus regarding common hazards and machine guarding approaches.

The Tier I Equipment includes:

- 640 Cutters
- Anti-cake Machines
- Conveyors
- Film Rollers or Wrappers
- Shredding Machines
- Tumblers
- Palletizers

[1] For the purposes of this document, the equipment listed will be referred to as the Tier I Equipment. Tier I Equipment is defined as: Production equipment commonly used to change the shape and/or output of the cheese as it advances during the converting process.

Potential Hazards and Controls

The cheese industry uses a variety of machinery not included in the Teir I Equipment list that could require guards.

It is up to the employer to identify equipment specific safeguarding needs and install appropriate devices and practices to prevent injuries to employees and bystanders.

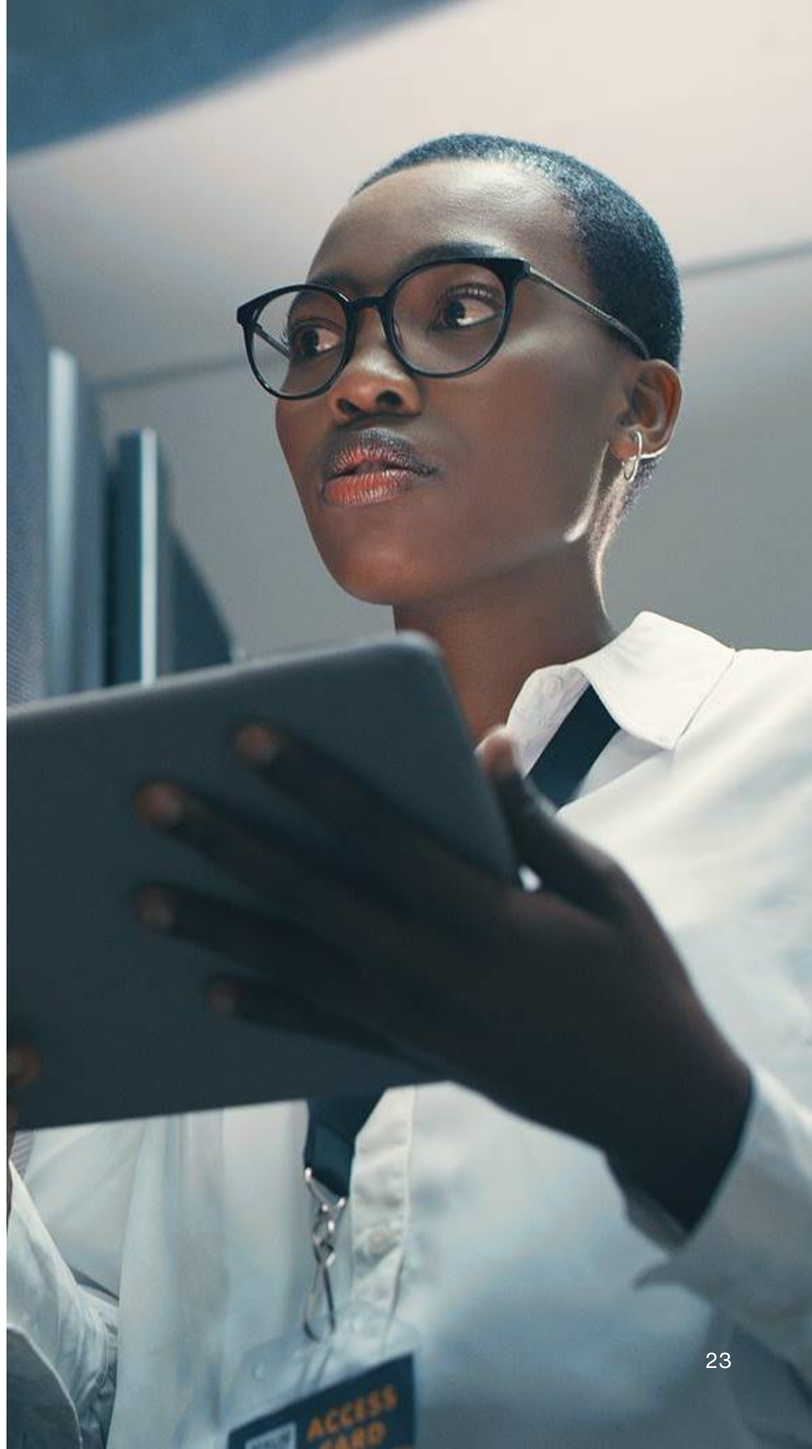
Other common workplace machinery related exposures faced by food manufacturers include but is not limited to:

Slip Hazards

Wet or oily floors around equipment create a variety of hazards increasing the risk of falls causing injuries like fractures sprains, strains, and bruises, as well as risks associated by falling onto or into equipment leading to cuts, amputations, or being caught in moving parts.

Trip Hazards

Hoses, packaging materials (e.g., excess film, pallets, boxes), and uneven walking surface increase the likelihood of falling and causing injuries like fractures, dislocated joints and bruises as well as, falling onto or into equipment causing bruising, cuts, amputations, or being caught in moving parts.



Potential Hazards and Controls

Electrical Hazards

Damaged cords, exposed wiring, or improperly grounded equipment can lead to electrical shocks. Interlock guards that do not function properly can also lead to a variety of injuries like being caught in or being struck by moving parts.

Struck-by Hazards

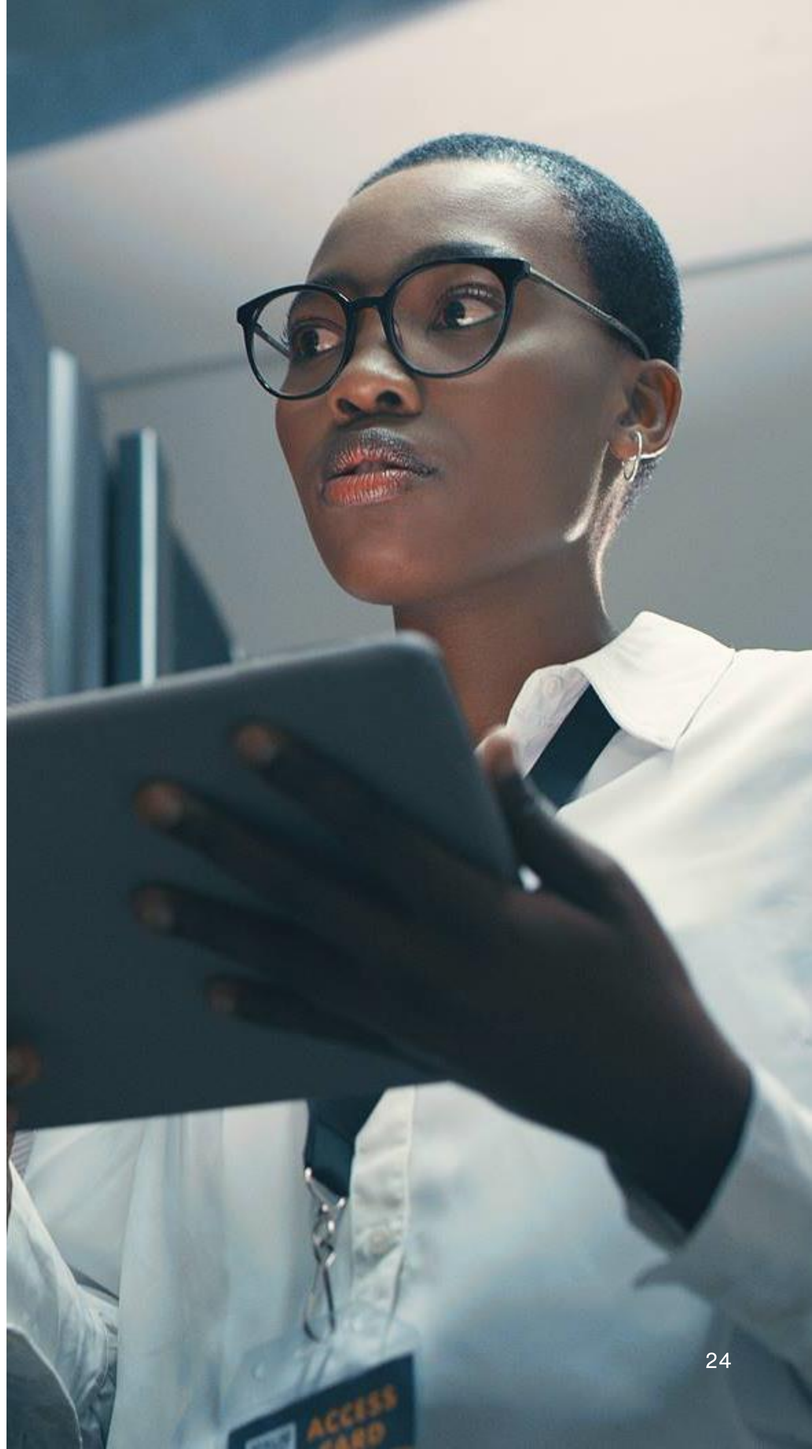
Rolling, falling, and swinging objects or pieces of equipment can strike employees working below or on the same level leading to a variety of injuries. Improperly guarded palletizing equipment can contribute to injuries when a worker is hit by a robotic arm.

Caught in-between Hazards

Improperly guarded palletizing equipment can injure employees if they are caught between stationary objects and other mechanical processes.

Maintenance and Inspection Tasks

While working on/around equipment, maintenance employees are exposed to significant and life-threating injuries like electrocution and amputations. Engulfment, as well as asphyxiation can occur when working in confined spaces (e.g., vats, holding tanks). It is crucial to identify and control these exposures to eliminate or minimize injury potential. Often other OSHA regulations need to be contemplated to ensure compliance with the unique situation.



Potential Hazards and Controls

The ISO 12100 consensus standard contains hazard definitions and Exhibit 2 lists common hazards related to machine guarding and applicable to Tier I Equipment.

Cheese converters can use the ISO 12100 methodology as it is an adaptable framework for assessing the presence of hazards not listed previously. Many OSHA regulations require employers to complete risk assessments and as such, employers conduct numerous types of evaluations to identify compliance triggers.

The information contained in this document is specific to machine guarding hazards only (i.e., does not address Control of Hazardous Energy) and is provided as a guide. The information should not be considered inclusive of all workplace exposures.

Exhibit 2

ISO 12100 Hazard Category Summary

Hazard Type	Description
Mechanical	Hazards associated with moving parts of machinery, such as gears, belts, and rotating shafts; Injury can occur when a worker's hand or other body part is caught in a rotating shaft or when a worker's arm is crushed between two moving parts of a machine; Other mechanical examples include: • **Shearing:** Injuries caused by sharp edges or moving parts cutting through flesh, like a guillotine • **Cutting:** Injuries from sharp edges or moving parts cutting through product like a knife • **Catching:** Clothing or body parts being caught in moving parts, like a conveyor belt or pulley • **Drawing in:** Being pulled into a machine or moving parts, like a conveyor belt or auger • **Stabbing:** Being injured by sharp objects or moving parts, like a needle • **Pushing:** Being pushed by a moving part or object, like a palletizer or block cutter
Thermal	Burns, frostbite, scalds injuries from contact with high or low temperatures; Burned by hot surfaces, liquids, steam or experiencing frostbite from prolonged exposure to cold machinery or cryogenic materials.
Radiation	Skin, tissue or eye damage, genetic mutation when exposed to ultraviolet light, ionizing radiation; Injuries can occur when workers are exposed to x-rays and certain classifications of lasers, welding arcs, etc.
Substances	Bodily injuries resulting from exposure to chemicals (e.g., poisoning), infections resulting from contact with bacteria or bloodborne pathogens, or injuries from exposure to explosive materials or conditions.

Potential Hazards and Controls — Equipment

640 Cutters

Used to slice cheese products. This type of cutter is commonly used at the start of a converting process as 640 lbs. blocks of cheese enter the production line.

Common Hazards and Controls

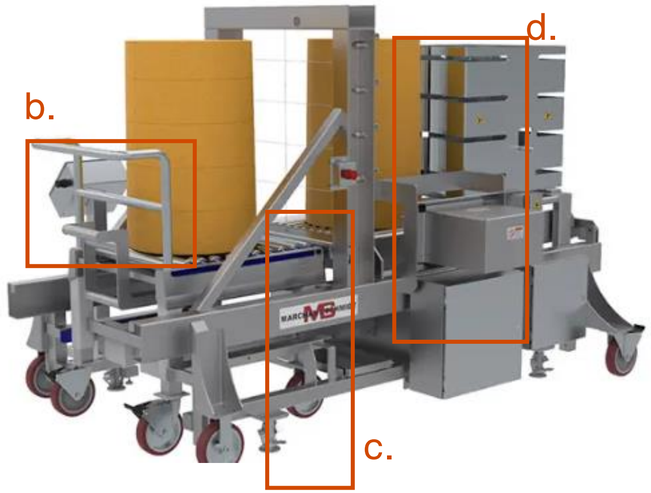
Caught in, pushing, shearing as product is passed through the harp wire

Auto block cutters should have full exterior guarding, access doors with safety interlocks, or fencing with light curtain protection for entry and exit of the product or physical barriers long enough to prevent access to hazards (a.).

Manual block cutters need dual hand control with sole operator training defining responsibility to avoid movement when other employees can gain access to machine or product in process (a. and b.).

Struck by when material falls/drops or when picking trim (c. and d.).

Tier 1 Equipment Hazard and Control Summary[1]



[1] Equipment images from www.marchantschmidt.com

Potential Hazards and Controls — Equipment

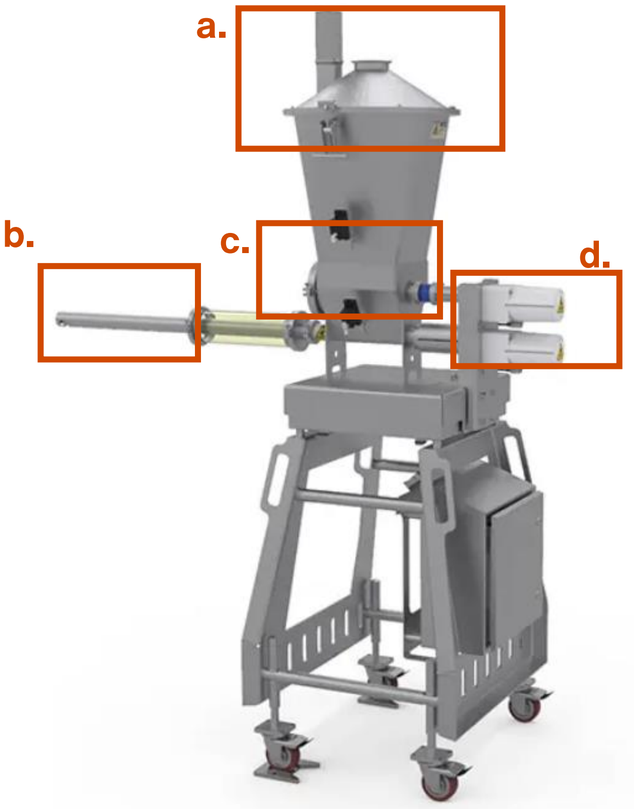
Anti-Cake Machines

Machines dispense dry powder that prevents shredded, diced or cubed cheeses from clumping or sticking together.

Common Hazards and Controls

- Anti-cake lid in open position — Secure lid to prevent unintended closure; If auger is accessible when lid is open, the opening to the auger should be guarded in accordance with CFR 1910 Subpart O Reach Distances or an interlock installed on lid to stop the auger when lid is open (a.).
- While the cover is open for anti-cake filling ensure lid is secure and cone is tall enough to prevent access to the auger (CFR 1910 Subpart O Reach Distances) (a.).
- Cutting, shearing and drawing in while anti-cake product is being introduced to process:
  - Rotating agitating auger at base of cone.
  - Rotating discharge auger.
  - Rotating end shaft for agitator auger/discharge auger.
- All openings of dispensing auger must comply with CFR 1910 Subpart O Reach Distances (b.).
- Common controls to comply with CFR 1910 Subpart O Reach Distances (c.) include:
  - Fixed grating at the top of the cone, allowing power to fall through but prevent bodily access.
  - Safety interlock on cone cover, which disengages auger while cover is open.
- Agitation and dispensing auger end shaft — Any end shaft extending beyond ½ its diameter or possess key/set screw must be fully guarded CFR 1910 Subpart O Reach Distances (d.).

Tier 1 Equipment Hazard and Control Summary[1]



[1] Equipment image from www.marchantschmidt.com

Potential Hazards and Controls — Equipment

Conveyors

Used for transporting materials and products throughout the entire converting process.

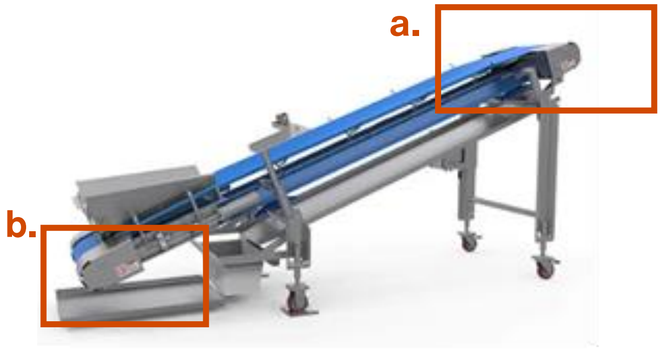
Variety of conveyor configurations exist and the ANSI B20.1 conveyor standards should be followed to ensure proper guarding is present for each specific application.

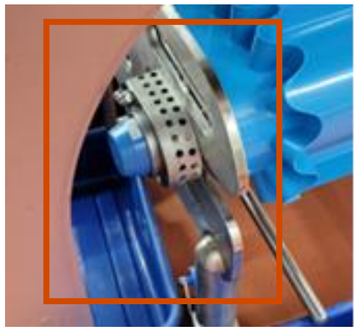
Common Hazards and Controls

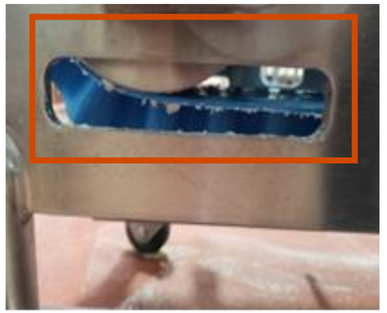
- Drive/idler roller nip points between belt and roller. (a. and b.).
- Conveyor transition speed of each conveyor is critical to avoid pinch hazard.
- Rotating shafts from inside conveyor to the drive roller-entanglement hazard (c.).
- All bearings need covers - align with Quality and food safety on weep holes (c. and d.).
- Sanitation clean out ports on framework-shearing hazard (e.).
- Belt tensioners — if too tight causes challenges with idler rollers.
- Conveyor transitions-fixed vs. mobile (conveyor to conveyor).
- Product rejection arms-check weight, metal detector, and x-ray.
- Clean-in-place belts and chain vs. disassembly (must consider sanitation)
  - How do you safely clean a belt in place when it is running?
  - When do you remove guards for cleaning a moving conveyor?
- Belts and chain conveyor material are guards themselves. If they are damaged in any way there is a gap (hazard) created.

[1] Equipment images from www.marchantschmidt.com

Tier 1 Equipment Hazard and Control Summary[1]







Potential Hazards and Controls – Equipment

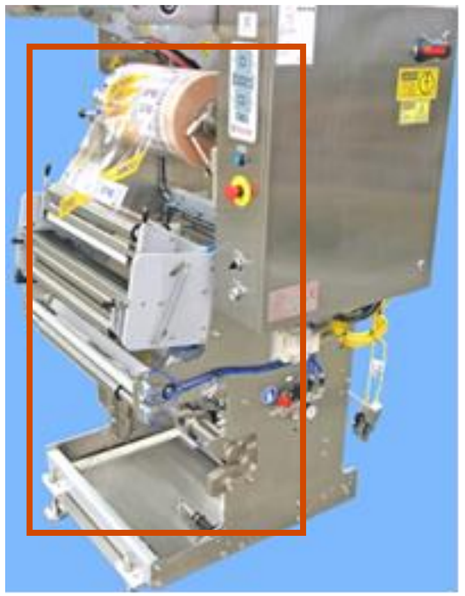
Film Rollers or Wrappers

Used in packaging and labeling process.

Common Hazards and Controls

- In-running nip points contribute to being caught in or drawn in equipment while inserting new rolls of film.
- Struck by when film and other materials falls/drops to the floor.
- Burns from sealing bars or stamping product labels into film.
- Fixed barrier guards covering the nip points with interlocks that stop rollers when cover is removed or open.
- Interlocked guards stop rollers when cover is open.
- Access sealing bars should be guarded or OSHA distances followed (CFR 1910 Subpart O – Machine Safeguarding Reach Distances).

Tier 1 Equipment Hazard and Control Summary[1]



[1] Equipment image from www.marchantschmidt.com

Potential Hazards and Controls – Equipment

Palletizer

Used to place finished goods on a pallet for storage or shipment; Equipment is often paired with robotic or vacuum pick and conveyors.

Common Hazards and Controls

- Physical fence around apparatus (a.)
  - Doghouse guards on infeed that do not allow contact with the end of arm tooling (EOAT).
  - Removable key system for entry required to prevent restart; or doors need to be physically locked open-administrative control.
- Presence sensing devices (e.g., light curtain, safety laser scanner systems)
  - Light curtain on pallet exits.
  - Light curtain for empty pallet magazines.
  - Light curtains for slip sheet magazines.
- Interlocked doors
  - Category 3 or 4 safety circuitry for doors or tool required fasteners.
- Teaching pendant administrative controls-only use when outside fencing.
  - Program home for all stops and starts.
  - Program to remove bad pallets from finished product pallet conveyor
  - Documented SOP for clearing product jams.
  - Maximum speed slow down when approaching the physical guarding.
- Cobot - Collaborative robot intended for direct human robot interaction within a shared space, or where humans and robots are in close proximity. Commissioning and start up risk assessment is suggested.
- Internal movement sensors can differentiate from the robot arm movement.

Tier 1 Equipment Hazard and Control Summary[1]

a.

Potential Hazards and Controls – Equipment

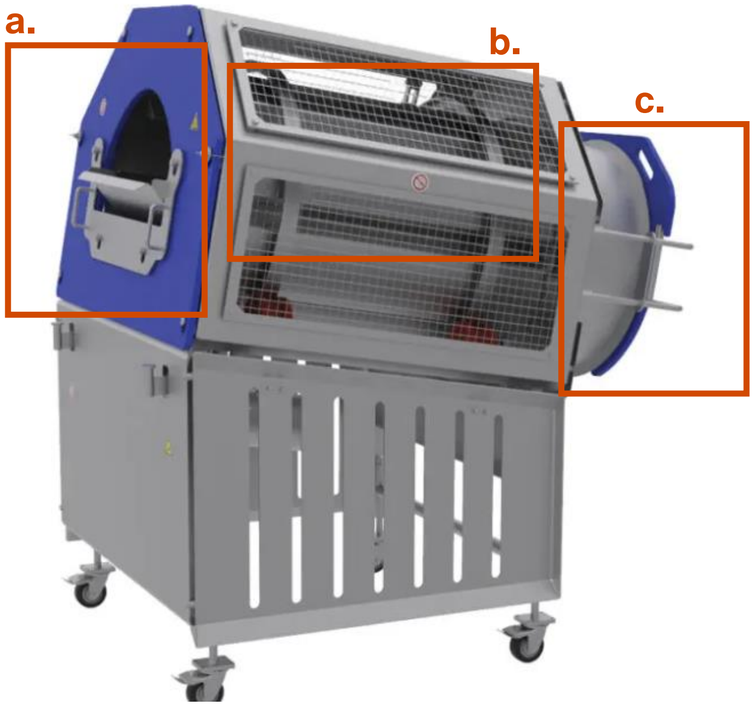
Tumblers

Machines that mix or tumble products to ensure uniformity.

Common Hazards and Controls

- Caught in revolving drum, entanglement in rotating parts, in-running nip points between rotating drum and bearings (a., b. and c.).
- Pinch points between moving parts and infeed/outfeed conveyors (a. and c.).
- Burns, skin irritation when equipment crevasses/pockets inside drum retain chemical used in sanitation (b.).
- Barrier guards/fencing around drum (b.).
- Struck by/caught between when moving equipment for setup, tear down and sanitation or when moving equipment on casters.
- PPE to prevent exposure to chemical procedures ensuring drums drain adequately.

Tier 1 Equipment Hazard and Control Summary[1]



[1] Equipment Image from www.marchantschmidt.com

Potential Hazards and Controls – Equipment

Shredders

Machines that are used to convert pre-cut block cheese or trim into shredded cheese.

Common Hazards and Controls

- Struck by/caught between when moving equipment for setup, tear down and sanitation or when moving equipment on casters.
- Caught in rotating parts.
- Cutting/severing from sharp parts.
- Barrier guards/shrouds.
- PPE cut resistance gloves when exposed to or to handle cutting knives.

Tier 1 Equipment Hazard and Control Summary[1]

[1] Equipment image from www.marchantschmidt.com

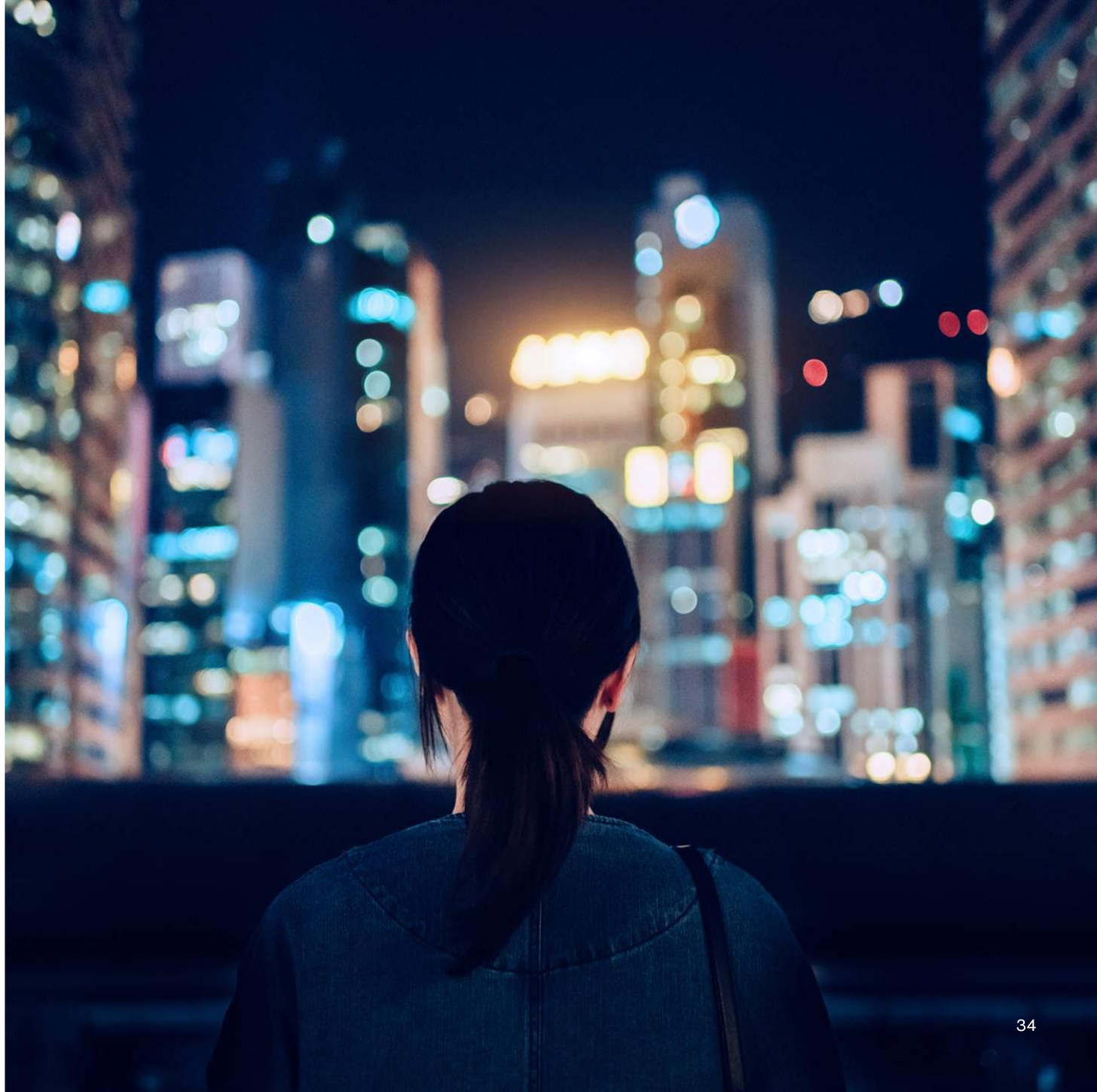
Stakeholder Roles and Standards

Stakeholder Roles and Standards

This is a summary of the individual stakeholders' typical function, roles and responsibilities relating to equipment guarding.

Using the materials referenced provides cheese converters and OEMs with tools to promote injury prevention, new and retrofit installation compliance, and offers practical information to address unique equipment configurations.

Regulatory considerations noted related to OSHA and consensus standards like ANSI and ISO.



Stakeholder: Original Equipment Manufacturers

It is the responsibility of OEMs to ensure machines they design, build, distribute, sell, install, and/or service are safe. This presents challenges to OEMs as technological advancements often outpace governmental and consensus standard promulgation and society's propensity to litigate. Original equipment manufacturers procure product liability insurance as a risk mitigation technique.

Product liability insurance is a contract between the insurance company and the OEM providing financial protection from activities that cause loss to a third-party. Product liability is a term used to describe the legal liability of manufacturers or sellers of goods to compensate buyers, users and even bystanders for damages or injuries suffered because of defects in the goods purchased.[1] Proving the claim usually involves one or more of the three basic theories of liability: negligence, breach of contract/warranty, and strict liability[2] and are defined as:

- **Negligence:** The manufacturer fails to exercise reasonable care.
- **Strict liability:** Holds OEM accountable for defects regardless of the care level.
- **Breach of warranty:** Focuses on a product's failure to fulfill its stated promises.[3]

[1] Introduction to product liability law | The Hanover Insurance Group
[2] https://www.cozen.com/admin/files/publications/2381648.pdf?embed=1
[3] Elements of a Product Liability Claim

Stakeholder: OEM

Product Liability Risk

A product liability risk mitigation program aims to minimize the risk of lawsuits and damages by proactively addressing potential hazards and defects in products. A program includes elements like risk assessment, design safety, supplier management, record-keeping, customer feedback, and legal considerations.

- **Product Risk Assessment and Hazard Identification:** Evaluations are performed regularly throughout the equipment manufacturing process to identify and mitigate potential hazards.
- **Design, Manufacture, and Maintenance:** OEMs design equipment with built-in safeguards to protect users from inherent hazards from the outset. Supplier management (e.g., supplier qualification and quality control processes) and product qualification (e.g., testing and evaluation of finished products) ensures items meet safety standards and performance expectations. Documents related to the instruction and maintenance are also considered as part of the equipment.
- **Record-Keeping and Traceability:** Detailed records are kept of product design, manufacturing processes, testing results, and customer feedback.
- **Customer Feedback and Monitoring:** Channels for customers to report issues and provide feedback on product performance and safety are typically in place.
- **Legal and Insurance**: Understand emerging trends and relevant product liability laws and regulations. Often, OEMs provide education to their employees on the safe use of machinery and the importance of safeguarding measures.

OEMs must manufacture equipment with safeguards to protect users and other third parties from inherent hazards present in the equipment the OEM designs and makes that could cause a loss.

Stakeholder: Cheese Converter

Employers have two primary requirements related to workplace safety:

Provide a workplace free of recognized hazards

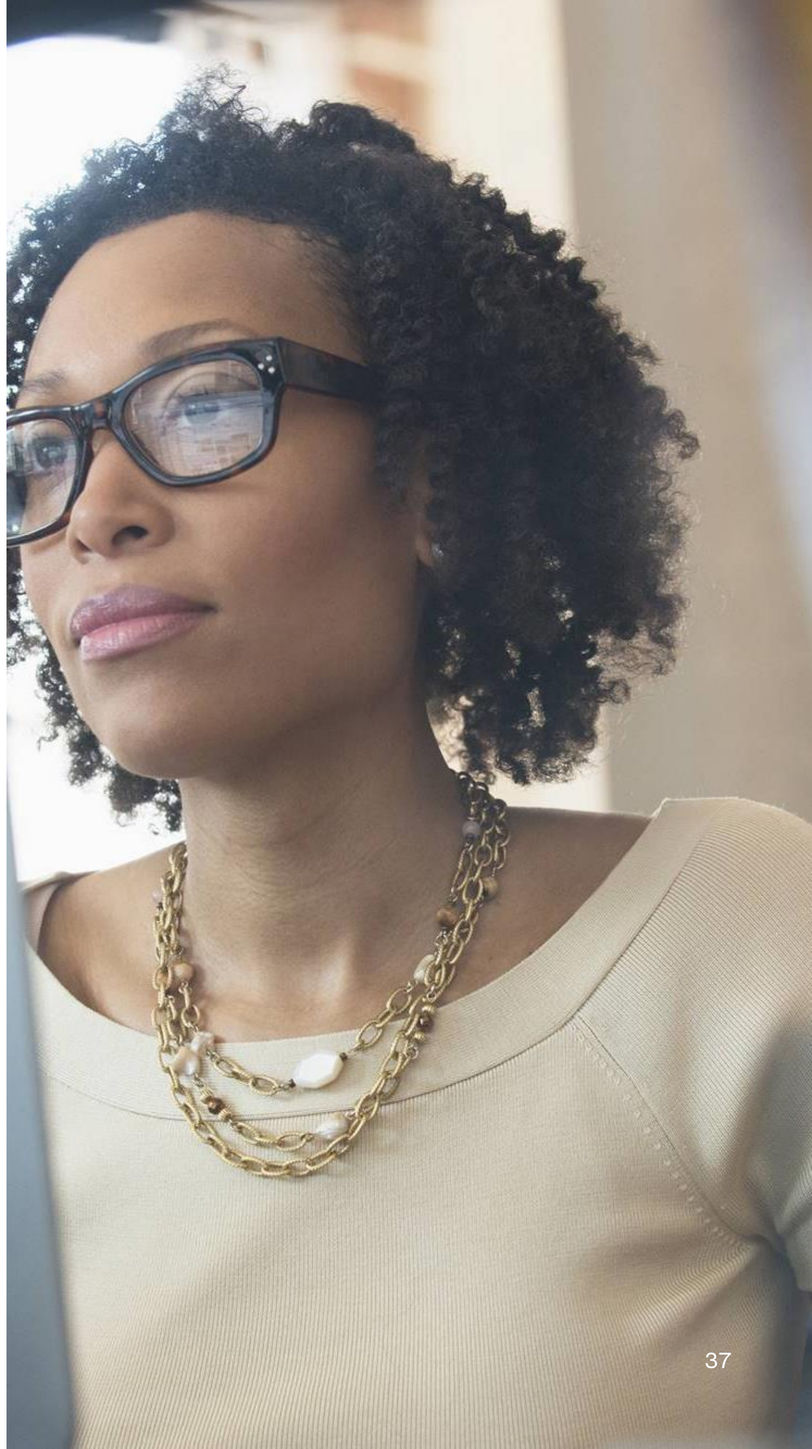
(i.e., OSHA General Duty clause)

Purchase workers' compensation or employers' liability insurance

This insurance pays for medical care and provides wage replacement to workers who are injured while in the "course or scope of employment"

Course and Scope of Employment

This refers to the activities an employee is expected to perform as part of their job, and the employer can be held financially responsible for damages (e.g., injuries) if the employee is harmed within that scope.



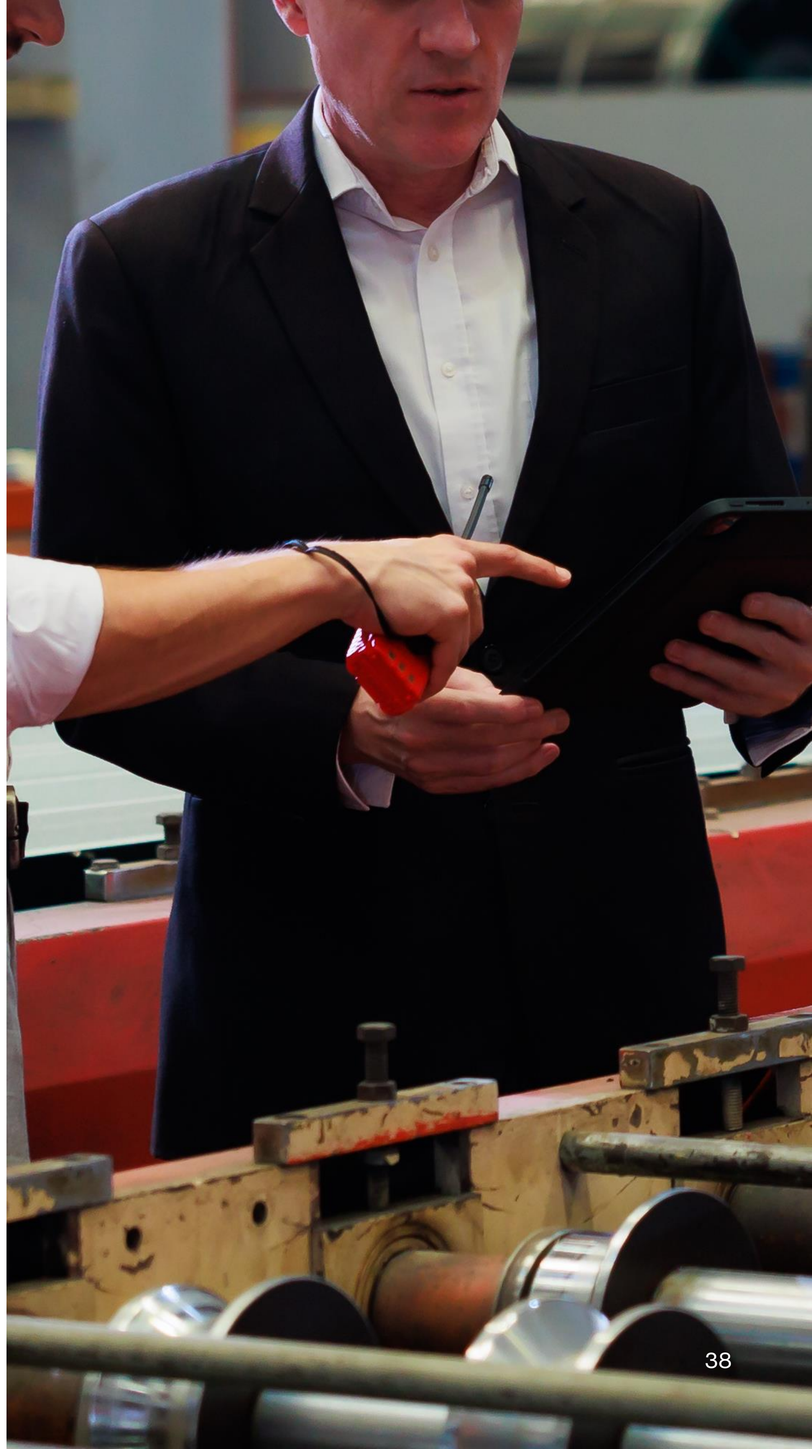
Stakeholder: Cheese Convertor

Factory Acceptance Testing (FAT) — Minimize Hazards Prior to Installation

To minimize hazards prior to installation, cheese converters and OEM should complete factory acceptance testing (FAT).

This will help to ensure equipment meets the cheese converter's specified requirements.

Often a formal process is followed and documented.



Factory Acceptance Testing (FAT)

Elements frequently included

Documentation Review

Ensure relevant documentation, including manuals, specifications, and drawings, are complete and accurate

Verify documentation aligns with the equipment's design

Functional Testing

Confirm equipment functions as intended, based on the design documents

Check functionalities, including start-up, shutdown, and operation

Performance Testing

Measure equipment's performance against specified criteria, such as speed, capacity, and accuracy

Verify performance meets contractual requirements

Safety Checks

Evaluate safety features, such as guards, interlocks, and emergency stop buttons, for compliance with standards

Ensure safety systems are properly configured and functional

Environmental Testing

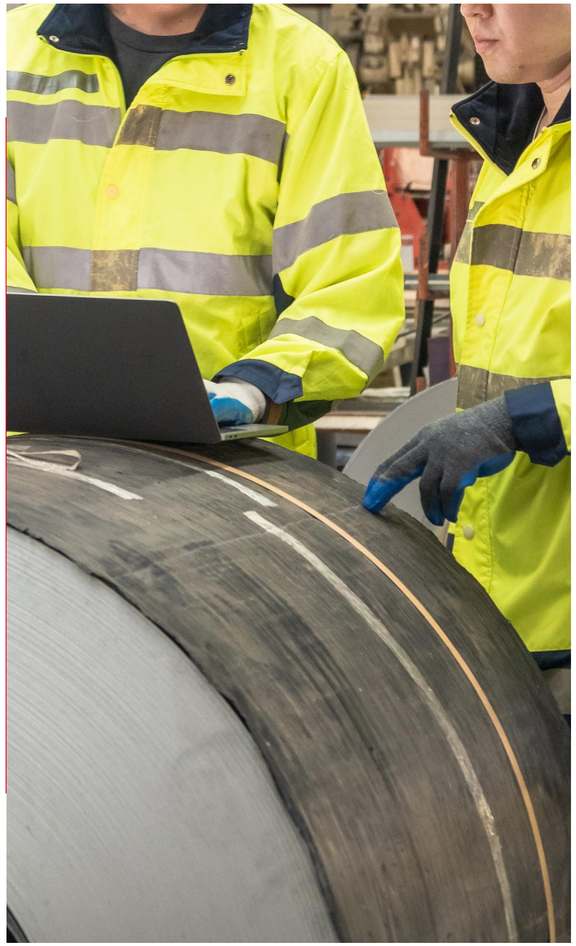
Assess equipment's reliability under various environmental conditions, such as temperature, humidity, and vibration

Verify equipment can operate without issues in the intended operating environment

Interface Testing

Check compatibility with other systems and devices the equipment will interface with

Ensure seamless integration and communication between different components



Factory Acceptance Testing (FAT)

Elements frequently included:

Alarm and Error Handling

Confirm equipment effectively detects and handles alarms and errors

Verify alarms are displayed appropriately and error handling procedures are in place

Calibration and Measurement

Ensure sensors and other measuring instruments are calibrated correctly

Verify measurements are accurate and reliable

Sign-off and Approval

Obtain signatures from relevant parties (e.g., safety representative, engineers, production and maintenance personnel) to confirm successful FAT completion

Document any outstanding issues or corrective actions required

Electrical Testing

Examine electrical components for compliance with standards and safety regulations

Verify electrical connections are secure and electrical circuits are functioning correctly

Stakeholder: Miscellaneous Parties

Cheese Convertor Customers

Many customers of cheese converters require the cheese convertor provide a safe workplace and the cheese convertor's customer may conduct audits to verify compliance with safety regulations and other internal quality standards.

During the audit a customer representative (or team) will likely tour the cheese convertor’s operation thereby exposing the representative(s) to potential exposure to injury.

Some audits require a review of the cheese convertor’s safety program(s) as an indicator of overall management strength and commitment to food and worker safety.

Stakeholder: Miscellaneous Parties

Insurance Company Safety Representatives

Insurance company representatives often seek to inspect their policyholder's business as part of the underwriting process.

- Inspections include a review of the physical workplace and condition
- Gather insights from interviews (e.g., supervisors, frontline employees, site leadership)
- Undesirable findings, (e.g., recommendations) are given to the policyholder with directions to inform the underwriter when compliance is achieved.
  - Insurance carriers expect recommendations will be addressed timely.
  - These types of inspections are also performed on a prospective basis, meaning the insurer representative will survey the site before making an underwriting decision.
- Charged with reporting uncontrolled exposures to underwriter(s); estimating damage in the event of a loss; and offering opinions on the attractive of the risk (business) from an exposure control standpoint.

Stakeholder: Miscellaneous Parties

Insurance Broker Safety Representatives

Insurance Broker Resource

Acting on the best interest of their client

Insurance Carrier Representative

Looks out for the interest of the insurance company they represent

Many insurance brokers have occupational safety and injury prevention specialists that will assist cheese converters with the design, build and implementation of machine guarding programs that comply with regulatory requirements and industry standards.

Also, insurance broker injury prevention staff consult with clients who are OEMs to eliminate and mitigate product liability risks, assist the OEM in communicating to underwriters the various risk management controls in place to mitigate injury potential.

Standard: OSHA Requirements

Represents State and Federal Plan as of June 30, 2025

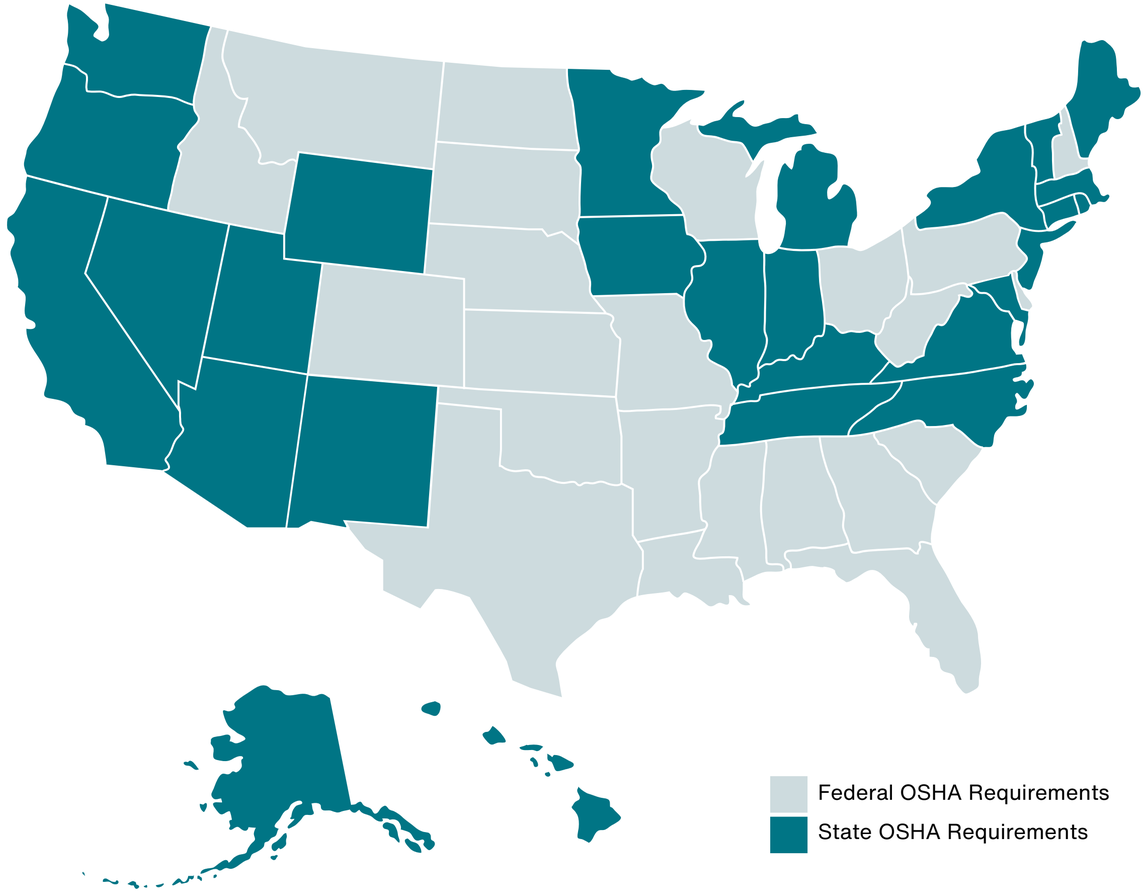
The Occupational Safety and Health Act (OSH Act) was signed into law by President Nixon on December 29, 1970, and the Occupational Safety and Health Administration (OSHA) was established on April 28,1971, as the primary enforcement agency.

The regulations were a means to:

- **Prevent** job-related injuries, illnesses, and death,
- **Ensure** safe and healthy working conditions, and
- **Reduce** the rate at which Americans were being injured or killed at work.

The OSH Act allows:

- Each state the option of creating a set of state-specific regulations
- The state specific OSHA requirements are enforced at the state level.
- Wisconsin is a Federal OSHA state.



General OSHA Industry Regulations

The General Industry OSHA regulations are found in the Code of Federal Register (CFR) 29 1910.

The principal machine safeguarding standard is found in 1910.212 and is the basis for OSHA referenced items in this document. The requirements of CFR 1910.212 have not been changed since the formation of OSHA, however OSHA can adopt and enforce consensus standards, as well as use Letters of Interpretation to determine compliance. Additionally, OSHA can cite employers under the General Duty Clause, which is found in Section 5(a)(1) of the OSH Act. The General Duty Clause states:

(a) **Each employer**

- 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;
- 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.

[1] There are machine safeguarding standards for specific types of applications (e.g., wood working machinery 1910.213) that are not contemplated within this document.

Other OSHA Regulatory Considerations

Control of Hazardous Energy and Electrical Safety

The OSHA standard for the Control of Hazardous Energy, also known as **Lockout/Tagout** or **LOTO**, addresses the practices and procedures necessary to de-energize machinery or equipment, thereby preventing the release of hazardous energy while employees perform servicing and maintenance activities.

The standard, located in CFR 29 1910.147, outlines measures for controlling hazardous energies — electrical, mechanical, hydraulic, pneumatic, chemical, thermal, and other energy sources. In addition, 29 CFR 1910.333 sets forth requirements to protect employees working on electric circuits and equipment.

These standards require workers to use safe work practices, including lockout and tagging procedures, and apply to employees who are exposed to electrical hazards while working on, near, or with conductors or systems that use electric energy.

Cheese converter machine guarding programs should confirm the various applicable safety standards complement one another and do not have conflicting procedures.

Standard: Consensus — ANSI and ISO

ANSI — American National Standards Institute

ANSI is a U.S. based private, not-for-profit organization that develops and promotes standards in the United States and globally.

ANSI's primary role is to accredit standards developers. ANSI does not write standards; it accredits organizations that do.

ANSI standards are used in various industries, safety, and product design.

ISO — International Organization for Standardization

ISO is globally recognized guidelines and specifications developed by this organization.

The standards aim to establish internationally recognized specifications and guidelines for various products, processes, and services, promoting consistency, quality, and safety globally. They serve as a framework for businesses to improve their practices, reduce risks, and achieve operational excellence, ultimately facilitating international trade and collaboration.

ISO has standards for a wide range of topics impacting cheese converters, including health and safety, food safety, quality management, environmental management, to ensure products and services are reliable and safe.

Conclusion

Conclusion

Machine safeguarding is a critical aspect of industrial safety.

By implementing robust safeguarding measures, companies can protect their employees, ensure compliance with regulatory standards, and promote their operational efficiency.

This document is a resource to help cheese converters understand the importance of safeguarding and provides information to use when implementing effective safety measures.

Through diligent application of these principles, the cheese industry, along with other food manufacturers, can achieve a safer and more productive workplace.

Appendices and Resources

Appendices and Resources

The appendices provide additional resources to enhance machine safeguarding practices.

They include examples of techniques, tools, and resources available to promote a unified strategy for addressing human safety concerns.

The appendices aim to help cheese converters make informed decisions based on industry-specific equipment and guidelines.

Addressing the shared challenges to human safety while balancing the need for flexibility will help cheese converters to:

- **Enhance injury prevention principles and compliance** with safety regulations for new equipment entering the production environment.
- **Assist converters and OEMs** in achieving a higher degree of safety compliance with the Tier I Equipment referenced in this document.
- **Provide practical information** tailored to the needs of converters and OEMs.

While each machine guarding configuration is unique, the peer group provided materials that can be adapted when considering new or retrofit equipment applications.

Using this section will allow cheese converters to make informed decisions based on industry-specific equipment and guidelines and move away from “this is how they build it” or “it’s always been done this way” thinking.

Appendix A
Machine Guarding Program Elements

Documentation is an essential component to a company's safety program.

A program is more than a set of rules or training classes. Programs outline performance expectations, internal requirements, and protocols triggering formal reviews and revisions. The program document can be considered a reference source for those affected by named program.

To ensure the machine guarding program is drafted and implemented as intended, a task force is often created. Membership typically represents a cross-function of operational, engineering, and business service roles like human resources and occupational safety.

In the food manufacturing industry, ensuring machine guarding standards is crucial for maintaining safety and compliance. Different job titles have specific roles and responsibilities related to equipment safeguarding and commonly include the functions noted on the following pages.

Sample of Machine Safeguarding Task Force Member Roles

Job Title	Functional Role	Machine Guarding Program Role
Site Leader	Oversees entire manufacturing facility, ensuring all operations run smoothly and efficiently.	Ensure program elements are followed, and resources are available to mitigate hazards requiring machine guarding when identified. The plant leader also coordinates with other department and organizational resources (i.e., corporate risk management) to address safety concerns and improve overall safety practices.
Production Supervisor	Production supervisors monitor the day-to-day operations on the manufacturing floor.	Enforce program policies, participate as requested in assessment tasks, solution development, bring forward existing or potential hazards when identified. They address safety concerns arising during production.
Frontline Operator	The frontline employees are directly involved in the operation of machinery.	Follow program policies, participate as requested in program elements, complete required training, notify operational leaders of existing or potential hazards when identified.
Maintenance Engineer	Maintenance engineers are responsible for the upkeep and repair of machinery.	They ensure all machine guards are in place and functioning correctly and perform regular inspections to identify and address potential hazards.

Sample of Machine Safeguarding Task Force Member Roles

Job Title	Functional Role	Machine Guarding Program Role
Safety Manager	The safety manager oversees the implementation and enforcement of safety protocols. They conduct risk assessments, develop safety training programs, and ensure compliance with regulations. Commonly the primary author of the written documents.	Primary expert as it pertains to injury prevention principles, regulatory compliance expectations and performance feedback. Will work with other internal resources to ensure machine guarding program requirements do not conflict with other programs.
Quality Control	Quality control ensure products meet safety and quality standards.	Ensure machinery used in production does not increase food safety risk while being compliant with machine guarding regulations.
Food Sanitation Specialist	The food sanitation specialist is responsible for ensuring that all machinery and equipment are clean and sanitized according to food safety standards. They ensure machine guards are not only in place but also clean and free from any residues that could compromise food safety.	Ensure food sanitation standards and machine safeguarding standards can be met simultaneously and without comprise. They work closely with the maintenance engineer and production supervisor to ensure sanitation procedures are integrated with machine guarding standards.

Sample of Machine Safeguarding Task Force Member Roles

Job Title	Functional Role	Machine Guarding Program Role
Human Resources Manager	The HR manager plays a role in ensuring all employees receive proper training on machine guarding standards. They also handle documentation and compliance with safety regulations.	Ensure employees receive new hire and on-going training as required by the program, support training program content development (i.e., facilitate e-learning content upload) and provide training program feedback from learning management system (i.e., completion rate, pass rate, average course duration, etc.).
Risk Manager	The risk manager identifies, assesses, and mitigates risks within their company and develops strategies to minimize potential exposures.	They also work closely with the safety manager to ensure safety programs, protocols and training programs are implemented.
Machine Guarding Program Administrator	Can be assigned to any team member regardless of functional role withing the organization.	Ensures program, practices and policies are executed as intended.

Each of these roles contributes to a comprehensive approach to maintaining machine guarding standards, ensuring a safe working environment in food manufacturing.

Sample of Machine Safeguarding Program Table of Contents

1. **Overview**
2. **Definitions**
3. **Responsibilities**
4. **Procedures**
    a. Machine Guarding Best Practices
    b. Safeguarding Specifics
    c. Pre-Startup Safety Review (PSSR)
5. **Powered Tools (Portable and Stationary)**
6. **Machine Guarding Awareness Training**
7. **Live Work Permit**
8. **Annual Review**
9. **References**
    a. Annual Program Evaluation Form and Most Recent Completion Notice
    b. Equipment Guarding Visual Presentation

Appendix B
Risk Assessment Tools

It has become best practice to consider machine safeguarding approaches whenever new equipment is being designed or retrofit of processes are being contemplated.

The ANSI B11 series offers several risk assessment models that risk management and safety professionals deploy when their internal management systems and/or regulations require an assessment to be conducted as part of the hazard identification review.

Annex D of the ANSI B11 provides guidance for each approach to help the cheese converter select the most appropriate tool.

A common model from ANSI B11 Annex D shown and represents a two-factor matrix with the factors being frequency or probability of occurrence and the severity or outcome of that event.

MIL-STD-882 Two-Factor Risk Scoring System [4x5]

	Severity			
Probability	**Catastrophic**	**Critical**	**Marginal**	**Negligible**
Frequent	High	High	Serious	Medium
Probably	High	High	Serious	Medium
Occasional	High	Serious	Medium	Low
Remote	Serious	Medium	Medium	Low
Improbable	Medium	Medium	Medium	Low

Risk Assessment

During the process of equipment selection to full scall operations, whether new or used, there are several times where risk assessments are performed as outlined in the program or in the contract between the cheese converter and the OEM.

Planning for Equipment

- Pre-order Safety Reviews
- Design and Selection: New, Used, and Retrofit of Existing Equipment
- Protype Build – Proof of Concept

Installing Equipment

- Planning for Installation: Observe Production Area
- Contractor Safety Review

Operating Equipment

- Have equipment designers operate equipment along side production workers?
- What are the differences and similarities? What was learned

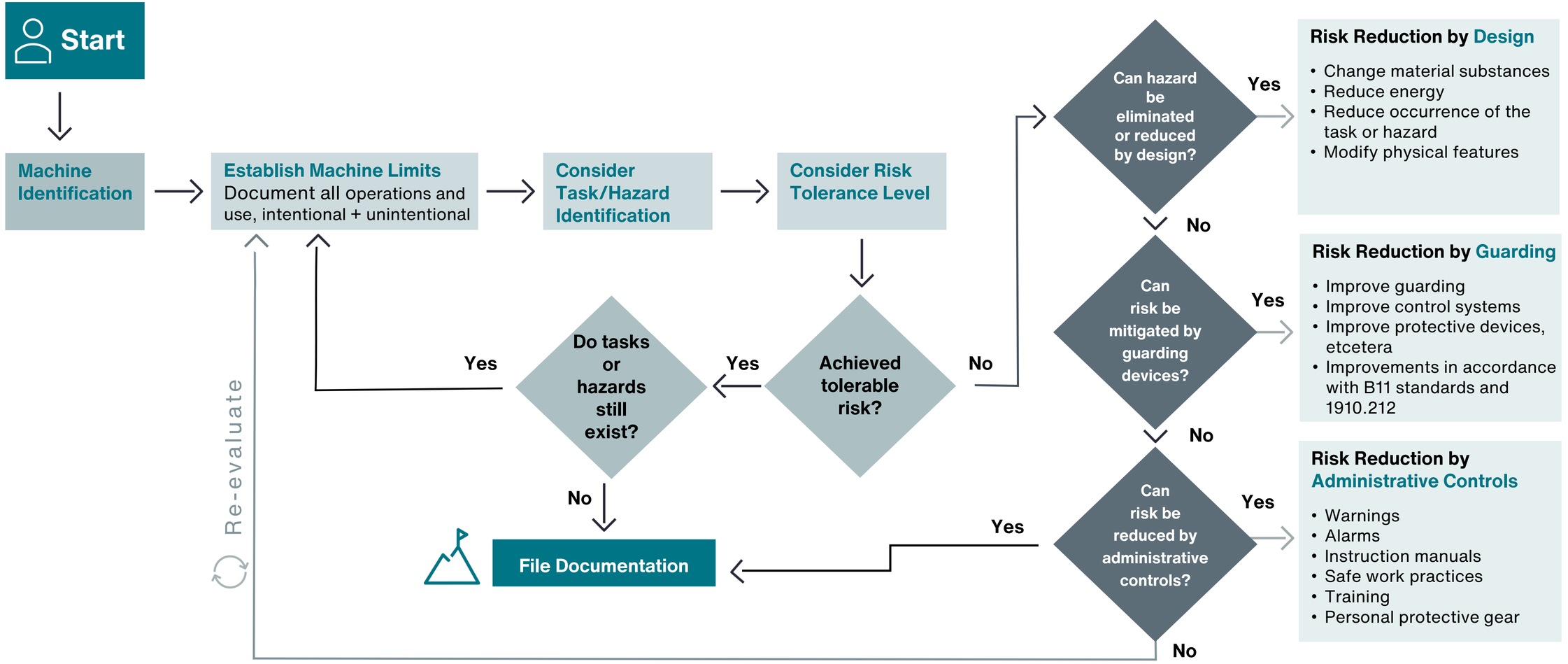
Servicing and Maintaining Equipment

Exhibit 3. Common OEM Risk Assessment Flow Chart

See following page.

Example of OEM Risk Assessment Flow Chart[1]

Exhibit 3.



[1] Flow chart adapted from Machine Safety Specialists

Appendix C
Machine Safeguarding Glossary[1]

Adjustable Barrier Guard	**Barrier** requires readjustment for each job or **die** setup.
Auger	Helical rotating part used to move or mix loose materials or liquids. May also be referred to as a ribbon or intermeshing paddles.
Authorized Person	One who, through training and competency evaluation, has the authority and responsibility to perform a specific assignment given by the employer.
Barrier	Physical obstruction; a protective shield which prevents an employee from accessing a point-of-operation or other hazard.
Brake	Mechanism used to stop and/or hold a crankshaft either directly or through a gear train when the **clutch** is disengaged.
Control System	Sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements to the operating mechanisms.
Exposed to Contact	An object is located is such a way that a person is likely to come into contact with the object and be injured.
Feeding	Process of placing or removing material within or from the **point of operation**.
Fixed Barrier Guard	**Barrier** attached to the equipment frame to prevent contact with the **point of operation**.
Foot Control	Mechanism operated by a foot which is designed to be used with a clutch or clutch and/or brake **control system**.
Gate or Movable Barrier	Device arranged to enclose the **point of operation** before the equipment can be started.
Guard	**Barrier** preventing entry of the operator's hands, fingers or other body parts into the **point of operation**.

[1] Compiled from Aon Casualty Risk Control resources and various regulatory sources.

Appendix C
Machine Safeguarding Glossary[1]

Guide Rail	Fixed or movable horizontal rails on the sides of moving conveyors that guide product or packaging direction around a radius or at machine transitions.
Hand Feeding Tool	Tool designed for placing or removing material or parts into or from the **point of operation**.
Harp	A steel frame with a wire woven inside, designed to cut cheese in a defined pattern as it is pushed through the wire with a hydraulic ram.
Hazard Analysis Critical Control Point	Management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product. More information can be found at: Hazard Analysis Critical Control Point (HACCP) - FDA
Interlocked Barrier Guard	**Barrier** attached to the equipment and connected to the power supply so the equipment cannot be started normally until the **guard** itself, the equipment hinge or movable sections enclose the **point of operation**.
Movable Barrier or Gate	**Device** arranged to enclose the **point of operation** before the equipment can be started.
Pinch Point	Point other than **point of operation** where it is possible for a part of the operator's body to be caught between the moving parts or auxiliary equipment; or between the material and the moving parts.
Point of Operation	Area on a machine where work is performed upon the material being processed. For example, cutting, shredding, or slicing.

[1] Compiled from Aon Casualty Risk Control resources and various regulatory sources.

Appendix C
Machine Safeguarding Glossary[1]

Presence Sensing Device	Mechanism designed, constructed and arranged to create a sensing field or area that signals the machine control to stop motion and/or release stored energy when any part of the operator's body or a hand tool is within the sensing field or area. An example is a light curtain.
Safety System	Integrated system including the pertinent elements of the machine, controls, safeguarding and their interfaces with the operator and the environment. Designed, constructed and arranged to operate together as a unit, so that a single failure or single operating error will not cause injury to personnel due to **point of operation** hazards.
Stop Control	Operator control designed and programmed to stop motion after completing the production cycle. This differs from an **emergency stop (e-stop)** which stops motion immediately upon activations
Trip or Tripping	Manual control activation to turn on or "run" the equipment.
Two Hand Control or Trip	**Device** requires concurrent pressure from both hands of the operator during activation of the equipment.
Zero Mechanical State	Condition where the equipment's power source cannot cause an unintentional/accidental start up or release of energy (power).

[1] Compiled from Aon Casualty Risk Control resources and various regulatory sources.

Appendix D
Reference Listing

ANSI/ASSP Z10	ANSI/ASSP Z10 is a voluntary standard that helps organizations establish occupational health and safety management systems (OHSMS). The standard is based on the protocols of the American Society of Safety Professionals and American National Standards Institute (ANSI).
ANSI/ASSP/ISO 45001	ANSI/ASSP/ISO 45001 refers to the international standard for occupational health and safety management systems (OHSMS), developed by the International Organization for Standardization (ISO), which provides practical solutions for worker safety and helps create a global foundation of safety standards.
ANSI B11	ANSI B11 series of American National Standards and Technical Reports focuses on machine/machinery/machine tool safety, providing guidelines and requirements for design, construction, operation, and maintenance, with the goal of minimizing risks for personnel.

Appendix D
Reference Listing

ANSI B20.1	ANSI B20.1 is developed by ASME (American Society of Mechanical Engineers), that provides a consensus view on the safe design, construction, and use of conveyor systems, covering both permanent and temporary conveyors for moving materials, packages, or units.
ANSI/RIA R15.06	ANSI/RIA R15.06 provides guidelines for safe design, integration, and operation of industrial robots and robot systems, emphasizing risk assessment and personnel safety. This standard, developed by the Robotic Industries Association (RIA), covers the safety requirements for industrial robots and robot systems, including safe design, hazards, and risk reduction measures by addressing the safety of personnel interacting with robotic systems, including requirements for manufacturer, integrator, and end-user responsibilities.
CFR 29 1910, Subpart O	“General Requirements for All Machines” outlines the fundamental requirements for machine guarding to protect workers from hazards like point-of-operation, ingoing nip points, rotating parts, and flying chips or sparks. This subpart covers a wide range of machinery and equipment and establishes general requirements to prevent contact with hazardous areas like point of operation, in running nip points, rotating parts, flying chips, power transmission, etc.

Appendix D
Reference Listing

ISO 12100	ISO 12100 risk assessment focuses on identifying and evaluating hazards related to machinery, encompassing mechanical, electrical, thermal, noise, vibration, radiation, material/substance, ergonomic, and environmental hazards.
US Department of Agriculture	USDA Guidelines for the Sanitary Design and Fabrication of Dairy Processing Equipment (February 2022). This document contains a series of standards and practices (3-A SSI) which provide criteria for materials and fabrication for specific types of dairy equipment. Examples of equipment covered by the 3-A sanitary standards are centrifugal and positive displacement rotary pumps, compression valves, non-coil batch processors, and bag collectors for dry milk products. Online location: Quality Management System.

About the Lead Contributors

About Masters Gallery Foods

Founded in 1974, Masters Gallery Foods (MGF) is a family-owned and operated business that has grown from a small Plymouth, Wisconsin-based cheese brokerage firm to one of the leading national cheese suppliers.

MGF maintains one of the largest privately held cheese inventories in the country and offers a full line of retail and food service cheese products.

This state-of-the-art cheese processing facility boasts numerous packaging lines to serve private label, retail, and food service customers worldwide.

www.mastersgalleryfoods.com

About Aon

Aon plc (NYSE: AON) exists to shape decisions for the better — to protect and enrich the lives of people around the world. Our colleagues provide our clients in over 120 countries with advice and solutions that give them the clarity and confidence to make better decisions to protect and grow their business.

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