FARM Workforce Development

Safety

Reference Manual

Document History

The FARM Safety Reference Manual was first developed in 2019. Revisions and updates have been incorporated as follows:

2021: updated links and added ergonomics and noise & hearing protection sections.

About this Manual

FARM Workforce Development Safety Reference Manual

The FARM Workforce Development Safety Reference Manual was produced through the joint efforts and funding of the Idaho Dairymen's Association (IDA), the Idaho Milk Processors Association (IMPA) and the National Milk Producers Federation (NMPF) in response to a growing demand from dairy producers seeking straightforward, relevant and useful information on workplace safety and health. It was produced with the purpose of identifying safety hazards and safe work practices, as well as applicable OSHA requirements pertaining to dairy farming activities. Dairy producers are encouraged to use this manual as a resource for a safety management program.

This manual is not a total safety program or plan, as all employees, subcontractors, vendors and customers are required to comply with all federal, state and local laws. Furthermore, when employees use farm equipment, power-operated machinery, hand tools or any other tools on the jobsite, full compliance to manufacturers' instructions is required.

Detailed regulatory requirements or unique safety issues or scenarios may not be included in this manual, and this manual does not replace any requirements as specified in any state or federal laws or regulations, including but not limited to OSHA regulations. This manual should only be used as a resource relating to OSHA regulations and dairy safety management in general. Dairy business owners should be involved to see that this manual and its procedures are followed and that all OSHA regulations are met in their areas of control and responsibility.

If any inconsistency ever exists between this manual and any laws or regulations, including OSHA regulations, the laws or regulations will always prevail and this manual should never be considered a substitute for any provisions of state or federal laws or regulations, including OSHA regulations.

Acknowledgments

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DMSI is a dairy customer-led collaborative effort to encourage fair, safe and healthy work environments on U.S. dairy farms. DMSI members reviewed the FARM Workforce Development Safety Reference Manual and provided valuable feedback.

Foreword

The U.S. dairy industry has time and again demonstrated its perseverance and leadership. We face and overcome the challenges of tough economic times and ever-changing consumer preferences. We pioneer new management practices and technologies that enhance the health of our cows and improve our environmental footprint. And today, we have an opportunity to lead once again by advancing safety management on farms across the country.

Dairy owners and managers have always cared about and prioritized safety. They and their family members are almost always the front-line workers in our family owned and operated dairy businesses. We do, however, lack the formal approach many other industries have when addressing safety and training. Agriculture is an industry with one of the highest injury and fatality rates in the country. We need to better formalize our safety and training programs to minimize those risks where we can and strive to continually improve.

The FARM Safety Reference Manual is a key resource for dairy owners and managers to build their safety management skills and pursue a reduction in injuries, illnesses and fatalities. Developed in partnership between National Milk Producers Federation, the Idaho Dairymen's Association and the Idaho Milk Processors Association, the manual represents a step forward for the industry. I encourage dairies to complete the safety self-assessment to assess the quality and extent of their current safety management and provide themselves a baseline from which they can continue to improve. Regardless of the current safety management efforts, there is room for growth on all dairies.

Dairy owners have the same goals for their employees as they do themselves: to arrive safely home at the end of the day to be with their families. Using the principles from the FARM Safety Reference Manual, and consulting with trusted experts, every dairy farm can improve workplace safety.

Sincerely,

Rick Naerebout
Chief Executive Officer
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*Addendum effective August 2021. Chapter available as a separate print document.

FARM Safety Self-Assessment

The Safety Self-Assessment serves as a starting point to evaluate current safety programs and determine safety needs. The Safety Self-Assessment does not replace the use of a safety audit checklist. It is intended to identify management-level practices that can lead to better overall safety management. It does not measure or evaluate actual safety outcomes.

The Safety Self-Assessment closely follows each section of this manual. It assists in determining safety-related strengths, weaknesses, goals and priorities. The first step in the process is to complete the self-assessment. Appropriate people to complete this questionnaire include those involved in the dairy operation's day-to-day safety activities including owners and managers. The self-assessment is for internal use only. Farms are encouraged to be as honest as possible in their self-assessment because it serves as the foundation for the safety program and future initiatives.

After completing the assessment, look at which topics have the most "no" or "none of the above" answers. Focus on those topics to establish safety priorities. It is important to emphasize that it is normal to have many "no" responses the first time the farm completes the self-assessment. The purpose of the manual and the FARM Program is to promote continuous improvement and pursue more "yes" responses over time.

Once safety priorities have been established, the corresponding chapters in this manual should be reviewed and appropriate programs, procedures and policies established from there. The long-term goal is to answer "yes" to all questions on the self-assessment.

Management Checklists

Questions in the self-assessment form the basis of management checklists throughout this manual. The management checklists at the beginning of each chapter detail key guidelines and best practices for safety topics contained in the chapter.

Note: Chapter 1 is an introduction, so it does not have associated self-assessment questions.

Section	2. Regulatory Context		Notes
2.1 ***Context***	Are you familiar with the OSHA and/or equivalent state regulations and standards that apply to your dairy? Federal and state safety regulations can be found in the FARM Workforce Development legal fact sheets.	☐ YES ☐ NO	

2.2 ***Workers' Rights and Employer Responsibilities***	Are you familiar with the rights of employees under OSHA (and/or equivalent state regulation)?	☐ YES ☐ NO	
	Are you familiar with your employer responsibilities under OSHA (and/or equivalent state regulation)?	☐ YES ☐ NO	
2.3 ***OSHA Required Poster***	Are legally-required safety posters displayed in a conspicuous place?	☐ YES ☐ NO	
2.4 ***Whistleblower Protection***	Are you familiar with whistleblower protections under OSHA (and/or equivalent state regulations)?	☐ YES ☐ NO	
2.5 ***Recordkeeping and Reporting***	Are you familiar with your safety reporting requirements under OSHA (and/or equivalent state regulations)?	☐ YES ☐ NO	

Section	3. Safety Management Principles		Notes
3.1 ***Components of a Safety Management Program***	Do you have a written safety plan or program?	☐ YES ☐ NO	
	Does your written safety plan or program include the following fundamental elements?		
	• Owner and Manager Commitment	☐ YES ☐ NO	
	• Employee Participation	☐ YES ☐ NO	
	• Ongoing Hazard Recognition / Control	☐ YES ☐ NO	
	• Training	☐ YES ☐ NO	
	Do employees know how to report safety concerns?	☐ YES ☐ NO	
	Do you review your written safety plan or program annually, and update as needed?	☐ YES ☐ NO	

3.2 ***Causes of Workplace Injuries and Fatalities***	Do you follow a process for identifying and controlling safety hazards on an ongoing basis? One example is the Anticipate-Recognize-Evaluate-Control model. See section 3.2 for more information.	☐ YES ☐ NO	
	When a hazard has been identified, do you evaluate the risk of injury or death? An example of a simple risk evaluation is to determine two factors: Likelihood and Severity. See section 3.2 for more information.	☐ YES ☐ NO	
3.3 ***Hierarchy of Controls***	When a hazard has been identified, do you implement a consistent method to prevent/control it? An example is the Hierarchy of Controls method: elimination, substitution, engineering controls, administrative controls and PPE (Personal Protective Equipment).	☐ YES ☐ NO	
3.4 ***Safety Inspections, Audits and Investigations***	Are safety inspections conducted on a regularly scheduled basis? For example, weekly or monthly walkthroughs.	☐ YES ☐ NO	
	Do you keep records of safety incidents and near miss events?	☐ YES ☐ NO	
	Do you investigate safety incidents and near miss events?	☐ YES ☐ NO	
	Do you follow a consistent process for conducting safety incidents and near miss investigations?	☐ YES ☐ NO	
	Do you document safety incidents and near miss investigations?	☐ YES ☐ NO	
	If available, have you taken advantage of a consultative visit from your OSHA office, state OSHA equivalent or your regional NIOSH Ag center?	☐ YES ☐ NO ☐ N/A	
	If available, have you taken advantage of a safety audit through your workers' comp provider?	☐ YES ☐ NO ☐ N/A	

3.5 ***Worker Safety Training***	Do all new employees receive safety training?	☐ YES ☐ NO	
	Do employees receive refresher safety training? For example, through monthly safety talks.	☐ YES ☐ NO	
	Do employees receive refresher training following a near miss or safety incident?	☐ YES ☐ NO	
	Is safety training documented?	☐ YES ☐ NO	
3.6 ***Leading and Lagging Indicators***	Do you use indicators to measure the effectiveness of your safety program?	☐ YES ☐ NO	
	Do you review the results of the indicators /statistics on a regular basis? For example, monthly or annually.	☐ YES ☐ NO	

Section	4. Safety Topics		Notes
4.1 ***Worker Safety During Animal Handling***	Has the farm conducted a hazards assessment for worker safety during animal handling, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has your farm used one or more of the following to manage hazards during animal handling? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training for worker safety during animal handling?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training for worker safety during animal handling?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used during animal handling?	☐ YES ☐ NO	

4.2 ***Confined Spaces on Dairy Farms***	Has the farm conducted a hazards assessment of confined spaces, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has the farm used one or more of the following to manage hazards of confined spaces? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training for confined spaces?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training for confined spaces?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used for confined spaces?	☐ YES ☐ NO	
4.3 ***Slips, Trips and Falls***	Has the farm conducted a hazards assessment for slips, trips and falls, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has the farm used one or more of the following to manage hazards for slips, trips and falls? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training to prevent slips, trips and falls?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training to prevent slips, trips and falls?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used to prevent slips, trips and falls?	☐ YES ☐ NO	

4.4 ***Hazard Communication and Chemical Safety***	Has the farm conducted a hazards assessment for chemical use, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has the farm used one or more of the following to manage hazards of chemical use? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training for chemical use?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training for chemical use?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used during chemical use?	☐ YES ☐ NO	
4.5 ***Control of Hazardous Energy and Lockout Tag Out (LOTO)***	Has the farm conducted a hazards assessment for sources of hazardous energy, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has the farm used one or more of the following to manage sources of hazardous energy? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training for sources of hazardous energy?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training for sources of hazardous energy?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used for sources of hazardous energy?	☐ YES ☐ NO	

4.6 ***Machine Guarding***	Has the farm conducted a hazards assessment for machinery with moving parts, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has the farm used one or more of the following to manage hazards of machinery with moving parts? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training for machinery with moving parts?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training for machinery with moving parts?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used for machinery with moving parts?	☐ YES ☐ NO	
4.7 ***Silage Safety***	Has the farm conducted a hazards assessment for silage management, evaluating both likelihood and severity of hazards?	☐ YES ☐ NO	
	Has the farm used one or more of the following to manage hazards of silage management? • Elimination / Substitution • Engineering Controls (Facility Design, Structures, Railings, etc.) • Administrative Controls (Training, Procedures, Signage, Documentation, etc.) • PPE	☐ YES ☐ NO	
	Does the farm conduct initial safety training for silage management?	☐ YES ☐ NO	
	Does the farm conduct regular refresher safety training for silage management?	☐ YES ☐ NO	
	Are regular inspections or audits conducted to ensure safe practices and procedures are being used for silage management?	☐ YES ☐ NO	

01

Introduction

Dairy farm owners and managers across the country look for ways every day to promote a safe and healthy work environment. Protecting worker safety is a moral, ethical and legal obligation, and one that dairy farm owners and managers should take seriously. A great safety culture attracts and retains quality workers, which is critical in a competitive labor market. Additionally, proactive and effective safety management can reduce the risk for worker injuries, illnesses or fatalities. Protecting worker safety is a key factor that will help each farm be competitive, sustainable and productive into the future.

The goal of each dairy business should be to provide a safe and healthy work environment for all workers. Responsibility for safety ultimately rests with dairy owners and the leadership team. Farm owners must make every effort to protect employees from safety hazards as well as recognize that all safety incidents are preventable. In turn, workers are responsible for following safety procedures, rules and precautions to protect themselves and their fellow workers. Workers should be held accountable for their safety behaviors and for following rules that have been designed for their protection. These responsibilities can only be met by everyone working continuously in unison to promote safe work practices and to maintain property, tools and equipment in safe operating conditions. Every procedure must be a safe procedure.

Safety is important for all dairy operations, whether they employ hired staff or rely solely on family labor. This manual refers to “worker” safety, but the principles and guidelines are useful whether that worker is hired, a family member or the owner themselves.

The primary objective of this manual is to help dairy owners, managers, supervisors and employees remain safe on the farm in the best way possible. This manual explains in easily understood language what workers can do to comply with safe work practices and applicable OSHA regulations, as well as how owners and managers can provide safe work environments.

1.1 Sustainable Dairy Farming, Social Responsibility and Worker Safety: The Big Picture

Ensuring worker safety and wellbeing falls within the larger context of promoting sustainability in farming. Dairy farm sustainability is an ongoing improvement process addressing financial, social and environmental performance objectives.

Farms actively pursue sustainability goals, whether or not they refer to them as sustainability. Sustainability encompasses the sound financial business practices that ensure long-term profitability. It also includes responsible and ethical cow care as well as adopting environmentally-beneficial practices that protect the land. Additionally, sustainability includes safe and exceptional work environments that ensure stable, productive and healthy workforces.[1-3]

While dairy farms have always pursued these sustainability goals, consumers and society as a whole have increasingly paid closer attention to how dairy business owners go about farming. As a result, retailers and processors are asking dairy farmers to provide evidence of their responsible production practices. Their interest is now extending beyond the environment and animal welfare to include human wellbeing considerations. This social dimension of sustainability often includes labor issues, such as worker rights, social justice and workplace conditions and safety.[1-3]

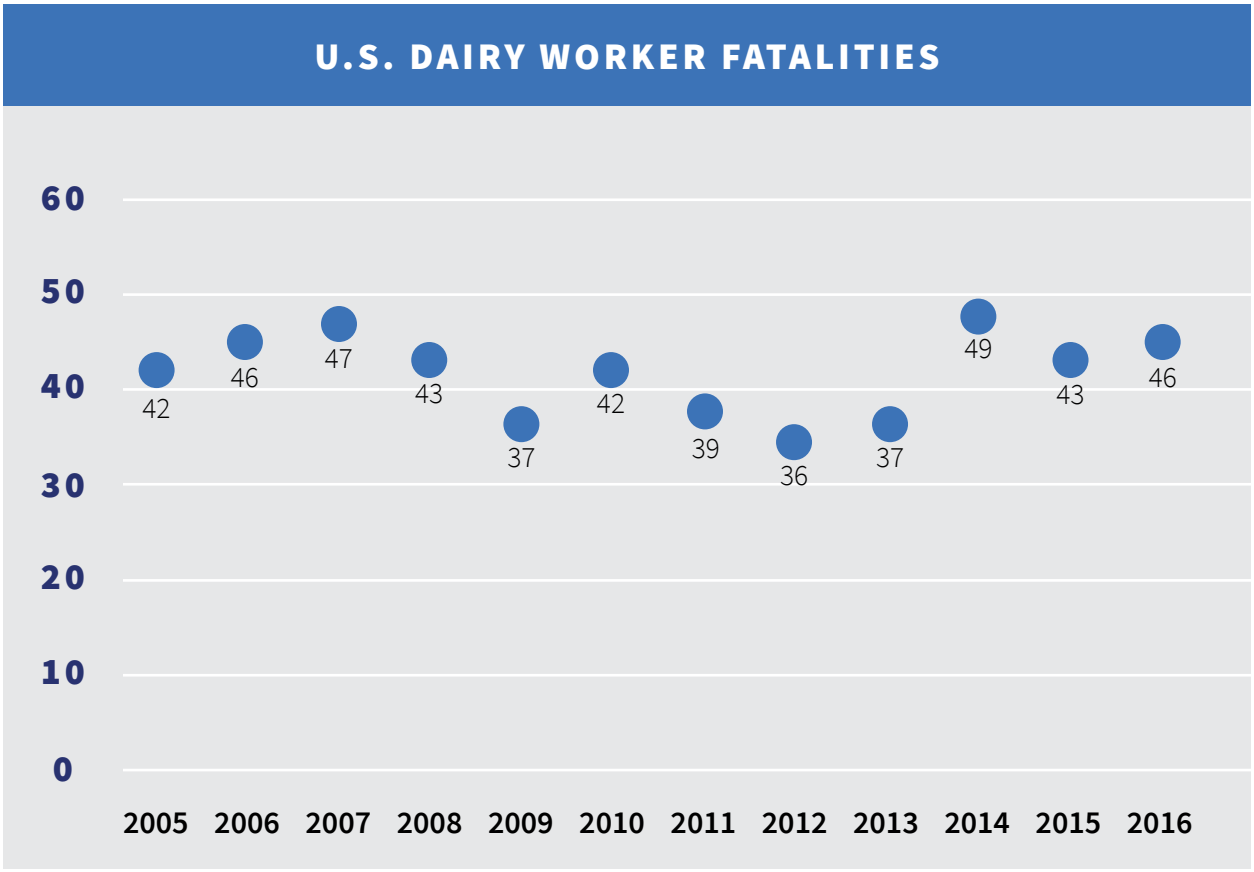
Workplace safety is a vital component of every dairy farm sustainability plan. Ensuring worker safety and health is not only an ethical obligation, but it addresses a growing interest area of customers and consumers. Helping customers understand on-farm working conditions in a transparent manner promotes trust in the dairy supply chain. Customer trust with the dairy industry is essential for creating lasting relationships that sustain profitability over time. This manual can help customers learn more about how dairy farm owners and managers address on-farm health and safety. However, its primary purpose is to serve as a resource for dairy farmers. It offers best-in-class guidance on methods to protect the safety of workers which, in turn, ultimately contribute to the sustainability of the dairy business.

1.2 Current Safety Situation in U.S. Dairy Industry

The United States (U.S.) Agriculture, Forestry and Fishing (AgFF) sector, which includes dairy farming and other industries, ranks among the most hazardous industrial sectors in terms of worker injuries and fatalities. In 2017, approximately 5.0 per 100 full-time AgFF workers sustained a non-fatal injury or illness, which is higher than the average for other sectors like construction or manufacturing.[1] On dairy farms in particular, there were 5,700 recordable nonfatal injuries in 2017, equating to an incidence rate of 5.6 non-fatal injuries or illnesses for every 100 workers. The national farm injury estimates do not include dairy operations that employ 10 or fewer workers.

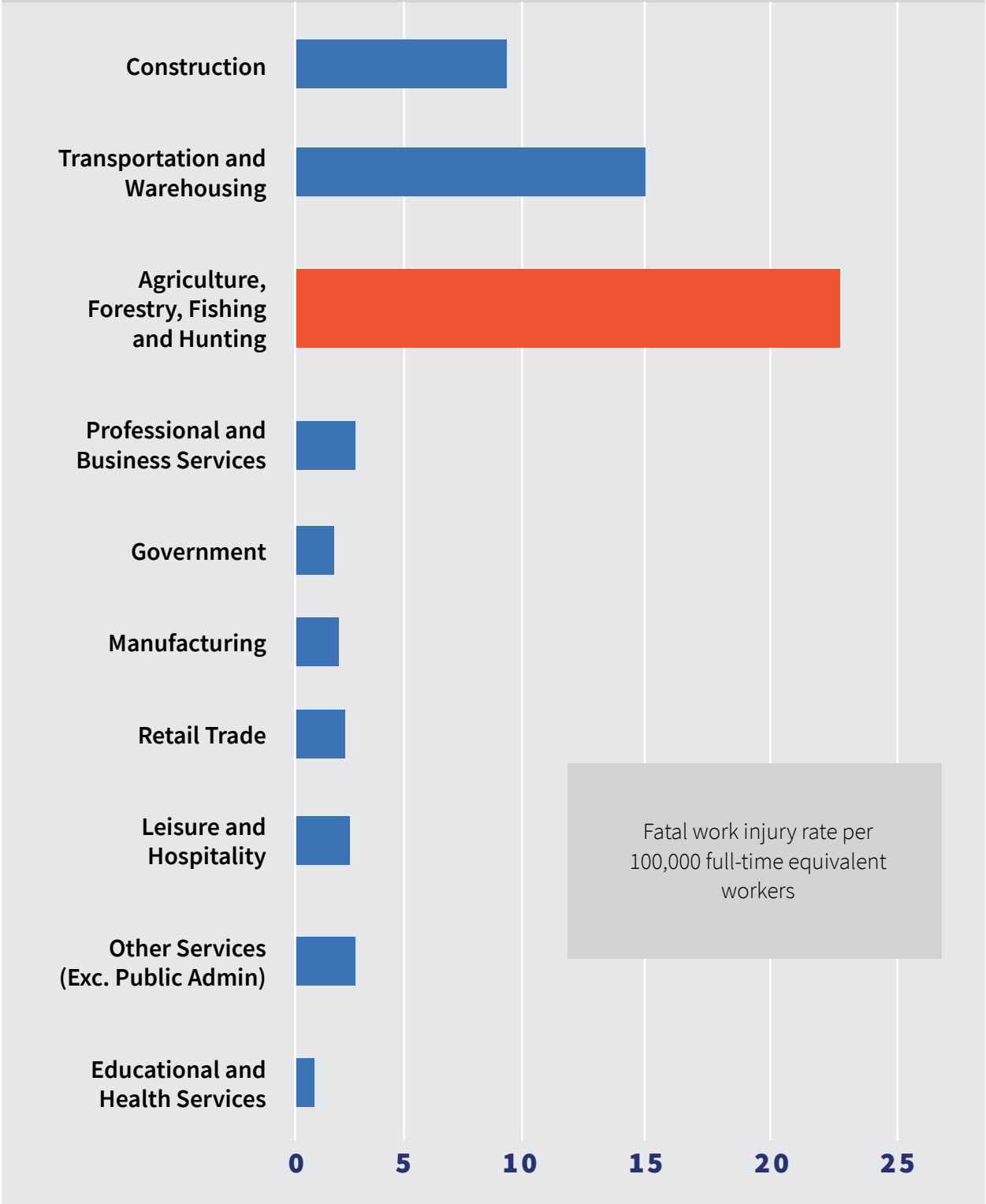
Dairy worker fatalities are often reported in the news media. As a result, on-farm safety has drawn increased attention from the general public as well as regulatory agencies.

For example, the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) implemented Local Emphasis Programs (LEPs) in the states of Wisconsin (2012-2017) and New York (2014-present) that focused on inspections of dairy farm establishments. In 2016, the most recent year for which data is available, there were 593 fatal work injuries in the Agriculture, Forestry and Fishing sector as a whole, equating to 23.2 deaths per 100,000 full-time workers.[1] While the *number* of fatalities is smaller than in other industry sectors, the fatality *rate* is the highest. On dairy farms alone, there were 46 fatal work injuries in 2016 (see U.S. Dairy Worker Fatalities chart below).



Source: U.S. Bureau of Labor Statistics, Census of Fatal Occupational Injuries (CFOI)

RATE OF FATAL WORK INJURIES
BY INDUSTRY SECTOR 2017



Source: U.S. Bureau of Labor Statistics, Census of Fatal Occupational Injuries (CFOI)

The industry trend towards larger-herd dairy operations necessitates an increasing number of workers on each farm to perform numerous tasks such as milking, feeding, cow and calf care, and maintenance activities.[4-6] Similar to other U.S. agriculture businesses, dairy farms employ a large percentage of immigrant workers.[6] Immigrant labor accounts for 51 percent of all dairy labor and dairies that employ immigrant labor produce 79 percent of the U.S. milk supply.[7] Immigrant agricultural workers in the U.S. are mostly from Latin America, including Mexico, and Central and South America.[8,9] The agricultural workforce is composed mostly of Hispanic individuals with limited English-proficiency.[10] Many immigrant agriculture workers speak little or no English with the common language being Spanish, and a growing percentage of workers speak a Guatemalan dialect of K'iche'.[11]

These realities present multiple safety training challenges.[4,9,11,12] A lack of English proficiency, low formal education and lower literacy skills can limit workers' access to safety information and training, making them vulnerable to occupational injury and illness.[13]

While all farms have inherent workplace hazards and safety challenges, dairy farm owners and managers can mitigate risks through robust safety management. Safety planning takes time and effort, both limited resources for dairy owners and managers. By providing a framework for dairies to engage in safety management, this manual reduces the amount of time dairies spend determining how to address safety and instead lets them focus on actually developing and implementing a tailored program.

02

Regulatory Background

MANAGEMENT CHECKLIST

- ✓ The farm is familiar with the OSHA and/or equivalent state regulations and standards that apply to the operation.
- ✓ The farm is familiar with the rights of employees under OSHA (and/or equivalent state regulation).
- ✓ The farm is familiar with its employer responsibilities under OSHA (and/or equivalent state regulation).
- ✓ Legally-required safety posters are displayed in a conspicuous place.
- ✓ The farm is familiar with whistleblower protections under OSHA (and/or equivalent state regulations).
- ✓ The farm is familiar with its safety reporting requirements under OSHA (and/or equivalent state regulation).
- ✓ The farm is familiar with its safety recordkeeping requirements under OSHA (and/or equivalent state regulation).

2.1 Context

✓ *The farm is familiar with the OSHA and/or equivalent state regulations and standards that apply to the operation.*

With the Occupational Safety and Health Act of 1970 (OSH Act), the U.S. Congress created the Occupational Safety and Health Administration (OSHA) to ensure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance. OSHA is part of the United States Department of Labor. The OSH Act covers employers and their employees either directly through federal OSHA or through an OSHA-approved state program. State programs must meet or exceed federal OSHA standards for workplace safety and health. Currently, there are 26 OSHA-approved state programs (AK, AZ, CA, CT, HI, IL, IA, IN, KY, MD, ME, MI, MN, NC, NM, NJ, NV, NY, OR, SC, TN, UT, VT, VA, WA, and WY), plus Puerto Rico and Virgin Islands.[1]

All farms are responsible for meeting applicable OSHA regulations and standards. However, OSHA enforcement – in other words, inspecting farms – is limited to farms with 11 or more employees during the previous 12-month period, or, those that have an active temporary labor camp during that period. **Dairy owners and managers should understand that being exempt from an OSHA inspection (due to having fewer than 11 workers) does not equate to being exempt from compliance with OSHA regulations. All dairy farms should be in compliance with applicable OSHA standards.**

Family members of farm employers are not counted when determining the number of employees for OSHA oversight. A part-time employee is counted as one employee. Although OSHA is prohibited from inspecting small farming operations, these operations are not exempt from OSHA regulations and the standards remain relevant. States with OSHA-approved State Plans may enforce on small farms and provide consultation or training. The FARM HR Legal Fact Sheets provide information and links on OSHA State Plans. The FARM HR Legal Fact Sheets are available for download at nationaldairyfarm.com. The rest of this chapter summarizes the major requirements of OSHA standards and regulations.

Resources
OSHA Laws and Regulations
https://www.osha.gov/law-regs.html

OSHA State Plans
https://www.osha.gov/dcsp/osp/index.html

OSHA Topics: Agriculture https://www.osha.gov/dsg/topics/agriculturaloperations/index.html

2.2 Workers' Rights and Employer Responsibilities

✓ *The farm is familiar with the rights of employees under OSHA (and/or equivalent state regulation).*

✓ *The farm is familiar with its employer responsibilities under OSHA (and/or equivalent state regulation).*

The Occupational Safety and Health Act of 1970 (OSH Act) was passed to ensure workers are provided with safe and healthful working conditions. According to OSHA, all workers have the right to a safe workplace. The OSH Act requires dairy farm employers, and employers in other sectors, to provide workers with working conditions that are free from recognized hazards that are likely to cause death or serious bodily harm to their workers.

Workers' Rights under the OSH Act

This law also gives workers important rights to participate in activities to ensure their protection from job hazards.

According to OSHA, dairy workers have the right to:

- File a confidential complaint with OSHA to have their workplace inspected.
- Receive information and training about hazards,

methods to prevent harm, and the OSHA standards that apply to the farm. Training MUST be done in a language and vocabulary workers can understand.
- Review records of work-related injuries and illnesses that occur in their workplace.
- Receive copies of the results from tests and monitoring done to find and measure hazards in the workplace.
- Get copies of their workplace medical records.
- Participate in an OSHA inspection and speak in private with the OSHA inspector.
- File a complaint with OSHA if they have been retaliated against by their employer as the result of requesting an inspection or using any of their other rights under the OSH Act.
- File a complaint if punished or retaliated against for acting as a "whistleblower" under the additional 21 federal statutes for which OSHA has jurisdiction.

Employer Responsibilities

Employers MUST provide their employees with a workplace that does not have serious hazards AND must follow all OSHA safety and health standards. An effective dairy management plan includes policies and procedures that will result in the identification and correction of safety and health problems. OSHA requires that employers, including dairy farm employers, must try to eliminate or reduce hazards first by making feasible changes in working conditions, such as switching to safer chemicals or safeguarding machines, rather than only relying on personal protective equipment such as masks, gloves or earplugs.

Employers MUST also:

- Prominently display the official OSHA poster that describes rights and responsibilities under the OSH Act (presented in the next section). All covered employers are required to display the poster in their workplace.
- Inform workers about hazards through training, labels, alarms, color-coded systems, chemical information sheets and other methods.
- Train workers in a language and vocabulary they can understand.
- Keep accurate records of work-related injuries and illnesses.
- Perform tests in the workplace, such as air sampling around confined spaces (open or closed manure pits), required by some OSHA standards.
- Provide hearing exams or other medical tests required by OSHA standards.
- Post OSHA citations and injury and illness data where workers can see them.
- Notify OSHA within 8 hours of a workplace fatality or within 24 hours of any work-related inpatient hospitalization, amputation or loss of an eye (covered in subsequent section).
- Not retaliate against workers for using their rights under the law, including their right to report a work-related injury or illness.

Agricultural employers must follow the OSHA General Duty Clause, applicable OSHA Agriculture standards and applicable General Industry standards. While not all General Industry standards are explicitly required for agriculture, they set out safety practices and procedures that can help with meeting General Duty Clause compliance. Owners and managers are encouraged to review the FARM HR Legal Fact Sheets (both federal and state) for more information about OSHA requirements: www.nationaldairyfarm.com.

Dairy employers can download OSHA Publication 3021-11R 2016 Workers' Rights free of charge, which outlines worker rights and employer responsibilities. This publication can be downloaded here: https://www.osha.gov/Publications/osha3021.pdf

U.S. Department of Labor

OSHA® Occupational Safety and Health Administration

Job Safety and Health
IT'S THE LAW!

All workers have the right to:

- A safe workplace.
- Raise a safety or health concern with your employer or OSHA, or report a work-related injury or illness, without being retaliated against.
- Receive information and training on job hazards, including all hazardous substances in your workplace.
- Request an OSHA inspection of your workplace if you believe there are unsafe or unhealthy conditions. OSHA will keep your name confidential. You have the right to have a representative contact OSHA on your behalf.
- Participate (or have your representative participate) in an OSHA inspection and speak in private to the inspector.
- File a complaint with OSHA within 30 days (by phone, online or by mail) if you have been retaliated against for using your rights.
- See any OSHA citations issued to your employer.
- Request copies of your medical records, tests that measure hazards in the workplace, and the workplace injury and illness log.

This poster is available free from OSHA.

Employers must:

- Provide employees a workplace free from recognized hazards. It is illegal to retaliate against an employee for using any of their rights under the law, including raising a health and safety concern with you or with OSHA, or reporting a work-related injury or illness.
- Comply with all applicable OSHA standards.
- Report to OSHA all work-related fatalities within 8 hours, and all inpatient hospitalizations, amputations and losses of an eye within 24 hours.
- Provide required training to all workers in a language and vocabulary they can understand.
- Prominently display this poster in the workplace.
- Post OSHA citations at or near the place of the alleged violations.

FREE ASSISTANCE to identify and correct hazards is available to small and medium-sized employers, without citation or penalty, through OSHA-supported consultation programs in every state.

Contact OSHA. We can help.

1-800-321-OSHA (6742) • TTY 1-877-889-5627 • www.osha.gov

OSHA 3165-04R 2015

2.3 OSHA Required Poster

✓ *Legally-required safety posters are displayed in a conspicuous place.*

OSHA requires employers to display a poster prepared by OSHA that informs workers of the protections afforded them under the Occupational Safety and Health (OSH) Act.

The poster must be displayed in a conspicuous place where employees can view it. This poster can be found in a break room, a meeting room or other common area that employees frequent. Farms may use the actual poster provided for free by OSHA, or a suitable reproduction. Previous versions of the poster are allowed. There is no provision for maintaining an OSHA poster in an electronic format. Employers in states with an OSHA-approved plan may have a state version of the OSHA poster.

Often referred to the "OSHA It's the Law Poster," the required poster clearly lists the workers' safety rights, as established by the Occupational Safety and Health Act. It also includes information that may be useful to an employee if he or she feels like the workplace is in violation of regulations. The poster must state that for assistance and information – including copies of the OSH Act and of specific safety and health standards – employees should contact the employer or the nearest office of the Department of Labor.

Although OSHA only requires employers to post the English version, the poster is available in several languages: Chinese, Korean, Nepali, Polish, Portuguese, Tagalog, Cebuano, Vietnamese, Haitian Creole, Arabic and Spanish. OSHA encourages companies to display the poster in other languages, particularly Spanish, but does not penalize companies who only post the English version. Dairy employers should post the Spanish version if they employ Spanish-speaking workers.

This poster is available free of charge and can be downloaded from https://www.osha.gov/Publications/poster.html.

2.4 Whistleblower Protection

✓ *The farm is familiar with whistleblower protections under OSHA (and/or equivalent state regulations).*

The OSH Act protects dairy workers who file a complaint with their employer, OSHA or other government agencies about unsafe or unhealthful working conditions in the workplace. Section 11(c) of the OSH Act specifically prohibits employers from discriminating against their employees for exercising their rights under the OSH Act. These rights include filing an OSHA complaint, participating in an inspection or talking to an OSHA inspector, seeking access to employee exposure and injury records, reporting an injury, and raising a safety or health complaint with their employer. Dairy workers should understand not only are they protected when they report safety hazards or conditions, but it is also their responsibility to report these situations so they may be addressed by dairy management.

Prohibited retaliation can take many forms. Workers cannot be transferred, denied a raise, have hours reduced, be fired or punished in any other way because they used any right given to them under the OSH Act. If a worker has been punished or discriminated against for using their rights, they can file a complaint with OSHA within 30 days of the alleged reprisal.

Workers have limited rights under the OSH Act to refuse to do a job because conditions are hazardous. A worker may refuse to do a job under the OSH Act only under the following conditions:

1) they believe that they face death or serious injury (and the situation is so clearly hazardous that any reasonable person would believe the same thing);

2) they have tried, where possible, to get their employer to correct the condition, and been unable to obtain a correction and there is no other way to do the job safely; and

3) the situation is so urgent that they do not have time to eliminate the hazard through regulatory channels such as calling OSHA.

OSHA's Whistleblower Protection Program enforces the whistleblower provisions of more than 20 whistleblower statutes. Upon receipt of a complaint, OSHA will first review it to determine whether it is valid on its face. If the evidence supports the employee's allegation and a settlement cannot be reached, OSHA will generally issue an order, which the employer may contest, requiring the employer to reinstate the employee, pay back wages, restore benefits and consider other possible remedies to make the employee whole.

Resources

The OSHA Whistleblower Protection Program https://www.whistleblowers.gov

An electronic summary of the Whistleblower Protection Program www.osha.gov/OshDoc/data_General_Facts/whistleblower_rights.pdf

OSHA Complain Filing Information https://www.osha.gov/workers/file_complaint.html

2.5 Recordkeeping and Reporting

✓ *The farm is familiar with its safety reporting requirements under OSHA (and/or equivalent state regulation).*

✓ *The farm is familiar with its safety recordkeeping requirements under OSHA (and/or equivalent state regulation).*

According to the OSHA Recordkeeping standard (29 CFR 1904), employers are required to prepare and maintain records of occupational injuries and illnesses. This information is important for employers, workers and OSHA in evaluating the safety of a workplace, understanding industry hazards, and implementing worker safeguards to reduce and eliminate hazards.

Which Farms Require OSHA Recordkeeping?

If a dairy operation had 11 or more employees (non-family) at any point in time in the previous year (January 1 to December 31), then the operation must maintain OSHA-300, 300A and 301 injury and illness records. Dairy employers with 10 or fewer employees at all times during the previous calendar year are exempt from routinely keeping OSHA injury and illness records.

What Should be Recorded?

Dairy employers who are subject to the recordkeeping requirement as outlined above are required to record work-related injuries and illnesses that result in the following: death, days away from work, restricted work activity or job transfer, loss of consciousness and medical treatment beyond first aid. Employers must record any significant work-related injuries and illnesses that are diagnosed by a physician or other licensed health care professional, such as any work-related case involving cancer, chronic irreversible disease, a fractured bone or a punctured eardrum.

Injuries and illnesses are work-related if: (1) An event or exposure in the work environment either caused or contributed to the resulting condition, or (2) an event or exposure in the work environment significantly aggravated a pre-existing injury or illness (results in greater consequences).

OSHA provides clarification of what constitutes first-aid (non-recordable) versus medical treatment (recordable) for purposes of OSHA recordkeeping.

- Using a nonprescription medication at non-prescription strength (for medications available in both prescription and non-prescription form, a recommendation by a physician or other licensed health care professional to use a nonprescription medication at prescription strength is considered medical treatment for recordkeeping purposes)
- Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment for recordkeeping purposes)
- Cleaning, flushing or soaking wounds on the surface of the skin
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using butterfly bandages or Steri-Strips™ (other wound closing devices such as sutures, staples, etc., are considered medical treatment for recordkeeping purposes)
- Using hot or cold therapy
- Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for recordkeeping purposes)
- Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.)
- Drilling of a fingernail or toenail to relieve pressure or draining fluid from a blister
- Using eye patches
- Removing foreign bodies from the eye using only irrigation or a cotton swab (removing foreign bodies from the eye using tweezers is considered medical treatment for recordkeeping purposes)
- Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means
- Using finger guards

- Using massages (physical therapy or chiropractic treatment are considered medical treatment for recordkeeping purposes)
- Drinking fluids for relief of heat stress

OSHA also has exceptions to recordable injuries/illnesses suffered while at work. The injury/illness may not be recordable if it falls under one of the following exceptions [29 CFR 1904.5(b)(2)]:

- Eating, drinking or preparing food or drink for personal consumption
- Personal grooming, self-medication for a non-work-related condition or an intentionally self-inflicted injury
- Personal tasks at establishment outside of assigned working hours
- Motor vehicle accidents on company property while the employee is commuting to or from work
- Common cold and flu
- Blood donations
- Exercise programs or recreational sports
- Mental illnesses unless diagnosed as work-related

Recordkeeping Forms

OSHA has designated forms to help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

The OSHA 301 Injury and Illness Incident Report is the first form to be completed when a recordable work-related injury or illness has occurred. An equivalent form can be used if it has the same information, is as readable and understandable, and uses the same instructions as the OSHA form it replaces.

Dairy employers are required to use the OSHA Form 300 Log of Work-Related Injuries and Illnesses to classify work-related injuries and illnesses and to note the extent and severity of each case. Employers are also required to keep a separate Summary of Work-Related Injuries and Illnesses (Form 300A). OSHA Form 300A (for the preceding year) must be certified by a company executive and posted in a common area for the duration of February 1 through April 30. If employees will not see the form in its posting area, copies should be made available to them. Employers must enter each recordable case on the forms within seven (7) calendar days of receiving information that a recordable case occurred.

Forms can be kept on a computer as long as they can be produced when they are needed. All OSHA Recordkeeping forms and instructions for completing can be found at http://www.osha.gov/recordkeeping/RKforms.html.

Reporting to OSHA

OSHA requires (29 CFR Subpart 1904.39) that all employers report any worker fatality within eight hours and any amputation, loss of an eye or hospitalization of a worker within 24 hours. Employers must orally report the fatality/ hospitalization by telephone or in person to the OSHA area office that is nearest to the site of the incident. Employers may also use the OSHA toll-free central telephone number 1-800-321-OSHA (1-800-321-6742).

Electronic Form Submission

Beginning in 2017, OSHA requires certain employers to electronically submit injury and illness data that they are already required to record on their OSHA Injury and Illness forms. Analysis of this data will enable OSHA to use its enforcement and compliance assistance resources more efficiently. Some of the data will also be posted to the OSHA website. OSHA believes that public disclosure will encourage employers to improve workplace safety and provide valuable information to workers, job seekers, customers, researchers and the general public. The amount of data submitted will vary depending on the size of company and type of industry.

OSHA has provided a secure website that offers three options for data submission. First, users are able to manually enter data into a webform. Second, users are able to upload a CSV file to process single or multiple establishments at the same time. Last, users of automated recordkeeping systems will have the ability to transmit data electronically via an API (application programming interface). The Injury Tracking Application (ITA) is accessible from the OSHA website (https://www.osha.gov/injuryreporting/ita/), where dairy management will be able to provide OSHA Form 300A information.

At the time of this manual preparation, covered establishments with 250 or more employees are only required to provide their 2017 Form 300A summary data. *OSHA is not accepting Form 300 and 301 information at this time.* OSHA announced that it will issue a notice of proposed rulemaking (NPRM) to reconsider, revise or remove provisions of the "Improve Tracking of Workplace Injuries and Illnesses" final rule, including the collection of the Forms 300/301 data. The agency is currently drafting that NPRM and will seek comment on those provisions.

Establishments with 20-249 employees must submit information from their Form 300A by March 2.

Resources

OSHA Recordkeeping Forms and Requirements https://www.osha.gov/recordkeeping/

OSHA Recordkeeping Forms https://www.osha.gov/recordkeeping/RKforms.html

OSHA Electronic Reporting https://www.osha.gov/injuryreporting/index.html

03

Safety Management Principles

MANAGEMENT CHECKLIST

- ✓ The farm has a written safety plan or program.
- ✓ The farm's written safety plan or program includes the following fundamental elements:
  - *Owner and Manager Commitment*
  - *Employee Participation*
  - *Ongoing Hazard Recognition / Control*
  - *Training*
- ✓ Employees know how to report safety concerns.
- ✓ The farm reviews its written safety plan or program annually and updates it as needed.
- ✓ The farm follows a process for identifying and controlling safety hazards on an ongoing basis. One example is the Anticipate-Recognize-Evaluate-Control model.
- ✓ When a hazard has been identified, the farm evaluates the risk of injury or death. An example of a simple risk evaluation is to determine two factors: Likelihood and Severity.
- ✓ When a hazard has been identified, the farm implements a consistent method to prevent/control it. An example is the Hierarchy of Controls method: elimination, substitution, engineering controls, administrative controls and PPE.
- ✓ Safety inspections are conducted on a regularly scheduled basis. For example, weekly or monthly walkthroughs.
- ✓ The farm keeps records of safety incidents and near miss events.
- ✓ The farm investigates safety incidents and near miss events.
- ✓ The farm follows a consistent process for conducting safety incident and near miss investigations.
- ✓ The farm documents safety incident and near miss investigations.
- ✓ All new employees receive safety training.
- ✓ Employees receive refresher safety training. For example, through monthly safety talks.
- ✓ Employees receive refresher training following a near miss or safety incident?
- ✓ Safety training is documented.
- ✓ Indicators are used to measure the effectiveness of the farm's safety program.
- ✓ The farm reviews the results of the indicators /statistics on a regular basis, for example, annually.

3.1 Components of a Safety Management Program

✓ *The farm has a written safety plan or program.*

✓ *The farm's written safety plan or program includes the following fundamental elements:*

- *Owner and Manager Commitment*
- *Employee Participation*
- *Ongoing Hazard Recognition / Control*
- *Training*

✓ *Employees know how to report safety concerns.*

✓ *The farm reviews its written safety plan or program annually and updates it as needed.*

There are four fundamental elements of a successful dairy farm safety management program:

1) Owner and Manager Commitment. Owners and top managers must demonstrate commitment to workplace safety and provide a forceful and continuous leadership role in the safety program. Additionally, front-line supervisors must be competent and effective leaders to facilitate safe behaviors among workers.

2) Employee Participation. Employee participation in injury prevention must be maintained and encouraged.

3) Hazard Recognition and Control. Work environments on dairy farms must be made safe, free of recognized hazards known to cause injury, illness or fatality among workers. This involves implementing a mechanism to identify, recognize and control hazards known to cause injuries, illnesses or fatalities among dairy workers.

4) Worker Safety Training. All workers must be trained in the recognition and reporting of safety hazards on farms, and workers must abide by all safety rules and perform their job duties in a safe manner.

Owner and Manager Commitment

The fundamental tenet to any dairy farm safety program is that owners and managers must understand that the safety of all workers is an integral part of doing business.

Managers must accept the responsibility of stimulating awareness of safety among workers, and also demonstrate a commitment to the safety of workers if they expect workers to cooperate in making workplace conditions safe. Managers and supervisors must demonstrate a sincere interest in the safety of employees. Each manager and supervisor must assume the responsibility for the safety of his or her own department and must be given the necessary authority to fulfill that obligation.

A successful safety program starts with owners and top management. Owners and managers must always embrace safety on the farm and demand safe operations. Their attitude toward injury prevention sets the tone for the entire business and is adopted by supervisors and workers. If owners and managers demonstrate genuine interest in preventing injuries, everyone on the dairy will share that dedication. Mere lip service – talking about safety but not taking any action – will eventually undermine the safety program and make it ineffective.

Owner and manager attitudes toward the safety of employees should be demonstrated in the form of a written policy statement and made known to all levels of management and workers alike. A sound safety policy outlines the organization's objectives for its safety program and designates the authority and responsibilities for achieving them. The policy should be effectively communicated and set the pace for both management and worker responsibilities in the program. It is vital that this policy is effectively communicated, and that any barriers – for example, low literacy or language differences – are addressed to ensure the policy is understood.

Assumption of Responsibility
The establishment of responsibility for safety at each level of management forges an unbroken chain of accountability from the owner of the dairy down to the supervisor. This accountability must be extended in direct line through each work area to each worker. Dairy managers must see to it that this responsibility is fully accepted and then in turn, hold supervisors accountable for the safety performance of their respective areas of responsibility. A successful safety program must have the backing of owners and managers as well as the cooperation of the farm's workers. If owners are not interested in injury prevention, it is most likely that others in the management structure will reflect the same attitude.

Assignment of Responsibility
A common attitude is that safety is everyone's responsibility. This is generally true, but regulatory standards dictate that the safety of the worker is a management responsibility. Those in ultimate control of the organization must regard the provision of a safe workplace as a fundamental principle in the management of their employees. Successful safety programs have one thing in common: there is a deep-seated commitment by top management. Such commitment filters down through the organizational hierarchy to workers.

Today, it is imperative that dairy owners and managers become involved and participate in their safety programs because of the vast scope and potential consequences of state and federal legislation dealing with occupational safety and health.

Employee Participation

A second tenet (in addition to owner/management commitment) of any successful dairy farm safety management program is to ensure worker participation in the safety program. Dairy farms cannot have a safe workplace unless workers can develop and express their buy-in to safety and health. This includes their own health and also the health of all other workers.

Dairy workers are the first line of defense against safety concerns on a farm. They are on the front lines and they witness more safety incidents than their supervisors can observe. Since workers are often those closest to safety hazards, and have the most first-hand knowledge of workplace hazards, they also often have the best ideas for improving safety. Employee participation means that workers are encouraged to participate in the safety program. Clearly, the employer has ultimate responsibility for its workers. However, using employees' knowledge, observations and experience to help identify and resolve problems can make the system more effective.

Examples of how dairy workers can participate in the safety program include:

- Incident investigations
- Procedure development
- Development and implementation of safety and health training
- Job safety analysis
- Safety and health committee/team involvement
- Recommendations for specific actions in response to employee safety suggestions
- Problem-solving techniques to seek solutions to identified safety and health problems

At a minimum, a mechanism should exist for workers to identify and report safety concerns on the farm without fear of reprisal or punishment. Some employers choose to use a third-party hotline to manage reports by workers of safety concerns. These reported issues should be addressed in a timely fashion, which will communicate to workers that safety is a high priority for owners and managers.

Worker involvement in the safety program should also be recognized. Recognition encourages employees to use safe work practices and to integrate safety into the fabric of their daily jobs. Involving workers and using safe-behavior reinforcement develops a positive approach to managing the safety and health program on a farm.

Accountability
On-farm visits and discussions with producers have revealed that some farms lack a clear structure that holds managers and employees accountable / responsible for their work. This situation happens when managers or workers are not given clear expectations for job performance or their individual level of responsibility. There should be no ambiguity when communicating to managers and workers that they are each individually accountable and responsible for following safety protocols.

Accountability is a fundamental principle of business success and must be incorporated into the management structure. When accountability is clear, productivity and efficiency follow. Holding owners, managers and workers accountable for their safety performance is no exception.

Hazard Recognition and Control

A third necessary component of a safety and health management program is an ongoing process of analyzing the workplace to identify hazards. The purpose of this is to identify hazards in the workplace so they can be adequately addressed through elimination or control.

A worksite hazard analysis begins with a comprehensive, baseline hazard survey (See Section 3.4). The farm should then perform routine health and safety inspections. The point is to identify hazards missed in prior inspections. These are generally done on a weekly basis. In addition, daily inspections of the work area should also be performed. Continuous inspections are used to analyze the work area to keep hazards in check and keep workers safe. Identified hazards should be controlled using the hierarchy of controls and with other methods.

The hierarchy of controls includes the following:

- Elimination and Substitution
- Engineering Controls
- Administrative Controls
- Personal Protective Equipment (PPE)

These four control methods are presented and discussed in Section 3.3.

Worker Safety Training

Worker safety training is the fourth tenet of a safety management program on a dairy farm. Safety and health training is vital to every work place and is most effective when it's integrated into a company's overall training in performance requirements and job practices. The materials covered in a farm's health and safety training and the methods of training presentation should reflect the unique needs and characteristics of the company's workforce. As a result, it's important to perform a training needs analysis early in the process. Worker health and safety training is presented and discussed in detail in Section 3.5.

Resources

What is a Safety and Health Management Program?, Convergence Training https://www.convergencetraining.com/blog/what-is-a-safety-and-health-management-program

3.2 Causes of Workplace Injuries and Fatalities

✓ *The farm follows a process for identifying and controlling safety hazards on an ongoing basis. One example is the Anticipate-Recognize-Evaluate-Control model.*

✓ *When a hazard has been identified, the farm evaluates the risk of injury or death. An example of a simple risk evaluation is to determine two factors: Likelihood and Severity.*

Every dairy farm is unique with variations in production practices, but all face potential safety hazards that can present a threat to the health and safety of workers. Dairy workers often work in isolation, facing safety risks from cows, mechanical and chemical hazards, climatic conditions, fatigue or even rushed work schedules.

Table 1. Frequency of Hazard with Example Definitions

Description	Code	Definition
Frequent	A	Once per week
Probable	B	Once per year
Occasional	C	Once per 3 years
Rare	D	Once per 10 years
Improbable	E	Once per 100 years

Figure 1. Risk Assessment Matrix of Frequency and Severity

(Priority: L=low, M=Medium, H=High, VH=Very High)

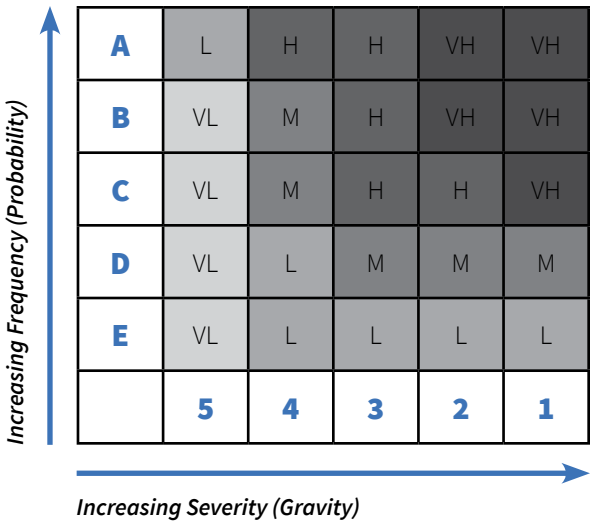


Table 2. Severity of Hazard with Example Definitions

Description	Code	Definition
Catastrophic	1	• Single or multiple deaths • Severe and immediate operational difficulties • Farm shutdown
Critical	2	• Severe multiple injuries or potential mortal disease • Severe operational difficulties • Severe reputational damage
Major	3	• Severe injury or disease • Loss of critical equipment
Minor	4	• Minor injury or disease • Irritation
Negligible	5	• No injury or disease • No significant impact on production

The leading cause of death and serious injury on U.S. dairy farms involve heavy machinery, specifically tractors.[1] Machine-related incidents include tractor rollovers, being run over by tractors and entanglement in rotating shafts. A second cause of dairy farm safety incidents involves interactions with dairy cows. Animal-related injuries include kicks, bites and being pinned between animals and fixed objects. Interactions with dairy cattle can take place when moving cows to the milking barn or during actual milking activities.[2-4] Other causes of injuries include chemical hazards, confined space entrapment (e.g., manure lagoons), use of power tools and improper use or lack of personal protective equipment.[5]

When evaluating dairy farm working environments, one approach to identifying safety hazards is to identify and control hazardous energy sources that may pose a threat to a worker. Those energy sources include electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other sources from machines, equipment or animals that can be hazardous to workers. A simplistic, four-step framework to address the potential causes of dairy farm injuries and fatalities is the Anticipate-Recognize-Evaluate-Control model. This model will be used throughout this manual to present how specific dairy safety hazards should be managed.

1) Anticipate potential safety hazards on the farm. Farm leadership should be conducting safety walkthroughs on a daily basis, either formally or informally. Work areas and situations should be assessed for potential safety hazards. Anticipation of what could go wrong is vital to the prevention of safety incidents. An example of safety anticipation is when farm management reviews new chemicals or machinery for hazards prior to their use on the farm.

2) Recognize potential safety hazards on the farm. For example, toxic gases emitted from a manure storage lagoon may cause harm to a worker. Therefore, everyone on the farm (i.e. employees, management, guests, vendors) should recognize these hazards.

3) Evaluate hazard exposures and their possible risk to the health and safety of the worker. Farm management can implement a formalized but simplistic method of assigning a degree of risk for injury or death with each recognized safety hazard based on two factors: Likelihood and Severity of the Hazard.

- *Frequency or Likelihood of the Hazard*
  Frequency of a hazard can be classified as frequent, probable, occasional, rare or improbable (Table 1, Page 23)
- *Severity of Injury or Consequence*
  The severity of a possible injury can be classified as catastrophic, critical, major, minor or negligible (Table 2, Page 23)
- Assignment of these two risk factors can then be incorporated into a risk matrix (Figure 1, Page 23) which will facilitate the prioritization of which safety hazards should be addressed first.

4) Prevention and Control of safety hazards before they result in worker injury or death. Safety hazards are prevented via usage of controls. Hierarchy of hazard control is a system used in industry to minimize or eliminate exposure to safety hazards. This hierarchy is a widely accepted system promoted by businesses in all industries. The hierarchy of hazard control is presented in Section 3.3.

3.3 Hierarchy of Controls

✓ *When a hazard has been identified, the farm implements a consistent method to prevent/control it. An example is the Hierarchy of Controls method: elimination, substitution, engineering controls, administrative controls and PPE.*

After Recognizing and Evaluating safety hazards on a farm (presented in Section 3.2), dairy management needs a systematic methodology to control identified hazards. Controlling exposures to occupational hazards is the fundamental method of protecting dairy workers. Traditionally, a Hierarchy of Controls has been used as a means of determining how to implement reasonable and effective control strategies.

Hierarchy of Controls is a widely accepted system used across all industries to minimize or eliminate exposure to hazards, and is a system promoted by numerous safety organizations.

A simple representation of the Hierarchy of Controls that is presented in multiple sources is an inverted triangle, where control methods at the top are more effective and protective than control methods at the bottom of the triangle. By following this hierarchy, dairy farm management can implement safety systems that lead to the reduction of injury or illness among dairy workers.

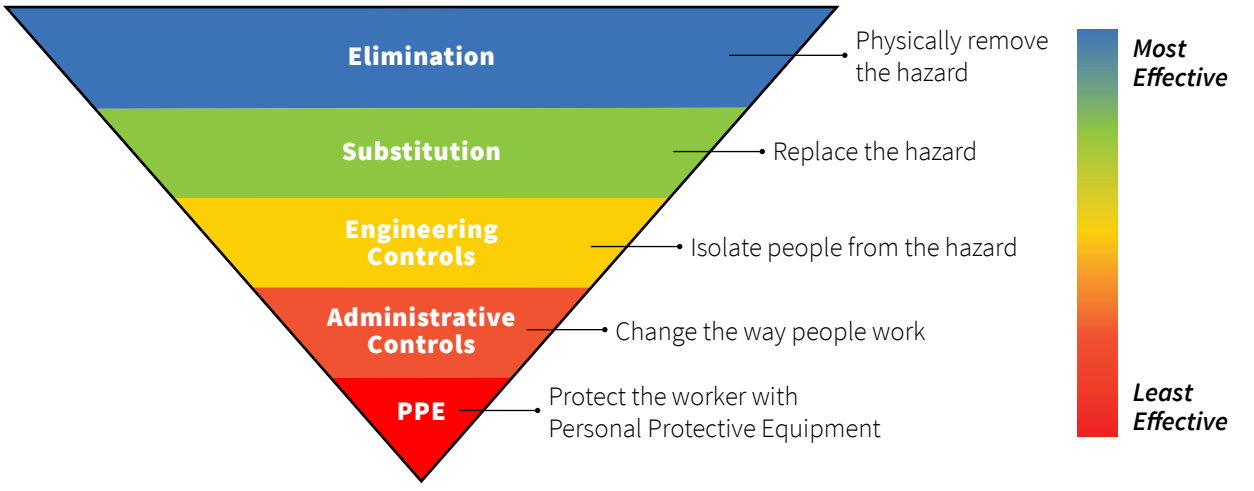
Elimination and Substitution

Hazard elimination, the most effective hazard control strategy, implies removing the safety hazard. For example, many older milking barns may have projections at head height such as pipes and rails, which present a risk for injury for workers. Where possible, removal of these head-high obstacles and hazards would be an effective elimination control strategy.

Substitution, the second most effective hazard control, involves replacing something that produces a hazard with something that does not produce a hazard. For example, instead of a solvent-based paint, water-based paints can be used. Sand-blasting can be substituted with a non-silica containing abrasive material. If an alternative product exists on the market, substitution can be a very effective solution. However, to be an effective control, the new product must not produce another hazard to workers, animals or the environment.

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be less expensive and simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for a hazard.

Figure 2. Hierarchy of Controls



Engineering Controls

Moving down the control hierarchy is engineering controls, which is the third most effective means of controlling hazards. Engineering controls do not eliminate hazards, but rather isolate people from the hazards.

Engineering controls are favored over administrative and personal protective equipment (PPE) for controlling existing worker exposures in the workplace because they are designed to remove the hazard at the source, before it comes in contact with the worker. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. One hazard in the milking parlor is the risk of kicking cows. An engineering control example is installing kick rails to reduce the risk of being kicked among milkers. Another example is automated wash systems. Traditional dairy parlors may have wash systems that require an individual to manually fill a screw-top jar with soaps/acids and attach it to the wash system. Automated systems pull the soap/acid directly from a large tote, thereby reducing worker exposure to such chemicals.

The initial cost of engineering controls can be higher than the cost of administrative controls or PPE, but over the longer term, operating costs are frequently lower, and in some instances, can provide a cost savings in other areas of the process.

Administrative Controls and PPE

Administrative controls and Personal Protective Equipment (PPE) are frequently used with existing processes where hazards are not particularly well controlled. Administrative controls (or work practice controls) are changes in work procedures such as written safety policies, rules, supervision, schedules and training with the goal of reducing the duration, frequency and severity of exposure to hazardous chemicals or situations.

An example of an administrative control inside a milking barn is job rotation among workers to help minimize fatigue and reduce muscle demands. Examples of PPEs include gloves, aprons, eye protection or dust masks. Administrative controls and PPE programs may be relatively inexpensive to establish. However, these methods for protecting workers have also proven to be less effective than other hazard controls, requiring significant effort by the affected workers.

3.4 Safety Inspections, Audits and Investigations

- ✓ *Safety inspections are conducted on a regularly scheduled basis. For example, weekly or monthly walkthroughs.*
- ✓ *The farm keeps records of safety incidents and near miss events.*
- ✓ *The farm investigates safety incidents and near miss events.*
- ✓ *The farm follows a consistent process for conducting safety incident and near miss investigations.*
- ✓ *The farm documents safety incident and near miss investigations.*

From a safety management perspective, the purpose of conducting various safety analyses is to prevent future safety incidents from occurring. There are three types of safety analyses that can be performed on a dairy farm: safety inspections, safety audits and safety incident investigations. All three modes of safety analysis have different objectives and methods, with all sharing a common goal of safety incident prevention.

Safety Inspection

Inspections are conducted to identify equipment failures, worker safety performance and opportunities for process improvement. Safety inspections can be general or very detailed. General inspections can include a simple safety walkthrough to identify a wide array of safety problems or hazards, similar to pilots of commercial aircraft performing pre-flight aircraft walk-arounds to inspect for noticeable safety issues. Detailed inspections may be tailored to a specific activity or piece of equipment when specific conditions or safety hazards are of interest.

Inspections can be conducted on a scheduled or pre-planned basis, or random and unannounced. Scheduled inspections may be a simple daily inspection of equipment or a work area performed at the same time each day or month. Dairy workers can be delegated the task of performing safety inspections prior to operation of machinery or tools. Unscheduled inspections can be random and conducted by farm safety personnel or hired outside consultants.

The goal of a safety inspection is to recognize and identify safety hazards. Inspections can be performed by personnel with specialized training, knowledge and experience to evaluate specific hazards. In most situations, anyone on a farm can be adequately trained to identify and report unsafe conditions. Dairy workers should be trained to identify safety hazards and report them to dairy management for abatement. On some occasions, special instrumentation or tools may be needed to conduct a safety inspection.

A safety checklist is the most common tool used to conduct a safety inspection. Workers often cannot remember every single safety hazard to be identified, and a checklist provides a formal method to monitor which items or work areas have been inspected and which hazards were identified. An inspector signature with date stamp provides proof that an inspection was conducted, and provides evidence that a proactive approach to the identification and correction of safety hazards occured.[1]

Safety Audit

A safety audit is a more formalized, systematic process for evaluating a dairy farm safety management program. Components of a safety audit can include compliance with regulatory standards or industry standards, and be applied to systems, processes, products or programs. After identification of the scope of a safety audit, audit team members with specific expertise or training in farm safety then carry out the audit in a formal, systematic approach.[1] Safety program and injury records are often reviewed as part of a safety audit. Some workers' compensation insurance providers offer free safety audits. The farm's local OSHA office, equivalent state OSHA office or regional NIOSH center may also offer consultative safety visits.

Safety Incident Investigation

A third form of safety analysis is a safety incident investigation. When safety incidents or near miss events occur, incident investigations provide valuable information related to the root cause to identify measures that can prevent similar incidents from happening in the future. A general objective of an incident investigation is to gather facts of the incident. Some questions to consider:

- Where did the incident or near miss occur?
- Who was involved?
- What were they doing during the incident or near miss?
- What caused the incident or near miss?
- How can similar incidents or near misses be prevented?

It is important to document safety incident and near miss investigations. This helps determine if there are any trends. For example, if incidents are occurring frequently during a particular shift or in a particular area of the operation, the farm owners and managers can focus attention accordingly. However, safety-related documentation can be discoverable during litigation. Work with a licensed attorney or safety consultant to determine the best approach to safety documentation for your farm.

High priority incident investigations include those high cost and high severity incidents, safety incidents that occur frequently, incidents that are of public interest and incidents with high potential losses including property or human life. Incident investigations should occur as soon after the occurrence as possible because pieces of evidence disappear or deteriorate with time, as well as witness memories.[1]

Resources

A Safety Checklist for Dairy Farms, Washington State Department of Labor and Industries https://lni.wa.gov/forms-publications/F417-267-000.pdf

Health and Safety for Dairy Farms, Forms and Checklists, Worksafe BC https://www.worksafebc.com/en/resources/health-safety/forms/dairy-farms-forms-checklists

Farm and Ranch Safety Audit, Texas Department of Insurance https://www.tdi.texas.gov/pubs/videoresource/cklfarm.pdf

Farm and Ranch Safety Audit, New Mexico State University http://aces.nmsu.edu/pubs/_m/M117.pdf

Farm Safety Checklist, New York OSHA Work Group http://www.nycamh.org/osha-ny-dairy-lep/

OSHA Field Operations Manual https://www.osha.gov/sites/default/files/enforcement/directives/CPL_02-00-164_1.pdf

Incident Investigation, OSHA https://www.osha.gov/dcsp/products/topics/incidentinvestigation/index.html

3.5 Worker Safety Training

✓ *All new employees receive safety training.*

✓ *Employees receive refresher safety training. For example, through monthly safety talks.*

✓ *Employees receive refresher training following a near miss or safety incident.*

✓ *Safety training is documented.*

Worker safety training is just one component of a comprehensive safety management program.

Effective worker safety training is one mechanism to facilitate the reduction of safety incidents. Safety training is necessary to inform workers of hazards and equip them with the knowledge and resources to protect themselves and coworkers. Methods of safety and health training can include classroom-based lectures, computer-based training or individualized methods that can include hands-on demonstration and mentoring.

Need for Worker Safety Training

Workplace safety training is a process that aims to provide dairy workers with knowledge and skills to perform their work in a safe manner. A dairy employer is responsible for instructing every worker on how to perform job tasks in an effective, safe and healthy manner. Safety training is an integral part of the employee onboarding process but it also requires regular refresher courses for reinforcement, compliance and effectiveness.

As farms increase in size, they need even more workers to perform a variety of farm tasks. At present, the U.S. dairy industry is experiencing significant labor shortages and competitive labor markets. As a result, many farms are confronted with high employee turnover. This makes safety training during onboarding more complicated because new workers may be hired on a daily basis, thus the training must be repeated many times. **A comprehensive training program is not limited to initial training during onboarding.** Regular and routine safety trainings help workers remember safety-related best practices and hazards information. Routine training sessions also provide an opportunity to teach new or revised safety protocols related to changes in equipment, materials, procedures and roles on the farm.

Workforce Demographics

Similar to other U.S. agricultural businesses, dairy farms employ a large percentage of immigrant workers.[1] Immigrant agricultural workers in the U.S. are mostly from Latin America, including Mexico, Central and South America.[2,3] The agricultural workforce is composed mostly of Hispanic individuals with limited English-proficiency.[4] Many immigrant agriculture workers speak little or no English with the common language being Spanish on dairy farms, which presents a safety training challenge.[5] Safety issues related to low English literacy levels of Hispanic workers on U.S. dairy farms can be a concern to dairy owners. Inadequate safety education and inadequate instruction are two factors related to safety training and can be compounded by a language barrier.[6]

Dairy management should recognize that limited education among dairy workers may affect safety training in several ways including (1) limited literacy, (2) limited development of learning skills, and (3) limited ability to learn complex concepts. As a result, the mode of delivery of safety training information to dairy workers should take this into consideration. The simple translation of training materials into a specific language does not ensure that they are linguistically, culturally and educationally appropriate for a particular workforce. All delivered trainings should be evaluated to determine if workers understood the material and are able to apply lessons learned.

Mechanisms of Training Delivery

The Occupational Safety and Health Administration (OSHA) mandates that if an employee does not speak or comprehend English, instruction must be provided in a language the employee can understand. Similarly, if the employee's vocabulary is limited, the training must account

for that limitation. By the same token, if employees are not literate, telling them to read training materials will not satisfy the employer's training obligation. In general, employers should approach communicating safety information similar to other work-related information. If employers customarily communicate work instructions or other workplace information to employees at a certain vocabulary level or in language other than English, they will also need to provide safety and health training to employees in the same manner.

An effective and sustainable safety training program involves the delivery of health and safety training content to workers in a variety of formats (visual, oral, hands-on) so that communication of concepts and practical information fits the learning styles that are most effective for individual workers. The best training programs take advantage of the following characteristics of adult learners:

- Adults are self-motivated
- Adults expect to gain information that has immediate application and relevance to their work
- Adults learn best when they are actively engaged
- Adult learning activities are most effective when they are designed to allow workers to develop both technical knowledge and general skills
- Adults learn best when they have time to interact, not only with the instructor but also with each other
- Adults learn best when asked to share each other's personal work experiences

A number of barriers to effective safety training on dairy farms should be recognized. Geographical remoteness of dairy farms makes the availability of safety trainers limited. Additionally, many dairies have limited computer resources and internet connectivity resulting in limited electronic training capability. The hurdle of delivering training that accommodates aforementioned learning styles, cultural differences and multiple languages has never been larger given the current workforce demographics.

Lastly, because dairy production is dependent on consistent and timely milking routines, any disruption of these milking routines could have profound effects on cow health and production, making it difficult to pull workers off the job for training. Recent novel advances in the delivery of safety training content using mobile devices have proven to be effective in overcoming these challenges to effective safety training on dairy farms.[5] Other practical approaches to overcoming these barriers to learning include utilizing bilingual trainers to deliver training content, incorporating worker participation in training sessions and providing learning opportunities for workers to practice safety skills learning in training sessions.

Training Effectiveness

There are four evaluation levels that can be used to determine the quality and effectiveness of training, and if the training is worth the time and expense.

- ***Level 1: Reaction Evaluation*** measures how trainees reacted to a training. It helps to determine how well the training was received and ways to improve future training.
- ***Level 2: Learning Evaluation*** measures what trainees learned and how much their knowledge increased. For example, pre-training and post-training quizzes can help determine how much knowledge was gained as a result of training.
- ***Level 3: Behavior Evaluation*** measures how trainees have changed their safety behavior on the farm based on the training. Specifically, this analyzes how trainees apply the information presented to them.
- ***Level 4: Results Evaluation*** measures the final results of training such as reduced injuries reported, reduced near misses or increased hazards identified and corrected.[7]

Documentation and Recordkeeping

Some regulations require that specific records be kept for proof of completion of required training. A recordkeeping system will help ensure that training records are:

- Retrievable, readily identifiable and maintained in an orderly manner
- Dated, current, accurate and legible
- Retained and maintained following each training event

Training records should identify:

- Date, location and duration of training
- Course name
- Name(s) of trainer/s
- Training materials used
- Training objectives
- Language spoken for delivery of training
- List of trainees participating in the class with their signature as proof of attendance

Resources

National Farm Medicine Center, Marshfield Clinic: http://www.marshfieldresearch.org/nccrahs; https://cultivatesafety.org/resourcesearch/

Upper Midwest Agricultural Safety and Health Center (UMASH) http://umash.umn.edu/resources/

Center for Dairy Farm Safety (CDFS) https://www.uwrf.edu/CenterForDairyFarmSafety/Index.cfm

Dairy Training Guide (English and Spanish), Western Center for Agricultural Safety and Health (WCAHS) https://agcenter.ucdavis.edu/dairy-safety-training

Dairy Training Videos, Ohio State University's Agricultural Safety & Health Program http://agsafety.osu.edu/programs/farm-sos-strategies-safety

Dairy Safety Training Videos, U.S. Agricultural Safety and Health Centers https://www.youtube.com/playlist?list=PLY7XQBihZRNux6fNXaUbFMEfuvE-7j89Rb

Occupational Safety and Health Administration, Training Requirements in OSHA Standards https://www.osha.gov/Publications/osha2254.pdf

Occupational Safety and Health Administration, Resource for Development and Delivery of Training to Workers https://www.osha.gov/Publications/osha3824.pdf

ANSI/ASSE Criteria for Accepted Practices in Safety, Health, and Environmental Training, ANSI/ASSE Z490.1-2009 https://store.assp.org/PersonifyEbusiness/Store/Product-Details/productId/29237745

3.6 Leading and Lagging Indicators

✓ *Indicators are used to measure the effectiveness of the farm's safety program.*

✓ *The farm reviews the results of the indicators /statistics on a regular basis, for example, annually.*

Like many other business organizations, dairy farms continuously strive to improve all operations on the farm to maximize productivity, efficiency and effectiveness. Workplace safety is no different as dairy operations should also strive to improve the safety of their workplace and reduce instances of workplace injuries among workers. However, sustained improvement programs in workplace safety, as reflected in reduced workplace incident rates, lost days due to injuries and other measures, are generally not common practice in the industry. In many business operations across industries, graphing key safety metrics over time often reveals a series of peaks and valleys in actual safety performance. Organizations can also plateau in their safety performance and struggle to improve beyond that point.

Too often, dairy farms focus only on *lagging indicators* of workplace safety. The number of safety incidents, injury rates and injury costs are important indications of the safety performance of a dairy farm. An important consideration is that these indicators reflect the consequence of unsafe conditions or behavior and provide limited insight into the root cause of a safety incident. *Leading indicators* focus on steps and processes that are designed to prevent a safety incident from taking place.

Getting Started with Safety Statistics

There are many options for developing metrics to assess the farm's workplace safety. Over time, as a safety program grows, the farm should look to grow the number and variety of metrics it uses to asses itself.

If a farm does not currently track any safety metrics, a good starting point is to calculate the farm's DART rate – cases with days away from work, job restriction or transfer. DART stands for Days Away, Restricted or Transferred. A farm can use this online calculator from the Bureau of Labor and Statistics: https://data.bls.gov/iirc/. Alternatively, the OSHA 300 Log can be used to help with the calculation: www.osha.gov/recordkeeping/RKforms.html. The steps to calculate DART manually are:

- Calculate the number of hours actually worked by all employees on the farm last calendar year
- List all non-fatal cases of on-farm injuries or illnesses from the last calendar year
- Put a checkmark next to each case that resulted in one or more days away from work, a job restriction (restricted work activity) or a job transfer. If you are using the OSHA 300 log, you can add up the number of cases with column (H) or (I) checked.

Now, perform the following calculation:

(Number of Cases × 200,000)
÷ Number of Hours Worked = DART Rate

For example, if the farm has 8 full-time employees who work 50 hours per week with 2 weeks of combined vacation and holidays per year, the total number of hours worked is: 8 employees x 50 hours x 50 weeks = 20,000 hours. If the farm had 2 cases of non-fatal injuries or illnesses that resulted in days away, a restriction or a job transfer, the DART rate would be: (2 x 200,000) / 20,000 = 20. That would mean that for every 100 full-time employees, an average of 20 would have had a DART recordable injury or illness.

The table on Page 35 summarizes DART rates for a sample set of industries. It can be useful to compare the farm's safety performance to other farms and other industries.

Safety incident rates, like DART, are useful lagging indicators. In other words, they measure past performance. As discussed below, a comprehensive safety assessment will consider both leading and lagging indicators.

Industry	2017 DART Rate*
Dairy cattle and milk production**	***3.3***
Construction	***1.8***
All Manufacturing	***2.0***
• Food manufacturing	***3.1***
• Apparel manufacturing	***2.4***
• Chemical manufacturing	***1.2***
Utilities	***1.1***

Data Source: Bureau of Labor Statistics, Industry Injury and Illness Data
https://www.bls.gov/iif/oshsum.htm
* Cases with days away from work, job restriction or transfer
**Does not reflect farms with fewer than 11 employees.

Sustained Farm Safety Improvement

There are many reasons for a failure of sustained safety continuous improvement on a dairy. These include dairy management directives and policies that conflict with the goals of a safe worksites around a farm, ineffective communications between management and workforce, failure of management to quickly respond when potential safety hazards are identified, and a lack of effective training of employees on safe work procedures.

Failure to achieve workplace safety objectives or sustain continuous improvement efforts can often result from improper choice of metrics used by dairy farms to measure individual aspects of a workplace safety program. A sole focus on lagging indicators, such as the number of safety incidents or injury rates, provides very minimal direction or insight into the specific behaviors or events that result in a worker injury or fatality. Lagging indicators only measure past performances or failures. Lagging indicators are reactive, not proactive.

Leading indicators are proactive, preventative and predictive measures that monitor and provide current information about the effective performance, activities and processes of a dairy farm safety management program. They foster the identification and elimination or control of risks on the farm that can lead to safety incidents and injuries. Leading indicator safety metrics that focus on specific safety behaviors and activities are more likely to have a positive influence on workplace safety on a farm. Leading safety indicators provide farm personnel with immediate feedback on actions that can result in unsafe workplace conditions or lead to incidents or injuries. Leading indicators also offer a quality control check on the integrity of processes designed to foster safe working conditions.

Effective leading indicators share the following characteristics:

- They measure identified behaviors and activities that can directly lead to improved workplace safety.
- They are understood and accepted by all farm personnel as directly relevant to workplace safety.
- Their focus and intent are closely aligned with an organization's strategic goals and objectives.
- They are cost-effective and easy to measure.
- They are achievable.
- They are meaningful, which justifies continued tracking.
- They are easy to communicate to all farm personnel.
- They are relevant to the dairy farm's organizational objectives.
- They are timely.

Leading and lagging indicators can be used together to get a complete picture of the status of workplace safety efforts and how to approach improvement.

Examples of leading and lagging indicators that can be used on dairy farms to measure workplace safety program effectiveness are presented in the table on Page 37. Each set of indicators corresponds to the given Safety Program Element.

Resources

UL, Using Leading and Lagging Indicators to Manage Workplace Health and Safety Risk
https://library.ul.com/wp-content/uploads/sites/40/2015/02/UL_WP_Final_Using-Leading-and-Lagging-Safety-Indicators-to-Manage-Workplace-Health-and-Safety-Risk_V7-LR1.pdf

National Safety Council, Practical Guide to Leading Indicators: Metrics, Case Studies and Strategies
https://www.nsc.org/Portals/0/Documents/CambpellInstituteandAwardDocuments/WP-PracticalGuidetoLI.pdf

National Safety Council, Transforming EHS Performance Measurement Through Leading Indicators
https://www.thecampbellinstitute.org/wp-content/uploads/2017/05/Campbell-Institute-Transforming-EHS-through-Leading-Indicators-WP.pdf

Safety Program Element	Leading Indicator Examples	Lagging Indicator Examples
Management Support and Accountability	• Mission and value statements incorporating safety • Percent of business goals incorporating safety • Average number of corrective actions per safety incident	• Participation in safety meetings • Budgetary resources allocated to safety • Safety metrics effectively disseminated and understood among workers
Worker Participation	• Percent of workers involved in safety processes • Percent of workers leading safety meetings • Percent of workers receiving safety meetings • Percent of workers providing return demonstration of safe work practices	• Number of work process modifications • Corrective action duration
New Hire Training	• Percent of employees trained prior to start of work • Trainee scores on pre- vs post-training quizzes	• Number of training topics • Number of training sessions • Number of repeated training topics
Safety Inspections/Audits	• Number of inspections and observations • Percent of compliant/safe conditions • Percent of suboptimal conditions • Percent of corrective actions within designated timeframe	• Near misses • Incident rate (frequency and severity)
Safety Incident/Near Miss Investigations	• Root cause(s) for loss identified • Number of near misses investigated • Number of observations investigated • Average time to complete investigations	• Average time for corrective actions to be implemented • Repeat incidents types and/or workers
Performance Management	• Percent of performance reviews measuring success in achieving results • Number of inspections compared to individual objective • Number of safe/unsafe behavior observations • Number of safety meetings conducted compared to individual objective	• Near misses • Incidence rate (frequency and severity) • OSHA recordable injuries • OSHA citations • Fatality rate • Workers' compensation claims • Experience modification rate • Loss costs • Project profitability

*Adapted from Using Leading and Lagging Safety Indicators to Manage Workplace Health and Safety Risk, UL, found at https://library.ul.com/wp-content/uploads/sites/40/2015/02/UL_WP_Final_Using-Leading-and-Lagging-Safety-Indicators-to-Manage-Workplace-Health-and-Safety-Risk_V7-LR1.pdf

04

Safety Topics

MANAGEMENT CHECKLIST

✓ The farm conducts a hazards assessment for each safety topic/area, evaluating both likelihood and severity of hazards.

✓ The farm uses one or more of the following to manage hazards for each safety topic/area.

- *Elimination / Substitution*
- *Engineering Controls (Facility Design, Structures, Railings, etc.)*
- *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
- *PPE*

✓ The farm offers initial safety training for each safety topic/area.

✓ The farm offers regular refresher safety training for each safety topic/area.

✓ Regular inspections or audits are conducted to ensure that safe practices and procedures are being used for each safety topic/area.

4.1 Worker Safety During Animal Handling

- ✓ *The farm conducts a hazards assessment for worker safety during animal handling, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage hazards during animal handling:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training for worker safety during animal handling.*
- ✓ *The farm offers regular refresher safety training for worker safety during animal handling.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used during animal handling.*

Livestock handling is a critical component of worker health and safety on dairy farms, and is a major contributor of fatal and nonfatal injury incidents.[1-6]

Dairy farming because of its very nature includes a large variety of activities and tasks that involve the handling of livestock. Almost every aspect of animal care involves a close interaction with livestock of any size and age. Livestock handling activities require differing levels of animal handling skills, but they all require a basic understanding of herding instinct and cow behavior. Some activities or tasks such as milking, feeding or heat detection occur frequently (daily or even multiple times a day), while others such as vaccinating or hoof care occur less frequently. Other activities such as veterinary care, dehorning and calving assistance are only performed on an as-needed basis.

Risk factors for a livestock handling injury include younger and older workers, hours worked, hearing difficulties, inadequate training of animal behavior and worker stress.[6] Inappropriate worker behavior can influence cow behavior thus increasing risk for injury to the cow or worker. Because little can be done to change behavioral instincts of cattle, there are only two factors that can be modified to decrease the risk of a livestock handling-related injury: human behavior and the working environment.[6]

Anticipation and Recognition of Hazards

Because there are multiple tasks performed on a dairy farm that involve close proximity interactions with dairy cows and calves, there are numerous situations and scenarios that may result in a worker injury. Every work area and task performed should be carefully analyzed and monitored to identify potential safety hazards. Dairy cows are large animals and their behavior can often be unpredictable. Each worker should approach each interaction with one or many cows with caution and anticipate dangerous situations or hazards that could unexpectedly develop quickly. For this reason, worker understanding of the behavioral characteristics of cattle may facilitate gentle yet efficient handling, thus reducing the risk for worker injury.

Critical in minimizing the risk for livestock handling safety incidents from a worker's perspective is gaining a true understanding and appreciation of how cows respond to their interactions with caretakers. Not understanding or anticipating cow reactions to their environments increases the risk of a worker being in a situation where he or she may be injured. An understanding of animal behavior will enable workers to anticipate and recognize hazards while working with dairy cows.

Another livestock handling hazard that should be anticipated and recognized is zoonotic diseases. Zoonoses can be serious diseases that are transferable to humans from animals causing mild to life threatening human health problems. People working with livestock, including those working in the dairy, may be exposed to these infections and in fact are at greater risk for some infections, especially enteric illnesses or skin infections (i.e. ringworm). The exposures may be due to direct contact with animals or a contaminated environment. More common zoonotic diseases of concern for dairy workers include Campylobacteriosis, Cryptosporidiosis, Salmonellosis and E. coli O157 infections. Some illnesses (i.e. Q-fever) can be a problem for pregnant women especially if handling bovine birthing tissues or fluids, but caution should also be used in handling milk, urine, blood, and semen. Another concern is consumption of raw milk or raw cheeses. It is important to emphasize and encourage regular hand washing, especially before breaks and eating, and refraining from consuming raw or unpasteurized dairy products.

CASE EXAMPLES

1. In July of 2018, a 68-year-old male was feeding his only bull when it charged and gored him unprovoked. The bull attacked him multiple times, pinning him to the ground and pushing him out of the pasture. The deceased was pronounced dead at the scene shortly after emergency personnel arrived at his farm. According to family members, the bull had shown signs of aggression.

2. In August of 2018, a 72-year-old man dies after being struck by a bull on a farm in western New York. The deceased was moving cattle around the farm when he was struck by a one year-old bull.

3. In July of 2003, a 48-year-old dairy farmer was loading cattle onto a trailer when he was fatally crushed between the end of a gate and a steel fence. A cow turned and tried to push through the gate while the victim was standing by the side wall. The victim was crushed by the gate and his heart punctured by a metal protrusion on the end of the gate. Source: https://www.health.ny.gov/environmental/investigations/face/03ny040.htm

Evaluation of Hazards

Frequency or Likelihood of Hazard
From a human perspective, as either the frequency of the task or the proximity of the task to the animal increases, the likelihood of livestock caretakers being confronted with this hazard increases. However, there is a mitigating factor in both frequency and proximity: as animals get used to being handled, and as they get used to their caretakers performing the same task repeatedly, the likelihood of an animal or group of animals reacting out of fear diminishes.

Tasks that are new or unknown to an individual or group of animals likely increase the risk to animal handlers. The risk or likelihood of an animal reacting unpredictable to certain activities or tasks increases even more if these animals are singled out without the protection of the herd, especially in unfamiliar surroundings.

Severity of Injury or Consequence
Prior reports and research have clearly established that livestock handling related safety incidents can result in significant injuries or even death.

As a result of high frequency and potential high injury severity safety hazards, worker safety during livestock handling activities should be assigned a high priority on a dairy farm and reinforced through trainings and communications. Identified safety hazards during livestock handling activities should be prevented or controlled using the Hierarchy of Controls approach.

Prevention and Control Strategies of Hazards

Elimination and Substitution of Hazard
Due to the necessity of having cows on a farm to produce milk, the use of milking cows obviously cannot be eliminated or substituted. Many farms have eliminated the inherent safety risks associated with dairy bulls and substituted with artificial insemination practices. However, many smaller farms continue to utilize bulls for natural service. The mere presence of bulls on a dairy farm should always be recognized as a safety hazard by all workers.

Engineering Controls
Proper facility design can play a major role in preventing safety incidents. Properly designed milking parlors, alleys, pens and chutes on a farm will facilitate the efficient moving of cattle where the animals move on their own accord with limited interaction with the handler. Effective facility design will reduce the incidence of alarmed, excited cattle as well as the risk for worker injury.[7]

Engineering control examples include:

- Nonslip flooring
- Alleys free from visual and auditory distractions causing cattle to balk (i.e., shadows, reflections, changes in flooring type and excessive noise)
- Alleys should be designed with a minimum number of corners and sharp turns
- Facilities and pens should have clearly marked and accessible exits so that it is possible for the handler to rapidly exit from the cattle area if the animal turns or attacks
- Facilities should be sturdy and in good repair
- Railing on the milking parlor platform can reduce the likelihood of a worker being kicked

Administrative Controls

Administrative controls in the form of worker education are believed to be a key component in preventing injuries in the livestock industry.[8] Several research studies focusing on animal-related injuries in agriculture suggest livestock handling training as one prevention strategy.[8-10] All dairy workers should be trained in proper livestock handling including cow behavior, animal welfare, animal loading and transportation, and proper cow restraint.[6]

Personal Protective Equipment (PPE)

- Eye protection (i.e. fog-proof safety glasses) can be used to protect the eyes from cows swatting their tails in the milking parlor.
- Gloves and aprons are also used to protect workers from chemicals used in the pre-milking process. Workers should also use face shields and aprons during hoof-trimming activities.
- Gloves and eye protection should be used anytime animal body fluid exposures are a possibility.
- Sturdy work boots with toe caps provide modest protection from being stepped on.
- Consider using needle stick-proof gloves when vaccinating.

Resources

The National Dairy FARM Program provides a stockmanship training video in partnership with the National Beef Quality Assurance (BQA) program. The 27-minute video is divided into several chapters, including "Point of Balance," "Understanding the Flight Zone" and "Utilizing Tools to Effectively Move Cattle." Each segment contains reminder points and multiple-choice questions to test viewers on the content. The video can serve as a training resource to satisfy the FARM Animal Care Program requirement for annual employee training. English and Spanish training videos can be found here: https://nationaldairyfarm.com/producer-resources/dairy-stockmanship/

The Upper Midwest Agricultural Safety and Health Center (UMASH) has developed the following Dairy Stockmanship resources, which include posters, fact sheets and training videos. These training resources are available in both English and Spanish and are free to download. These resources can be found here: http://umash.umn.edu/dairy-handling/

Penn State Extension has published numerous safety resources for the dairy industry including animal handling. These resources can be found here: https://extension.psu.edu/animals-and-livestock/dairy/personal-safety

4.2 Confined Spaces on Dairy Farms

- ✓ *The farm conducts a hazards assessment of confined spaces, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage hazards of confined spaces:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training for confined spaces.*
- ✓ *The farm offers regular refresher safety training for confined spaces.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used for confined spaces.*

Confined spaces are enclosed or partially enclosed areas (1) that are big enough for workers to enter, (2) with limited or restricted means for entry or exit, and (3) that are not designed for continuous occupancy. There are many confined spaces on dairy farms, which have been the source of many dairy worker fatalities. Though confined spaces are not designed for someone to work in regularly, entering such areas may be necessary to perform multiple tasks including inspection, cleaning, maintenance or repairs. Restricted access to confined spaces makes first aid, rescue and evacuation of injured workers difficult. Confined spaces are a source of many dairy worker fatalities and injuries on dairy farms and should be a priority safety hazard to be managed and controlled.

Anticipation and Recognition of Hazard

There are two types of confined spaces: 1) non-permit required confined space (NPRCS) and, 2) permit-required confined space (PRCS). A non-permit required confined space is a space that has no hazards present and no potential for having hazards present. Permit-required confined spaces have hazards present and/or have the potential for a hazard to develop.

A non-permit required confined space is an enclosed or partially enclosed area on a dairy farm that has the following characteristics.

1) The area is large enough for a worker to enter and perform work. This means a person's body can be entirely in the space, even if it is bent, crouched or prone. This is an important distinction. A space in which a person could only fit his torso or his hands would not meet this criteria. The term "body" is the deciding factor.

2) The area is not designed for continuous occupancy by the worker. One way to consider this is whether a worker would perform tasks in the area for a prolonged period of time, eat and relax in the space, etc. A question that can be asked is "Was this space built with the intention of having a person in it continuously?"

3) The area has a limited or restricted means of entry or exit that would restrict the ability of all workers to exit quickly in the case of an emergency. A limited/restricted access does NOT mean it only has one entry point.

A "permit-required confined space" is one that meets the three criteria above for a non-permit required confined space plus one or more of the following four characteristics. Only one of these four additional criteria need to be present for the space to be considered permit-required.

1) The area has the potential to contain a hazardous atmosphere. A hazardous atmosphere is one that exposes employees to the risk of death, incapacitation, impairment of the ability of a worker to self-rescue (i.e. escape unaided from a permit space), injury or acute illness.

There are three main types of atmosphere hazards: oxygen deficient, combustible and toxic.

- Oxygen Deficient: An environment that has an oxygen concentration less than 19.5 percent is considered deficient and dangerous. This means the amount of oxygen in the air is not enough for a worker to function normally and if the levels are very low it will cause death. Oxygen deficiency is a primary hazard in confined spaces. Oxygen can be displaced by other gases. Other gases may push oxygen out of the way or consume it altogether. Because of their chemical properties, some gases concentrate in certain places. Heavy concentrations leave no room for oxygen. For example, if a gas is heavier than air, such as hydrogen sulfide or H2S, it will tend to settle at the bottom.
- Combustible: A hazardous atmosphere is present when there is a flammable gas, vapor or mist that exceeds 10 percent of its lower flammable limit (LFL) in the space. The LFL is the lower end of the concentration range over which a flammable mixture of gas or vapor in air can be ignited at a given temperature and pressure. A hazardous atmosphere is also present when there is a combustible dust concentration that meets or exceeds its LFL and is in a suspended state that obscures a worker's vision. Lastly, a combustible atmosphere exists when oxygen level is above 23.5 percent. Combustible atmospheres are usually toxic as well. A dairy farm should be aware of all chemicals being used in confined spaces and their LFLs to avoid unexpected combustion events.
- Toxic: A toxic atmosphere is when the permissible exposure limit (PEL) of a chemical in the air is met or exceeded. The permissible exposure limit (PEL or OSHA PEL) is a legal limit in the United States for exposure of a worker to a chemical substance or physical agent. Permissible exposure limits are established by the Occupational Safety and Health Administration (OSHA). Toxic atmospheres can be caused by different sources. Hot work (welding, cutting, brazing, soldering and grinding), for example, uses up the oxygen in the space. Vehicle exhaust displaces the oxygen in a space. Manure decomposition creates gases such as hydrogen sulfide and methane that also displace oxygen. The wind can also carry toxic chemicals or atmospheres from other places.

The four main gases produced from decomposing manure are hydrogen sulfide (H2S), methane (CH4), ammonia (NH3) and carbon dioxide (CO2). When manure pits are agitated for pumping, some or all of these gases are rapidly released from the manure. When released the gases can reach toxic levels or displace oxygen, increasing the risk to humans and livestock.[1]

Hydrogen sulfide is considered the most dangerous gas in manure pits because it is highly toxic and is rapidly released from decomposing manure during agitation and pumping. Concentrations of hydrogen sulfide can soar to dangerous levels in seconds after agitation begins. High concentrations of hydrogen sulfide can kill an individual after taking only one or two breaths. H2S has a distinctive rotten egg odor.

Methane is continuously produced in manure pits. A colorless, odorless, non-toxic gas that is lighter than air, methane generally dissipates from a confinement building. The primary danger of methane accumulation in a facility is the risk of a fiery explosion from a spark if the methane/oxygen mix is in proper proportions.

Ammonia is easily recognized because of its pungent odor that is characteristic of drying urine. This gas is released throughout the year from urine and feces on the facility floor or from a pit beneath the floor. Ammonia is lighter than air and generally dissipates from a well-ventilated facility.

Carbon dioxide is produced by decomposing manure, animal respiration and heating fuels. Carbon dioxide is an odorless, colorless, non-toxic gas. Carbon dioxide, in combination with rising temperatures and humidity, can displace oxygen and kill animals/people through asphyxiation and heat stress if ventilation failures last for several hours.

When oxygen levels reduce below 19.5 percent (at sea level), people will not have enough oxygen. In oxygen-deficient atmospheres, a worker's pulse and breathing rate may increase and they may begin to feel nauseous. Impaired thinking, reduced coordination and fatigue develop, and workers may faint, leading to death. When planning to work in a confined space, a worker needs to consider how toxic gases could be in the space or be introduced into the space.

2) A second hazard that can be present for a space to be considered permit-required is engulfment potential. The area has engulfment potential when liquid (fuel, water, manure) or solid or granular material (e.g. feed commodities) is present. Engulfment means the surrounding and capture of a person by a liquid or finely divided (flowable) solid substance that can cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction or crushing. Engulfment hazards exist when the stored material has characteristics that allow the person to sink – especially to a level where self-rescue is not possible. Engulfment also occurs when the material can fall and surround the individual or it can flow/move and cover the individual. Risk for engulfment is eliminated by blocking, barricading, locking out equipment and using fall restraint devices.

3) A third hazard that can be present for a space to be considered permit-required is if the space or area has an internal configuration that makes exiting of the area or space difficult. An example would be if the space has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section such as in a hopper bottom bin or a dump pit.

4) A fourth criteria for a space or area to be considered a permit-required confined space is if the area has any other recognized safety or health hazard present. Confined spaces often have other physical safety hazards that need to be recognized:

- Workers can fall in confined spaces where ladders are used or slick/wet surfaces are present.
- Mechanical hazards can be present such as machinery moving parts.
- Tools or other objects can fall down shafts where workers are present.
- Drowning is an issue in spaces where liquids may be present. Even if there is not much liquid, a slip or fall could render someone incapable of keeping their airway clear of liquid.
- Confined spaces can harbor rodents, snakes, spiders and/or insects, some of which may be poisonous.
- Ergonomic issues are a major consideration when working in confined spaces. Workers often need to bend, twist, stoop, possibly lay prone, climb in tight spaces and use restricted or unnatural body movements that can lead to strains and sprains. These injuries can lead to lost work time and rack up medical costs if they do not heal properly or are reinjured.

The differences between the two types of confined spaces are quite large and important to understand. Confined space work is one of the leading causes of occupational fatalities on dairy farms in the U.S. A big part of that comes from workers not being properly prepared for, or even having knowledge of, the potential hazards that might be present in a confined space. Knowing the difference between a permit and non-permit required space will help prepare dairy workers for those hazards by knowing when proper safeguarding measures need to be taken.

When evaluating dairy farms the following may be considered a confined space, and once classified as such, they may also be a permit-required confined space.

Manure Storage Facilities

Manure and waste water handling is most often accomplished on a dairy farm by collecting and storing manure and waste in storages located directly beneath the animals or in a nearby containment structures that may be located either above ground or at ground level. These management processes and storage structures can present many hazards for both humans and animals.[2] Both underground and open air manure storage facilities can meet the definition of permit-required confined spaces because they often have limited/restricted access, workers are able to bodily enter and perform work, and are not designed for continuous occupancy. Additionally, they have the potential for atmospheric hazards including toxic gases, engulfment potential and configurations that could trap or asphyxiate a worker.

A recent mail survey of 1,200 farms across 16 states was conducted to identify the number, type and size of manure storages per farm, as well as safety-related behaviors or actions related to entry into confined-space manure storage and handling facilities. Survey results suggest that most farm operations with confined space manure storages do not follow best safety practices regarding their manure storages, including using gas detection equipment before entering a manure pit, using rescue lines when entering storages or developing a written confined-space safety policy or plan. Survey results also suggest that few farmers post warning signs around their storages, post recommended ventilation times before entry or conduct training for workers who enter confined-space manure storages.[3]

Open air manure storage lagoon.

Sloping, slippery bank of open pit manure lagoon making exit difficult.

Manure separation system access.

CASE EXAMPLES

1. In 2016, a dairy farmer and 16 cows died after a dome of toxic gases formed over a manure holding tank. The farmer was killed while emptying a manure pit. When the farmer activated an agitator that broke up a top layer crust of solid manure, toxic gases were released into the atmosphere. According to authorities, weather conditions contributed to the farmer inhaling toxic levels of gas while standing on the bank of the manure lagoon.

2. In June of 2018, a dairy worker died after falling down a well shaft where he succumbed to methane fumes and drowned in a pool of water that was only two to three feet deep. The deceased, along with one of the owners of the property and two electrical contractors, entered the well house to make repairs. According to news reports, deputies were told that the employee slipped and fell into the well and immediately died because of the methane fumes and went under water. The owner and one of the contractors attempted to pull the victim out but were also overcome by the toxic gases; the second contractor was able to pull the two men from the well but was unable to reach the employee. Authorities believed methane from manure on the dairy farm gathered at the bottom, forming a gas pocket over the water.

3. In 2007, four family members and a worker died from exposure to toxic gases in a manure pit on a dairy farm. A dairy farmer was transferring liquid manure from a small pit to a larger one when the transfer pipe became blocked. After entering the small pit to clear the blockage he collapsed from being exposed to hydrogen sulfide gas in the pit. Another worker then climbed into the pit to help the farmer but was also overcome by the deadly gas. The farmer's wife and two daughters then entered the pit and were also overcome by the gas.

4. In 2015, a dairy worker drowned in a manure lagoon. The dairy worker became trapped when the front-end loader he was driving on a dirt road adjacent to the open manure pit fell onto its side and he was unable to escape.

5. In 2016, a worker mistakenly drove a feeder truck into a manure pond. A winter heat wave had melted snow and ice overnight, flooding part of the farm. A foot of standing water made it hard to tell where the feeding area ended and the bank of the manure lagoon began. The worker managed to get free and tried to swim back to solid ground. The worker apparently became disoriented and swam in the wrong direction, according to the county sheriff. Emergency divers found his body 70 yards from the truck. The pond was not marked or protected by a barrier.

Milk Storage Tanks

A milk storage tank may also be considered a permit-required confined space when workers enter to perform cleaning tasks. These tanks often have moving parts, which necessitates lockout tag-out (LOTO) procedures to be followed. Usage of chemicals while inside the tank may necessitate the need for atmospheric monitoring and adequate ventilation.

Liquid Storage Containers

Liquid storage containers are also considered confined spaces and may be a permit-required space when toxic chemicals or other physical hazards are present.

CASE EXAMPLE

A farm maintenance worker died after entering an 8,000-gallon polyethylene storage tank that was not marked to indicate a potential uncontrolled hazardous atmosphere. At the time of the incident, the tank contained liquid whey, known to produce carbon dioxide gas as it decomposes. A broken ball valve inside the tank needed replacement. Using a forklift, a worker was lowered through a 16-inch-diameter hole at the top to fix the valve. The forklift operator had no visual contact or other means to monitor the situation inside the 12-foot by 12-foot tank. To determine the worker's progress inside the tank, the operator climbed to the top of an adjacent bin where he saw the worker lying face down inside the whey tank. The fire department responded and cut a hole in the tank (see Figure 1, Page 25) to retrieve the worker who had died from asphyxiation. Source: https://www.osha.gov/Publications/OSHA3939.pdf

Grain Storage

CASE EXAMPLE

In November of 2014, a dairy worker was attempting to unclog a sump when he was engulfed by corn and died in a grain bin. According to authorities, a drag conveyor was not deactivated and the worker was in the bin while the corn was moving. The worker was exposed to engulfment hazards when grain handling and energy control procedures were not followed. Confined space procedures were not followed when an attendant trained in confined space rescue was not present when the worker was inside the grain bin.

Feed mixer wagon with moving parts.

CASE EXAMPLE

In 2015, a dairy veterinarian had been feeding cattle for several hours. The veterinarian was adding hay to a mixer when he lost his balance and fell in. The machine was powered by a tractor and should have been turned off when being fed hay or grain.

Machinery

Large farming machinery such as feed mixers can also be considered permit-required confined space. Workers may need to perform maintenance inside a mixer or can be pulled inside the mixer when reaching into the mixer when parts are moving.

Evaluation of Hazard

Frequency or Likelihood of Hazard

On any given dairy farm, only a limited percentage of employees directly operate machinery or drive vehicles around manure lagoons. Additionally, only a few workers perform most maintenance in recognized confined spaces. As a result, the frequency of exposure to confined spaces on a dairy farm is lower.

Severity of Injury or Consequence

The possible consequence of exposure to confined space hazards (including manure storage facilities) is high as evidenced by multiple worker fatalities associated with confined spaces on dairy farms.

As a result of high injury severity safety hazards, worker safety inside confined spaces should be considered a high priority on dairy farms and reinforced through trainings and communications. Identified safety hazards in confined spaces should be prevented or controlled using the Hierarchy of Controls approach.

Prevention and Control Strategies of Hazard

Elimination or Substitution of Confined Space Hazards

Due to the necessity of having cows on a farm, the use of milking cows obviously cannot be eliminated and manure, which can produce toxic gases, will always be a byproduct. Additionally, other confined spaces, such as milk tanks, are required as well. As a result, engineering and administrative controls, as well as worker PPE, need to be utilized to protect workers from confined space hazards.

Engineering Controls

There are several engineering controls to prevent recognized hazards associated with confined spaces. Erecting railings or fencing around liquid manure structures can prevent entry by persons on the farm.

Proper design of manure storages and treatment lagoons is important for the safe and efficient handling of manure and wastewater. Operations must use proper construction criteria and size the structure to meet minimum storage requirements for the operations. Earthen berms are designed to confine manure and wastewater and are often not designed to be used as roadways for heavy machinery on a dairy farm. It is imperative to protect these earthen berms from failure and prevent catastrophic losses of manure, or to keep heavy machinery from sinking or tipping over in soft soil. State regulations may require specific setbacks of roadways from manure storage structures; this can also provide a distance barrier between lagoons and vehicles and machinery.

Placing concrete barricades can provide solid demarcations between heavily utilized roads and manure lagoons. New manure storage structures can be constructed away from roads that are used by heavy vehicles and machinery.

Earthen berms between confinement lagoons can be fenced off to prevent them from being used as roadways for vehicles or machinery.

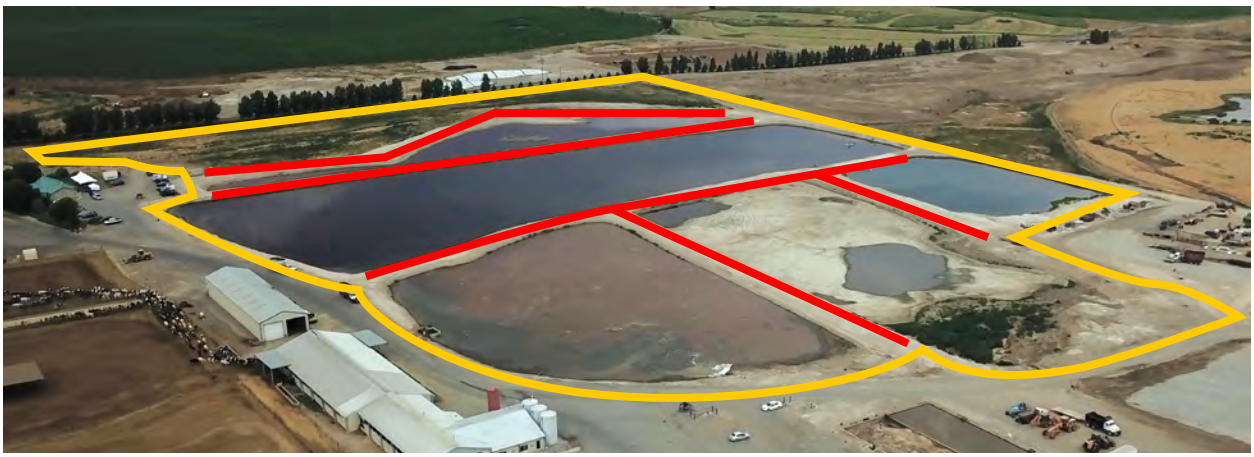
The aerial view photos at the bottom of Page 52 show large manure storage facilities. The red lines are earthen berms, which should be fenced off

to prevent them from being used as roadways. The yellow lines depict where fencing or concrete barricades can be placed to reduce the risk of vehicles or machinery being driven into the storage facilities. Insurance companies may offer rate reductions or incentives for putting up fencing or signage.

Administrative Controls

The purpose of having administrative control procedures is to ensure that entry into any confined space is planned and documented as required in order to identify and control hazards. Procedures should include entry method selection, planning and documentation of entry into confined spaces of both classifications: non-permit required (NPRCS) and permit-required confined spaces (PRCS). Procedures should apply to workers (as entrants and attendants), confined space entry supervisors, dairy owners and any other applicable personnel involved in a confined space entry situation.

Requirements for entering a confined space depend on the hazards present as determined by a pre-entry hazard assessment. Once a confined space has been identified as having any one of the four aforementioned potential hazards, an employer should identify it as such and **enter the space only after the entry permit has been completed, signed by a qualified person and posted at the area of entry.** Specific entry procedures should be followed to ensure that all safety hazards have been accounted for and controlled. This includes having necessary atmospheric monitoring, ventilation and/or personal respiratory protection for workers. Additionally, emergency worker extraction mechanisms should be available in the event that a worker becomes incapable of self-extraction. Examples of confined space program policies,



training programs, entry permits and pre-entry hazard assessment and checklists are provided at the conclusion of this section.

In addition to confined space entry procedures, all confined spaces including manure storage facilities should have appropriate warning signage that communicates drowning and harmful gas hazards. Another example of an administrative control may be the use of reflective poles to demarcate the road edge during inclement weather when machine operator visibility might be diminished. Installation of lighting along roads is another strategy to provide road boundary identification.

An additional best management practice is to agitate manure lagoons when adequate wind velocity is present to allow released gases to be carried away from workers. Installation of wind socks can provide an indication of wind direction to inform workers of proper positioning during manure agitation processes.

Finally, administrative procedures should be set up for routine testing of any monitoring equipment used. For example, direct-reading gas monitors require regular "bump tests." Such testing is described in more detail in the next section.

Personal Protective Equipment

Workers who enter confined spaces should always wear appropriate personal protective equipment (PPE) for applicable hazards. This includes supplied-air respiratory protection, and atmospheric testing and monitoring for toxic gases and oxygen deficiency. In addition to atmospheric monitoring, direct-reading, personal gas monitors can warn workers of the risk of potentially fatal gas exposures that may arise during manure handling. Low-cost, low maintenance gas monitors are available from many manufacturers. Differences in their features and performance should be considered during selection. Direct-reading gas monitors require routine "bump tests" to ensure that each monitor reacts to the presence of toxic gases, even if the manufacturer does not recommend the procedure.

Bump testing is the process that verifies that the gas detector and sensors are responding to the target gas. For example, an H2S sensor is exposed to H2S gas to confirm that it responds appropriately. Dairy workers should inspect and bump test these monitors prior to any potentially high-risk activity, such as manure agitation, pumping or pressure washing, to ensure that the monitor appropriately detects and warns users of toxic levels of gases in the atmosphere.[4]

Resources

OSHA Standard 1910.146 Permit-required confined space: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9797

OSHA Standard 1910.146 App B Procedures for Atmospheric Testing: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9799

OSHA 1910.146 App D Confined Space Pre-Entry Check List: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9801

WorkSafeBC, Management of Confined Spaces in Agriculture: Dairy Farms: https://www.worksafebc.com/en/resources/health-safety/books-guides/management-of-confined-spaces-in-agriculture-dairy-farms?lang=en

Michigan State Extension, Beware of Manure Pit Hazards: http://nasdonline.org/1292/d001097/beware-of-manure-pit-hazards.html

Penn State Extension:

- Confined Space Manure Gas Monitoring: https://extension.psu.edu/confined-space-manure-gas-monitoring
- Ventilation of manure storages to reduce entry risk: https://extension.psu.edu/confined-space-manure-storage-ventilation-systems
- Confined Space Manure Storage Emergencies: https://extension.psu.edu/confined-space-manure-storage-emergencies

Policy Template

Confined Space and Manure Storage written templates are available from NYCAMH: https://www.nycamh.org/resources/safety-policy-templates.php

4.3 Slips, Trips and Falls and General Housekeeping

- ✓ *The farm conducts a hazards assessment for slips, trips and falls, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage hazards for slips, trips and falls:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training to prevent slips, trips and falls.*
- ✓ *The farm offers regular refresher safety training to prevent slips, trips and falls.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used to prevent slips, trips and falls.*

Dairy farms may present multiple walking and working surfaces that increase the risk for worker slips, trips and falls.. These hazards may result in serious injury or even death. Numerous control strategies can be utilized to reduce the risk of slips, trips and falls among dairy workers.

Anticipation and Recognition of Hazard

Workers in many diverse workplaces are exposed to walking-working surface hazards that can result in slips, trips, falls and other injuries or fatalities. According to the Bureau of Labor Statistics (BLS) data, slips, trips and falls are a leading cause of workplace fatalities and injuries in general industry, which indicates that workers regularly encounter these hazards. In 2016 alone, a total of 849 U.S. workers in all industries combined died as a result of a slip, trip or fall while on the job.

Slips, trips, and falls continue to be a leading cause of occupational morbidity in the dairy sector.[1] From 2010-2016, a total of 25 U.S. dairy workers died as a result of a slip, trip or fall.[2] More serious slips or trips together with the resulting falls may result in non-fatal injuries such as sprains or strains, broken bones when trying to break the fall, a back injury due to the sudden and forceful impact during a fall, burns if it occurs near hot surfaces or if the person is handling hot fluids, or cuts if it occurs near sharp objects.

Farming involves working with different ground conditions: muddy, slippery, steep, with obstacles and tripping hazards. Slips and trips are one of the most common safety incidents when working in and around the dairy farm. They often happen in the pit during milking, when herding cattle, moving cows in for milking, and during maintenance and cleaning.

Dairy workers can slip because of:

- Slippery surfaces: wet or icy weather, running water, effluent, mud and manure. A change in weather can create unexpected changes in surfaces
- Unexpected change to surface friction: such as moving from a slip-resistant surface (e.g., rubber matting) to a surface with lower slip resistance (e.g., wet, smooth concrete or polished wood)
- Carrying objects over uneven or steep terrain
- Holes in the ground
- Speed: walking quickly or running
- Distracted walking (listening, playing or talking on devices)
- Footwear with poor grip or loose soles
- Obstacles: rough ground or a step or rise of as little as 9-10mm can cause a trip (for example, pipes or cables in the yards)
- Poorly designed steps – too high or not deep enough, or in poorly lit areas, like in and around the milking pit
- Climbing fences and gates
- Poor housekeeping (spills, slippery floors)

CASE EXAMPLE

A worker was walking down a silage pile and fell and struck his head on a front-end loader and was killed.

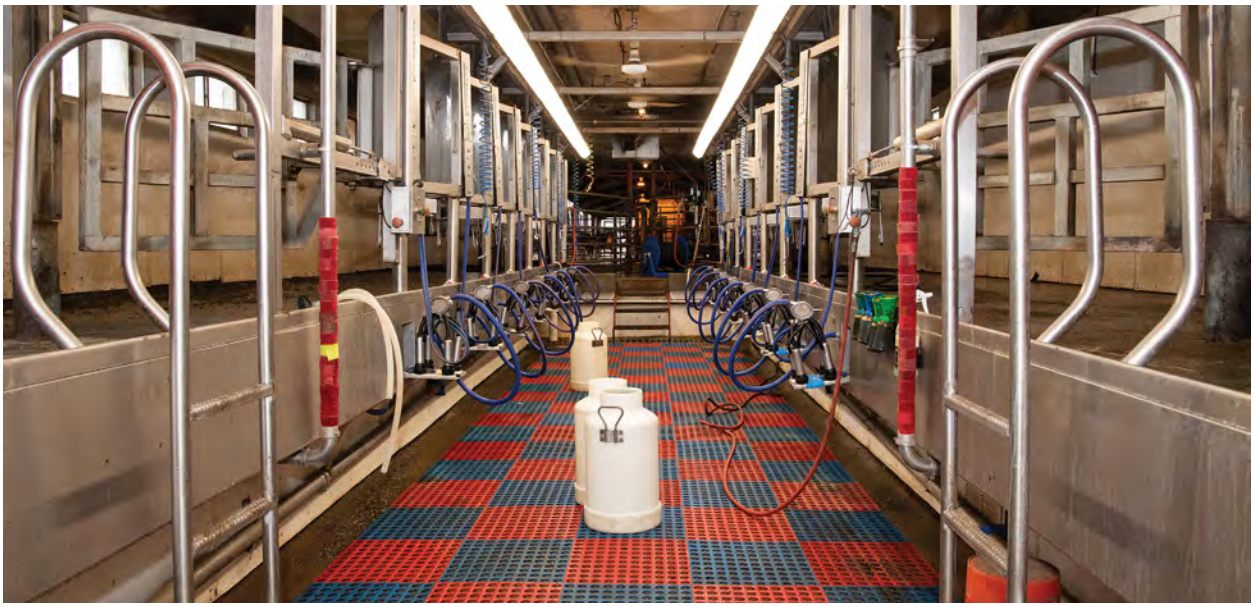
Evaluation of Hazard

Frequency or Likelihood of Hazard
The likelihood of a slip, trip or fall occurring is increased where there are more workers in condensed work areas with multiple trips hazards such as those in a milking parlor. Milking parlors may have increased risk for slips, trips and falls due to wet conditions, slippery walking surfaces, trip hazards including hoses and buckets, inadequate lighting and several workers moving around one another. Other areas or conditions that may increase the risk for falls include inclement weather in outside working environments, debris, natural hazards, sloped walking surfaces, damaged stair steps and objects or tools that are not stored in appropriate areas.

Severity of Injury or Consequence
Slips, trips and falls represent the majority of general industry safety incidents. They are among the most frequently reported injuries and the leading cause of worker death. Injuries sustained as a result of a slip, trip or fall can include sprains and strains, bruises and contusions, fractures, abrasions and lacerations, or even death.

Prevention and Control Strategies of Hazard

Elimination of Hazard
Slips, trips and falls are preventable by designing and maintaining work areas and processes to prevent exposures to slip and trip hazards. Elimination of slip and trip hazards on the farm can be accomplished by leveling floor levels and installing power outlets in strategic wall locations or ceilings to avoid trailing power cords. Elevating water and dip lines off the parlor floor can eliminate trip hazards. Floor holes should be covered.



Substitution of Hazard
Unprotected concrete in the milking parlor will deteriorate over time and become slippery or present uneven trip hazards as a result of exposure to lactic acid and chemicals. Resurfacing the parlor floor with non-slip texturing, or providing non-slip, anti-fatigue flooring can reduce the likelihood of slips in the parlor.

Engineering Controls
Open drains or drainage holes should be covered with a firm, flush-fitting grates. Updating lighting and ventilation in older facilities increases visibility, aids in floor drying and inhibits algae growth.

Administrative Controls
Good housekeeping practices including maintaining clear, tidy work areas free of clutter are a very effective administrative control strategy. Hoses and other obstacles can be secured to walls and kept out of the way. When spills occur during transport, handling or decanting they should be cleaned up immediately. Signage can warn workers of particular risks, such as fall hazards.

Personal Protective Equipment
Workers should always wear proper footwear with good traction to prevent slips on slippery walking surfaces. Waterproof boots may not always have adequate traction; attention should be paid to ensuring that waterproof, rubber boots provide the right amount of traction to prevent slips.

Resources
OSHA Standard 1910 Subpart D Walking-Working Surfaces. Covers all general industry walking-working surfaces, including but not limited to, floors, ladders, stairways, runways, roofs, scaffolds, and elevated work surfaces and walkways: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10112

4.4 Hazard Communication and Chemical Safety

- ✓ *The farm conducts a hazards assessment for chemical use, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage hazards of chemical use:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training for chemical use.*
- ✓ *The farm offers regular refresher training for chemical use safety.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used during chemical use.*

Chemicals are used in many dairy farm operations, and many of these chemicals pose a wide range of health and physical hazards. Chemical exposure may cause or contribute to many serious health effects such as heart ailments, central nervous or reproductive systems, kidney and lung damage, sterility, cancer, burns and rashes. Some chemicals may also pose physical hazards and have the potential to cause fires and explosions and other serious accidents. Each farm should have a Hazard Communication Program, which will provide a structured mechanism to identify hazardous chemicals and educate and protect workers from their potential harmful effects.

Anticipation and Recognition of Hazard

OSHA has estimated that there may be as many as 650,000 hazardous chemical products in use in workplaces throughout the United States, and many of these chemicals are used for various purposes on dairy farms. The broad scope of chemical uses poses a number of challenges to protecting dairy workers from exposures to these chemicals. Dairy management should anticipate and recognize the health hazards associated with chemicals used on the farm.

Evaluation of Hazard

A chemical hazard refers to an inherent property of a substance that is capable of causing an adverse effect. Risk refers to the probability that an adverse effect will occur with specific exposure conditions. A chemical substance will present the same hazard in all situations due to its innate chemical or physical properties and its actions on cells and tissues in a worker's body. However, considerable differences may exist in the risk posed by a substance, depending on how the chemical substance is contained or handled, personal protective measures used and other conditions that result in or limit exposure.

Frequency or Likelihood of Hazard

Chemical hazard risk is increased among those dairy workers who handle chemical substances on a more frequent basis. Job tasks that do not involve working in close proximity to or handling of chemicals obviously does not increase the risk for potential adverse health effects. Therefore, job tasks involving frequent handling of chemicals should be prioritized for control measures.

Severity of Injury or Consequence

There are many routes that chemicals can enter a worker's body. These routes of exposure include inhalation through breathing, absorption through the skin, ingestion through swallowing, and injection.

After entering the body through one of these four routes, chemicals' adverse health effects on different bodily systems include respiratory, renal, cardiovascular, reproductive, immune, and integumentary (skin) and hepatic systems. Some chemical exposures can result in immediate death or disability if the exposure level is high enough, and some can result in chronic conditions or cancers, which may manifest themselves years after exposure. As a result, exposure to many chemicals used on a dairy farm can have severe consequences including death.

Prevention and Control Strategies of Hazard

Selection of appropriate engineering controls, personal protective equipment, and controls such as substitution, is predicated on knowing what chemicals are present, what form they are present in, and what their hazardous effects are, including physical and chemical characteristics.

Elimination of Hazard

The first mechanism to control the potential adverse health effects of a hazardous chemical used on a farm is to eliminate its use. When a chemical is no longer being used, it should be properly disposed of or destroyed according to environmental rules and regulations.

Substitution of Hazard

If a hazardous chemical cannot be eliminated, substitute chemicals that are less hazardous could be identified and used.

Engineering Controls

Hazardous chemical engineering controls can include closed chemical storage and delivery systems that eliminate exposures and handling among workers.

Administrative Controls
Dairy farm operations should have a comprehensive hazard communication program, which includes four primary components:

1) Written Hazard Communication Program
A Written Hazard Communication Program should indicate how chemical hazard communication will be addressed on the dairy farm. An updated inventory of all hazardous chemicals used on the farm should be included in this written plan. A written inventory, which includes chemical product identifiers, will make it easier for dairy management to manage Safety Data Sheets and labels for each hazardous chemical.

2) Chemical Labeling and Hazard Warning
Each dairy employer is required to ensure that all chemical containers in the workplace are labeled. A chemical supplier is required to provide labels for all chemical containers that include a harmonized signal word, pictogram and hazard statement for each hazard class and category. Precautionary statements must also be provided. OSHA has adopted new hazardous chemical labeling requirements that will help ensure improved quality and consistency in the classification and labeling of all chemicals, and will also enhance worker comprehension. Each label must contain the following:

- Name, address and telephone number
- Product identifier
- Signal word
- Hazard statement(s)
- Precautionary statement(s)
- Pictogram(s) or universally recognized graphic symbols used to communicate specific information about the hazards of the chemical.

3) Safety Data Sheets
Dairy employers should maintain Safety Data Sheets or SDSs (formerly MSDs or Material Safety Data Sheets), which should be provided to the farm by their chemical supplier. The information contained in the SDS is largely the same as the MSDS, except now the SDSs are required to be presented in a consistent user-friendly, 16-section format.

4) Worker Information and Training
A Hazard Communication Program includes a training component with a mechanism to educate workers on how to recognize hazardous chemicals used on a dairy and how to effectively protect themselves from adverse health effects of chemical exposures.

Personal Protective Equipment

When elimination/substitution, engineering, work practice and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment (PPE) to their employees and ensure its use. Dairy employers should identify proper PPE to be used based on chemical manufacturer recommendations, train workers in proper PPE use and care, and maintain PPE including replacing worn or damaged PPE. Workers should be required to properly wear PPE when needed, attend training sessions on PPE, clean and maintain PPE, and inform supervisors of the need to repair or replace PPE.

Resources

OSHA Hazard Communication Standard: https://www.osha.gov/dsg/hazcom/

Pesticide Educational Resources Collaborative: http://pesticideresources.org/

Policy Template

A Hazard Communication Program template is available from NYCAMH: https://www.nycamh.org/resources/safety-policy-templates.php

4.5 Control of Hazardous Energy and Lockout Tag Out (LOTO)

- ✓ *The farm conducts a hazards assessment for sources of hazardous energy, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage sources of hazardous energy:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training for sources of hazardous energy.*
- ✓ *The farm offers regular refresher safety training for sources of hazardous energy.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used for sources of hazardous energy.*

Hazardous energy on a dairy farm should be controlled. Hazardous energy can exist in many forms including mechanical, electrical, hydraulic, pneumatic, chemical and thermal. An established lockout tag out (LOTO) procedure will ensure that all energy sources that could cause injury to dairy workers are controlled prior to equipment or machinery maintenance or repair.

Anticipation and Recognition of Hazard

The control of hazardous energy and LOTO is applicable to dairy workers who are responsible for the service or maintenance of machines where the unexpected startup, energization or the release of stored energy could cause injury or death. All employees are responsible for seeing that LOTO procedures are followed. All employees should be instructed in the safety significance of the lockout procedure as well as its purpose and proper usage.

A farm inventory should be conducted of all machines, equipment and processes that could expose employees to unexpected hazardous energy release. Sources of energy may include all sources of energy, including, but not limited to: mechanical, electrical, hydraulic, pneumatic, chemical and thermal.

The following case examples of inadequate control of unanticipated release of hazardous energy resulted in dairy worker injuries or death.

CASE EXAMPLES

1. A dairy worker was working on a skid loader hydraulic line. The worker disconnected the hydraulic line and the skid loader bucket dropped on him, resulting in his death.

2. A dairy worker was using a pitchfork to clear a jammed manure separator. The separator was not locked out during the clearing process. He was injured when his left foot became caught between two rollers and his foot was crushed. The worker's left foot was subsequently amputated due to extensive muscle and tissue damage, and infection.

3. A dairy worker tried to start a hay bailer by engaging the clutch, but the hay bailer stalled. The worker called over his coworker who found a clog of hay inside the hay bailer. Unknown to the worker, the coworker reached into the hay bailer to remove the clog. The worker started the hay bailer by engaging the clutch, and the coworker's left hand was amputated at the wrist. The worker was the supervisor of the coworker who lost his hand in the incident.

4. A dairy worker was conducting a safety walk-around looking for problems. The foreman noticed water coming from a hot water pipe. Using a crescent wrench, the worker attempted to tighten a clamp when the clamp failed, allowing 180-degree water to splash onto the worker who sustained second- and third-degree burns.

Evaluation of Hazard

Frequency or Likelihood of Hazard
The likelihood of exposure is increased for those dairy workers who perform service or maintenance of machines where an unexpected startup, energization or the release of stored energy can result. The simplest of maintenance or repair of equipment or machinery should never be discounted as a potential source of hazardous energy release.

Severity of Injury or Consequence
Workers can be seriously injured or killed if the machinery they are cleaning or servicing unexpectedly becomes energized, starts up or releases stored energy. As a result, the consequence of exposure can be severe.

Prevention and Control Strategies of Hazardous Energy

Elimination or Substitution
When machinery is being serviced, the associated energy hazards often cannot be eliminated or substituted. Therefore, the associated energy hazards should be controlled using other approaches.

Engineering Controls
Energy isolating devices used in the lockout tag out procedure (explained below) are mechanical devices that physically prevent the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch, a line valve and a block or any similar device used to block or isolate energy. Push

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

The determination of needed energy isolating devices begins with making a simple inventory list detailing the machines, equipment and processes that expose employees to potential hazardous energy. This process may require an audit of the dairy operation and is an excellent time to engage all affected workers. Potential personnel to include in this audit are the health and safety supervisor, engineering and maintenance, machine operators and others. The list needs to include some key information, such as the machine name, the types of hazardous energy associated with the machine, the machine location on the farm and the process that the equipment performs.

Using the generated list of machinery and equipment, all required energy isolating devices associated with each piece of equipment should be identified. This may seem like an obvious step, but it requires evaluating the equipment again to determine the potential methods that can be used to remove hazardous energy from the equipment. Once all needed energy isolating devices are identified and acquired, they should be stored in a secure location until they are needed at the time of machinery maintenance or repair.

Administrative Controls

Administrative control strategies include having a simple LOTO procedure to control potential hazardous energy sources. The sequence of the LOTO procedure includes the following:

Step 1: Notify Employees. All affected employees should be notified which machine or equipment will be shut down and locked out.

Step 2: Review Procedures. Each person performing LOTO (authorized employee) understands the type and magnitude of the energy present, the associated hazards and the proper methods of control.

Step 3: Shutdown Equipment. If the machine or equipment is operating, shut it down using normal procedures.

Step 4: Disconnect and Isolate Energy Source. Disconnect/de-activate the energy isolating devices(s) so the machine or equipment is isolated from the energy source(s).

Step 5: Lockout Controls and Tag Out. An individually assigned lockout device is applied to the energy-isolating device. A prominent warning tag should be securely fastened to the energy-isolating lockout device to indicate that the machine or equipment not be operated until the tagout device is removed.

Step 6: Release of Residual Energy. Stored or residual energy should be released or dissipated to a zero mechanical state. A zero mechanical state, or ZMS, recognizes that simply locking out the main power sources of a machine or system may not effectively remove all sources of energy. Residual energy may be stored and remain present, which would continue to present a safety hazard to dairy workers. Residual energy sources include pneumatic, hydraulic or other fluid lines or components that may still be pressurized and may need to be relieved or isolated to make them safe. Valves from other energy sources may not be completely closed. Springs may have stored energy and need to be blocked or tied. Suspended or loose components may fall or cause movement in the machine and need to be restrained.[1]

Step 7: Verification. The machine or equipment should be verified to ensure the energy source has been isolated. After ensuring that no personnel are exposed, activation of the machine or equipment should be attempted to make certain the equipment will not operate. Operating controls should be returned to their neutral position after the verification test.

After maintenance or repair has been completed, the following lockout release steps can be followed:

Step 1: Inspect Equipment. Equipment should be checked to ensure machinery components are operational.

Step 2: Check Area. The immediate area should be inspected to ensure all employees have been safely positioned, and tools and any nonessential items have been removed.

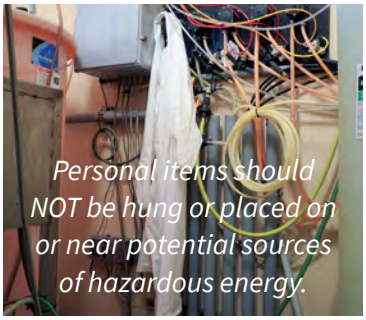
Step 3: Check Controls. Operating controls should be checked to verify they are in the off position.

Step 4: Re-Energize Equipment. Lockout devices should be removed and energy isolating device(s) can be activated.

Step 5. Notify Employees. Affected employees should be notified that the services or maintenance has been completed and equipment is ready for use.

Step 6. Startup Equipment. Startup of equipment can proceed and should be monitored for several operating cycles to ensure proper functioning.

In addition to LOTO procedures, administrative controls can include signage and worker training such as how to perform LOTO. Workers should also be informed and trained on the importance of not placing personal items on or near potential sources of hazardous energy.



Personal Protective Equipment

Proper personal protective equipment (PPE) should be utilized during the repair or maintenance of equipment to protect workers from unexpected release of hazardous energy. PPE for working around electricity may include task-appropriate rubber gloves, plastic face shields or electrical hazard footwear.

Resources

Occupational Safety and Health Administration Control of Hazardous Energy: Lockout Tagout: https://www.osha.gov/Publications/osha3120.pdf

Occupational Safety and Health Administration Lockout/Tag: https://www.osha.gov/dts/osta/lototraining/tutorial/purpose.html

Policy Template

A Control of Hazardous Energy policy template is available from NYCAMH: https://www.nycamh.org/resources/safety-policy-templates.php

4.6 Machine Guarding

- ✓ *The farm conducts a hazards assessment for machinery with moving parts, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage hazards from machinery with moving parts:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training for machinery with moving parts.*
- ✓ *The farm offers regular refresher safety training for machinery with moving parts.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used for machinery with moving parts.*

Moving machine parts have the potential to cause severe workplace injuries, such as crushed fingers or hands, amputations, burns or blindness. Safeguarding machinery is essential for protecting workers from these preventable injuries. Any machine part, function or process that may cause injury must be safeguarded. When the operation of a machine or accidental contact injure the operator or others in the vicinity, the hazards must be eliminated or controlled. Hazards associated with moving machine parts are controlled using proper machine guarding.

Anticipation and Recognition of Machinery Hazards

Employee exposures to unguarded or inadequately guarded machines is prevalent in many workplaces, especially dairy farms. Consequently, many dairy workers who operate and maintain machinery can experience severe injuries including amputations or even death. Amputation is one of the most severe and crippling types of injuries in the workplace, and often results in permanent disability.

There are numerous types of machinery with moving parts present on a modern dairy farm that may need proper safeguarding, including:

- Fans
- Rotary milking platforms
- Robotic milking equipment
- Machinery power transmissions
- Pump machinery
- Power take-off or PTO
- Manure spreader
- Feed Mixer
- Shop machinery and tools

CASE EXAMPLES

1. A dairy worker was working alone and operating a manure-spreading unit mounted on the chassis. The manure was discharged from the rear of the box through a bed chain conveyor that was operated and moved via a power take-off (PTO) drive connected to hydraulic motors. After finishing the spreading of hot manure on a field, he noticed some smoke in the box. The worker stopped the unit and left the PTO engaged. He exited from the cab and climbed between the cab of the truck and the box, reaching into the open area to brush off some smoking manure and residual material. He did not shut off the power source to the PTO nor disengage the PTO before climbing out of the cab of the truck. The worker then placed his arm into the pinch points danger zone of the exposed bed chain that was still operating at slow speed. His sweater became caught on the bed chain, which pulled his arm into the equipment. The force broke his right arm and subsequently amputated his right arm above the elbow.

2. A dairy worker was attempting to fill a feed mixer. The mixer was attached to a tractor at the drawbar. A power take-off from the tractor to the mixer was engaged and revolving, and the guard was missing. The worker was killed when he became entangled in the unguarded power take-off shaft.

3. A dairy worker was shoveling grain inside of a grain bin while a spiral auger was running. The auger was located on the floor of the bin. When the auger rotated around the bin, one of the worker's legs became caught in the auger. The auger then traveled over his leg, up to his waist. The worker died later that day from the injuries he sustained from the accident.

4. A dairy worker was driving a tractor with an attached manure spreader. The worker stopped the tractor with the engine still running and approached the manure spreader. Running along the side of the manure spreader was an unguarded rotating shaft with a protruding greaser. The shaft was approximately one inch in diameter and was rotating about 500 revolutions per minute. The greaser protruded about 0.75 in. from the shaft. The sleeve of the employee's shirt became entangled on the rotating greaser and shaft. The employee suffered an amputation of his right arm below the elbow.

Evaluation of Hazard

Frequency or Likelihood of Hazard
The likelihood of exposure is increased for those dairy workers who perform service or maintenance of machines where an unexpected startup, energization or the release of stored energy can result. The simplest of maintenance or repair of equipment or machinery should never be discounted as a potential source of hazardous energy release.

Severity of Injury or Consequence
Workers can be seriously injured or killed if the machinery they are cleaning or performing service work on unexpectedly becomes energized, starts up, or releases stored energy. Severe injuries can include crushed fingers or hands, amputations, burns, blindness or death. As a result, the consequence of exposure can be severe.

Prevention and Control Strategies of Machinery Hazards

Elimination or Substitution
Any machine part, function or process that may cause injury must be safeguarded. Where the operation of a machine can injure the worker or others in the vicinity, the hazards should be eliminated. When the hazards cannot be eliminated, they should be controlled using engineering measures.

Engineering Controls
There are three methods of machine safeguarding:

1) Guards. Guards are barriers that prevent the entry of a person's body and clothing into a hazardous zone of a machine. Additionally, machine guards prevent materials from striking and injuring workers. When evaluating the adequacy and effectiveness of safeguards, one should verify that the safeguard is a permanent part of the machine, must prevent access to the danger zone during operation and must be durable and constructed to withstand wear and abuse expected in the work area where the machine is used. Machine guards should also be designed so routine inspection, adjustment, lubrication, cleaning and repairing can be performed without removing the guard. Since machinery will often present the same hazards during setup, maintenance and repair, guards should protect the dairy worker from these activities.

2) Devices. When it is not possible to provide an adequate guard, point-of-operation devices are used. Point-of-operation devices are controls or attachments that inhibit normal operation of a machine if any portion of a person's body is within a hazardous area. If a machine guard has an access panel, the panel should have an interlock or presence-sensing device that de-energizes the machine or enclosed power transmission equipment. Additionally, an emergency shutoff control should be within reach of hazardous components for each worker.

3) Location/distance. Distance places the hazardous area of machinery out of reach from the worker to prevent inadvertent contact with the dangerous part or moving machine part. Location involves placing the dangerous machinery in an area where dairy workers will not normally be present.

Administrative Controls

Administrative controls may include placing easy-to-understand warning signage on or around hazardous machinery to inform workers of dangerous moving parts. Additionally, all workers should be properly training on the dangers of moving machinery as well as proper machine guarding principles and purpose.

Personal Protective Equipment

Proper personal protective equipment (PPE) should be utilized during the repair or maintenance of any piece of equipment to protect workers from unexpected machine part movement or release of hazardous energy. The appropriate PPE will depend on the particular task, but may include goggles, face shields, task-appropriate gloves, steel-toed footwear, electrical hazard footwear, shoes with puncture-resistant soles, etc.

Resources

Occupational Safety and Health Administration: Machine Guarding can be found here: https://www.osha.gov/SLTC/machineguarding/standards.html

Occupational Safety and Health Administration Machine Guarding eTool can be found here: https://www.osha.gov/SLTC/etools/machine-guarding/generalrequirements.html

National ROPS Rebate Program: https://www.ropsr4u.com/

Policy Template

Policy templates for Guarding of Power Take-Offs and Guarding of Other Functional Components are available from NYCAMH: https://www.nycamh.org/resources/safety-policy-templates.php

4.7 Silage Safety

- ✓ *The farm conducts a hazards assessment for silage management, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage hazards from silage management:*
  - *Elimination / Substitution*
  - *Engineering Controls (Facility Design, Structures, Railings, etc.)*
  - *Administrative Controls (Training, Procedures, Signage, Documentation, etc.)*
  - *PPE*
- ✓ *The farm offers initial safety training for silage management.*
- ✓ *The farm offers regular refresher safety training for silage management.*
- ✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used for silage management.*

Silage storage facilities on dairy farms present multiple safety hazards that can result in severe injury or death to a dairy worker. Simple control strategies can minimize the risk associated with these safety hazards.

Anticipation and Recognition of Hazard

There are multiple hazards that dairy owners, managers and employees need to be aware of when working around bunker silos and drive-over piles: falls from heights, tractor rollovers, machinery entanglement or run-over by machinery, avalanche or collapsing silage, and nitrogen dioxide.

Falls from heights. Working on top of bunker silos and silage piles creates a risk for falls. Workers can easily slip on plastic when covering or uncovering a bunker or pile, especially in wet weather.

Tractor rollovers. Tractor rollovers are the leading cause of fatalities on U.S. farms. Steep inclines and straight drop-offs from silo walls are significant risks for tractor overturns.

Machinery entanglement or run-overs. Workers can become entangled in machinery such as tractor power take-offs (PTOs), or even run over if a tractor operator does not see a co-worker standing nearby.

Avalanche or collapsing silage. A major contributory factor to injury or fatality from silage avalanche/ collapse is over-filled bunker silos and drive-over piles. A silage avalanche can result in silage falling on a worker who is standing too close to a silage face. Recovery of a worker who is buried under a silage pile can take a long period of time, especially if there are no co-workers nearby to see the event.

Nitrogen dioxide. Numerous gases including carbon dioxide and nitric oxide are produced during the first two-to-three weeks of the harvesting, filling and ensiling periods. Nitric oxide changes to nitrogen dioxide when it contacts oxygen in the air. Nitrogen dioxide (NO2) is a toxic gas that can produce sudden death. The highest levels of nitrogen dioxide are usually present during the first 24-to-72 hours after the forage is put into a silo, but dangerous levels can persist for up to three weeks. When inhaled, NO2 dissolves in the moisture on the internal lung surfaces to form nitric acid. This strong acid burns lung tissue, effectively stopping the supply of oxygen to the body. Depending on the NO2 concentration, the presence of this “silo gas” might be recognized by a burning sensation in the nose, throat and chest. Pulmonary edema and lower airway obstruction may not become apparent until several weeks after exposure and initial recovery symptoms and individuals who survive acute exposures should be closely followed by their physician. Prevention includes adequate ventilation and proper respiratory protection.

CASE EXAMPLES

1. A dairy worker was cutting and removing strips of a tarp off a silage pile. While walking down the north slope of the pile on the tarp, the wind picked up and blew the worker off the east face from about 10-to-15 feet high. The worker was taken to the hospital and later died of injuries sustained in the fall.

2. A dairy worker was standing near a 13-foot high face of silage in a silage bunker and using a front loader to help other employees obtain usable silage samples. A piece of the face collapsed and fell on the worker. Other coworkers who were standing in the area were hit by falling silage but were not injured. The employee that had dismounted his front loader and was standing on the ground near the silage pile at the time of the collapse died from the incident.

Evaluation of Hazard

Frequency or Likelihood of Hazard
The likelihood of injury or death is increased for dairy workers who work around silage storage facilities.

Severity of Injury or Consequence
Silage storage-related injuries can be severe resulting in death to a dairy worker. As a result, injury severity can be high.

Prevention and Control Strategies of Hazard

Elimination or Substitution of Hazard
A common cause of silage avalanche events is the practice of undercutting silage at the face during removal. Undercutting, a situation that is quite common when the unloader bucket cannot reach the top of an over-filled bunker or pile, creates an overhang of silage that can loosen and tumble to the floor. Eliminating the practice of undercutting can significantly reduce the likelihood of a silage avalanche.

Engineering Controls
Lighting and rails should be installed above the walls to indicate the location of the wall. Fall protection should also be employed if necessary when workers are working on top of a silage pile when removing tires or tarps. Tractors should be equipped with roll-over protective structures (ROPS), which create a zone of protection around the tractor operator. Operators should also use seat belts at all times. ROPS and seatbelts prevent the operator from being thrown from the tractor and being crushed. Machine guards and shields should be kept in place to protect the operator from an assortment of rotating shafts, chain and v-belt drives, gears and pulleys and rotating knives on forage harvesters, wagons and silage feeding equipment.

Administrative Controls
Numerous administrative controls can be utilized to reduce the risks associated with silage storage facilities. These controls include the following:

1) Bunkers and piles should never be filled higher than the unloading equipment can reach safely.
Proper unloading techniques include shaving silage down the feed-out face, and never digging the bucket into the bottom of the silage. As previously mentioned, undercutting the silage face creates an overhang of silage that can loosen and tumble to the floor. The silage face should be maintained to be as smooth as possible.

If more silage is added to an existing pile or bunker, the plastic cover should be removed prior to adding additional silage. Silage should not be put on top of plastic covering, as this silage can easily slide down the plastic and become an avalanche during silage removal.

2) Workers should maintain a safe distance from the face edge when removing tires, plastic covers and spoiled feed from the top edge of the face. Workers should approach the face edge carefully with minimal disturbance. A hooked pole or rod can be used to stay even farther back while pulling tires or plastic back from an edge that looks particularly unstable.

3) Never allow people to stand near the feed-out face, and a rule of thumb is never stand closer to the feeding face than three times its height. When sampling silage, workers can take samples from a pile of silage in the commodity barn, after it has been removed from the silage pile or bunker.

4) The perimeter of bunker silos and drive-over piles should be roped off or fenced, with proper warning signs posted.

5) Workers should never be allowed to ride in the bucket of a front-end loader when accessing the top of a bunker or pile.

6) Workers and farm visitors should not be in the vicinity of silage machinery or the silage face.

7) Bunker silos should not be filled higher than the top of the wall. To reduce the risk of a tractor rollover, a maximum slope of 1 to 3 should be maintained on the sides and ends of a drive-over pile.

8) All workers should be properly trained on the dangers of silage storage facilities.

9) Workers who have no job responsibilities involving silage storage facilities should not be allowed in their vicinity.

Personal Protective Equipment

High visibility clothing should be worn by all dairy workers working around silage storage facilities in the event that they might be buried under a silage avalanche. Additionally, fall protection or restraints can be employed if necessary when workers are working on top of a silage pile when removing tires or tarps.

Resources

The Keith Bolsen Silage Safety Foundation: http://silagesafety.org/

Ohio State University Extension, Silage Pile Management and Safety: https://dairy.osu.edu/newsletter/buckeye-dairy-news/volume-17-issue-5/silage-pile-management-and-safety

Lallemand Animal Nutrition, Silage Safety Handbook: https://qualitysilage.com/handbook/silage-safety-handbook/?format=e

Connor Agriscience, Silage Safety Videos: http://www.connoragriscience.com/silage-safety-1

Penn State Extension, Horizontal Silage Safety: https://extension.psu.edu/horizontal-silo-safety

University of Wisconsin-Madison Extension, Horizontal Silo Management Video: https://fyi.extension.wisc.edu/agsafety/2015/04/22/new-video-on-horizontal-silo-management-available-at-world-dairy-expo/

Policy Template

A Horizontal Silo Safety policy template is available from NYCAMH: https://www.nycamh.org/resources/safety-policy-templates.php

4.8 Ergonomics

✓ *The farm conducts an ergonomic hazards assessment, evaluating both likelihood and severity of hazards.*

✓ *The farm uses one or more of the following to manage ergonomic hazards:*

- *Elimination / substitution*
- *Engineering controls (facility design, structures, railings, etc.)*
- *Administrative controls (training, procedures, signage, documentation, etc.)*
- *Personal protective equipment (PPE)*

✓ *The farm offers initial safety training that addresses ergonomic topics.*

✓ *The farm offers regular refresher safety training related to ergonomic best practices.*

✓ *Regular inspections or audits are conducted to ensure that safe practices and procedures are being used.*

Like other agricultural sectors, dairy farm tasks have been associated with work-related musculoskeletal disorders (MSDs). As part of a proactive safety management program focused on injury prevention, implementing ergonomic principles can minimize the risk of developing MSDs among workers.

A simple definition of ergonomics is "the study of work." A more detailed definition is "an applied science concerned with designing and arranging the environment so that workers interact with their environment in the most efficient and safe manner." There are four common objectives of sound ergonomic design as it relates to the workplace:

1. Optimize worker health and safety
2. Maximize productivity and efficiency
3. Improve product quality
4. Improve quality of work life

Anticipation and Recognition of Hazard

Understanding risk factors and practicing basic ergonomic principles are the first defense against possible injury and lost productivity on a dairy farm. Job activities involving any of the recognized ergonomic risk hazards below may contribute to or result in an increased risk of worker injury.

- Awkward postures
- Bending
- Compression or contact stress
- Forceful exertion
- Insufficient rest breaks
- Lifting
- Pushing, pulling
- Reaching
- Repetitive motions
- Static or sustained postures
- Vibration

Awkward postures include twisting, bending, reaching, pulling or lifting. Other examples are a worker performing tasks with their hands above their head or elbows above shoulders. Awkward postures can place excessive force on joints and overload the muscles and tendons around the joints. Body joints are most efficient when they operate closest to the mid-range motion of the joint. Risk of MSD increases when joints are worked outside of this mid-range repetitively or for sustained periods without adequate recovery time.

Excessive muscular force is another primary ergonomic risk factor. Many work tasks can require high force loads on the human body. Muscle effort increases in response to high force requirements which can increase fatigue and risk of a MSD. Numerous conditions affect force, but the goal is to recognize when a job or task requires excessive force and then find ways to reduce that force.

A third primary risk factor is **repetitive motion**. Many work tasks are repetitive and frequently controlled by hourly or daily production targets and work processes. When combined with other risk factors such as high force and/or awkward postures, task repetition can contribute to the formation of MSD. Reduce excessive or unnecessary motions when possible. In situations where this is not possible, it is important to eliminate excessive force requirements and awkward postures.

Evaluation of Ergonomic Hazards

Frequency or Likelihood of Ergonomic Hazards

The likelihood of developing a work-related MSD increases when workers engage in tasks involving awkward postures, forceful muscular exertion or highly repetitive motions. Observe how employees perform tasks. Allow them to share feedback on challenges when performing specific tasks. Consider control strategies if you identify any ergonomic risk factors.

Severity of Injury or Consequence of Ergonomic Hazards

Work-related MSDs represent a majority of workers' compensation claims across many industries. While they often don't increase the risk of death to a worker, a work-related MSD can be debilitating, often resulting in time off or the inability to work.

Prevention and Control Strategies of Ergonomic Hazards

Engineering controls of awkward postures include eliminating or reducing the posture with modifications to maintain mid-range joint motion. Use properly designed tools that allow workers to maintain optimal joint positions. **Administrative controls** of awkward postures can include work procedures to reduce or limit awkward postures. Train workers on proper work and lifting techniques. Encourage their responsibility of properly using their body and avoiding awkward postures whenever possible.

Engineering controls to eliminate or reduce excessive muscular force requirements can lower worker fatigue and MSD risk among workers. Using mechanical assists, counterbalance systems, equipment and ergonomic tools can reduce work effort and muscle exertion.

Administrative controls may include work process improvements such as:

- Using carts and dollies to reduce lifting and carrying demands
- Sliding objects instead of carrying or lifting
- Minimizing reaching activities to reduce the muscular load on the shoulder

Milking Parlor

Multiple ergonomic risk factors are present in the milking parlor. This work area has the highest percentage of workers on a dairy farm. Some milking parlors operate 24/7 with minimal interruption of milking operations. Research has demonstrated a high prevalence of reported musculoskeletal symptoms among parlor workers, especially in the upper extremity.[1] Additionally, a high percentage of workers' compensation injury claims have been associated with work inside the milking parlor.[2] Therefore, the application of sound ergonomic principles has the potential to improve worker health and safety.

*Addendum effective August 2021. Chapter available as a separate print document.

Every milking parlor is unique in configuration (i.e., herringbone, parallel, rotary or other variations), staffing levels, milking routine, shift duration, milking equipment and tools (i.e., cluster design, dip cup or spray, etc.), and other characteristics. Parlor milking involves highly repetitive tasks, high muscle forces and awkward or extreme postures, all recognized as risk factors for developing MSDs among workers. Additionally, work organization factors such as work-rest schedules or environmental conditions, including heat, cold or wet conditions, and inadequate lighting can affect worker health and safety. These ergonomic risk factors can also contribute to worker fatigue, resulting in lower worker performance or compromised health.

Engineering controls can include milking platforms that are at the optimum height to minimize the need for reaching when milking. A support arm for the milking unit reduces shoulder and lower back strain. In parlors where a support arm is not feasible, consider lightweight milking units. Using adjustable height pit floors or platforms allows workers to milk at the most appropriate working posture.

Administrative controls can include installing perforated rubber matting on parlor floors to decrease the physical load on lower extremities (hip, thigh, leg, ankle and foot) and reduce fatigue. Comfortable and supportive footwear can also mitigate worker fatigue while reducing the likelihood of slips and falls. Place paper towels or cloths for udder cleaning in a central location(s) at hip and shoulder height. Using teat dip sprayers or long-handled dippers instead of a teat dip cup helps avoid awkward neck and arm posture. Integrating short micro-breaks during working shifts can provide brief periods of muscular rest to mitigate fatigue onset. Cross-training workers enables employees to work in other farm areas and allows job rotation as a strategy to reduce ergonomic-related hazard exposures.

Benefits of Addressing Ergonomic Hazards

Productivity and Efficiency

Ergonomics can have a dramatic and far-reaching impact on a dairy farm, including improving productivity and efficiency. The goal of ergonomics is to optimize the interaction between the work and the worker. By achieving this goal, dairy farms can improve employee productivity and efficiency as job tasks become easier and more efficient to perform.

Product Quality

Humans are vulnerable to error and fatigue. Integrating ergonomic principles can help mitigate the effects of worker fatigue on performance error. Simple strategies such as effective communication between supervisors and workers, proper training, effective workstation and process design, and providing appropriate tools and machinery can have a significant impact on milk quality and cow health.

Quality of Work Life

Working environments designed without ergonomics in mind can lead to employee frustration and stress while performing daily tasks, reducing productivity. Poorly designed worksites can make workers feel overworked, tired and less involved. As a result, dairy farm employees will not achieve performance expectations. An increase in job stress also increases the chances of catching an illness or making an error that leads to injuries. With a more focused mindset and a less stressful environment, dairy workers can improve their mental and physical conditions and maintain a healthy lifestyle.

Conclusions

Dairy farm owners, managers, supervisors and other decision-makers should be aware of the ergonomic risk factors associated with employees developing MSDs. Equally important is appreciating how sound ergonomic principles can positively influence worker performance, productivity and efficiency.

Resources

Northeast Center for Agricultural and Occupational Health-Ergonomic Considerations in Dairy Work http://www.farmworkercliniciansmanual.com/index.php/patient-farm-type/dairy/common-dairy-hazards/ergonomic-conditions/

Upper Midwest Agricultural Safety and Health Center (UMASH) Recommendations for Prevention: Worker Injuries Causes by Repetitive Motion https://vetmedbiosci.colostate.edu/hicahs/wp-content/uploads/sites/17/2020/09/prevent-repetitive-motion-dairy-2020.pdf

4.9 Noise and Hearing Protection

- ✓ *The farm conducts a hazards assessment for noise and hearing loss, evaluating both likelihood and severity of hazards.*
- ✓ *The farm uses one or more of the following to manage noise hazards:*
  - *Elimination / substitution*
  - *Engineering controls (facility design, structures, railings, etc.)*
  - *Administrative controls (training, procedures, signage, documentation, etc.)*
  - *Personal protective equipment (PPE)*
- ✓ *The farm offers initial safety training that addresses noise hazards.*
- ✓ *The farm offers regular refresher safety training related to noise hazards.*
- ✓ *Regular inspections or audits are conducted to ensure safe practices and procedures are being used.*

Hearing loss is not just a consequence of old age. It can result from excessive noise exposures. Noise-induced hearing loss ranks among the top 10 work-related conditions outlined by the National Institute for Occupational Safety and Health (NIOSH).

Agricultural workers experience one of the highest rates of hearing loss caused by loud noises on the farm. Studies suggest lengthy exposure to typical farm noises can result in noise-induced hearing loss to farmers of all ages, including teenagers. Some chemicals (ototoxins) used in agriculture may also contribute to hearing loss.

Worker's compensation for hearing loss disability is estimated to cost $242 million annually.[1]

Anticipation and Recognition of Hazard

Typically, hazardous noise levels on a dairy farm relate to heavy machinery. Machines such as forage harvesters, tractors, silage blowers, skid steers, generators and pumps can produce hazardous noise levels that can be detrimental to the human ear and result in hearing loss.

Measurement of Sound

Decibels (dBA) measure sound, ranging from the softest sounds heard by humans to the most detrimental sounds causing hearing loss. The Occupational Safety and Health Administration (OSHA) has established safe levels of noise in the workplace. Acceptable levels in the U.S. come from OSHA and are in Table 3 . While 90 dBA is the noise level permissible for an 8-hour workday, hearing protection is recommended at 85 dBA. Mobile apps can provide a quick assessment of a sound level.

Table 3: OSHA Permissible Noise Exposures

Duration per day (Hours)	Sound level dBA
8	***90***
6	***92***
4	***95***
3	***97***
2	***100***
1.5	***102***
1	***105***
0.5	***110***
0.25	***115***

Severity of Injury or Consequence

Sounds on a dairy farm can be harmful when they are long-lasting or too loud, even if only for a short time. These sounds can damage part of the inner ear and cause permanent hearing loss. This permanent hearing loss can worsen over a lifetime, making the performance of everyday tasks challenging.

Prevention and Control Strategies of Hazardous Sound

Engineering Controls

Farm equipment is the most common source of hazardous noise. The most effective mechanism of noise reduction is to reduce it at the source. Simple machine maintenance can often reduce hazardous noise levels. Worn, loose or unbalanced machinery parts can be the source of hazardous noise levels. Routine maintenance, lubrication and parts replacement can significantly reduce friction and noise levels. Installing high-quality mufflers on engine-powered equipment can help reduce noise levels. Tractor operators can be isolated from machinery sources of noise by an acoustic tractor cab.

Administrative Controls

The next control mechanism for noise is utilizing administrative controls. Workstation rotation can reduce noise exposures among workers. Another simple administrative control can involve moving a work location a longer distance away from a noise source or rescheduling it during less noisy work times.

Personal Protective Equipment (PPE)

Use PPE when engineering or administrative controls cannot reduce noise levels. Personal protection for hearing comes in two basic forms – earplugs and ear muffs. Each form has its advantages and disadvantages.

Earplugs are made to fit into the ear opening and may be disposable or reusable. Both are available in different shapes, sizes and stiffness. Earplugs can be a source of ear infections – they must be kept clean and sanitized. Do not share earplugs with others to avoid transmitting ear infections.

Properly insert earplugs in the ear canal to maximize effectiveness in reducing noise exposures. Individually fitted earplugs by a hearing specialist or audiologist provide the best protection. Workers should receive training on the proper method to insert earplugs. Disposable

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earplugs are compressed before inserting into the ear, then expand to fill the ear canal. Disposable plugs should be thrown away at the end of the day as they are very inexpensive when purchased in bulk quantities.

Ear muffs cover the ear and ear canal to provide a barrier to sound. Ear muffs fit well with a good seal against the head and are comfortable. Like earplugs, ear muffs do not block out all sounds, making conversation easier for information and safety purposes. However, ear muffs can be uncomfortable in hot and humid weather and problematic in confined spaces.

Ear protection devices are ranked by their Noise Reduction Rating (NRR). The NRR is a single-number rating method to describe a hearing protector based on how much the hearing protector reduces the overall noise level. An NRR 25 rating suggests a noise reduction of 25 decibels under ideal conditions. For example, in a 105 dBA work area, a device with a NRR of 25 dBA would indicate an exposure level of 80 dBA. This reduction assumes a perfect fit and that the worker wears the hearing protector the entire duration of exposure to the 105 dBA noise. Numerous field studies suggest it is difficult to wear and use hearing protection perfectly. Often safety and health professionals discount the NRR on earplugs and muffs by up to 50%.

Resources

PennState Extension. Noise Induced Hearing Loss in Agriculture. https://extension.psu.edu/noise-induced-hearing-loss-in-agriculture

Farm and Ranch eXtension in Safety and Health (FReSH) Community of Practice. Hearing loss and protection for agricultural producers. http://www.extension.org/pages/62258/hearing-loss-and-protection-for-agricultural-producers.

University of Maine Cooperative Extension. Hearing Protection for Farmers. https://nasdonline.org/1139/d000933/hearing-protection-for-farmers.html

Great Plains Center for Agricultural Health. Hearing Loss Among Farmers and Agricultural Workers. https://gpcah.public-health.uiowa.edu/fact-sheets/hearing-loss/

NIOSH. Fitting Formable Plugs. https://www.cdc.gov/niosh/docs/2007-176/pdfs/2007-176.pdf

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