MODULE SIX

Hazards: Animal Handling and Farm Structures

Learning Objective:

Upon completion of this unit you will be able to identify the hazards related to animal handling and farm structures on your operation and implement safety protocols to address these hazards.

Learner Outcomes:

You will be able to:

1. Identify and implement proper animal handling techniques.
2. Identify OSHA requirements for floor holes, floor openings, stairs and handrails.
3. Explain safety considerations related to electrical energy.
4. Define "confined space" and "permit required confined space."
5. Explain lockout-tagout procedure.
6. Describe safety measures to be taken with manure storage and handling facilities, upright and horizontal silos, and grain bins.
7. Outline techniques for teaching employees about hazards in animal handling and farm structures.

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General Animal Handling

Working in close contact with dairy cattle is a necessary part of any dairy operation. There are some important generalizations we can make about cattle that facilitate their handling:

- Excited animals are harder to handle. If cattle become nervous or excited when being worked, stop and allow the animal 30 minutes for their heart rates to return to normal.
- Cattle are generally color blind and have poor depth perception, thus they are very sensitive to contrast. Eliminate blind turns, dark shadows and swinging/ dangling items in their path to enable easier movement.
- Loud noises, especially high pitched noises, frighten cattle. When cattle are moved quietly they remain more calm and easier to handle.
- Cattle remember "bad" experiences and create associations from fear memories. For example, if a man with a beard caused a cow pain, she may exhibit fear towards all men with beards. This makes calm and respectful handling at all times even more important.
- When cattle kick they kick forward, then out and back in a swinging motion. Handlers should be aware of this to reduce the risk of injury.

Areas of Focus:

- Flight Patterns
- Restraints
- Bulls
- Post-Parturition Cows
- Zoonotic Diseases
- Hormones

Flight Patterns

A flight zone refers to a cow's "personal space." When a human enters her flight zone she will move, just as when a human leaves her flight zone she will stop moving. The size of the flight zone varies depending on the tameness of the cow and can range from 5 to 25 feet for the average dairy cow.

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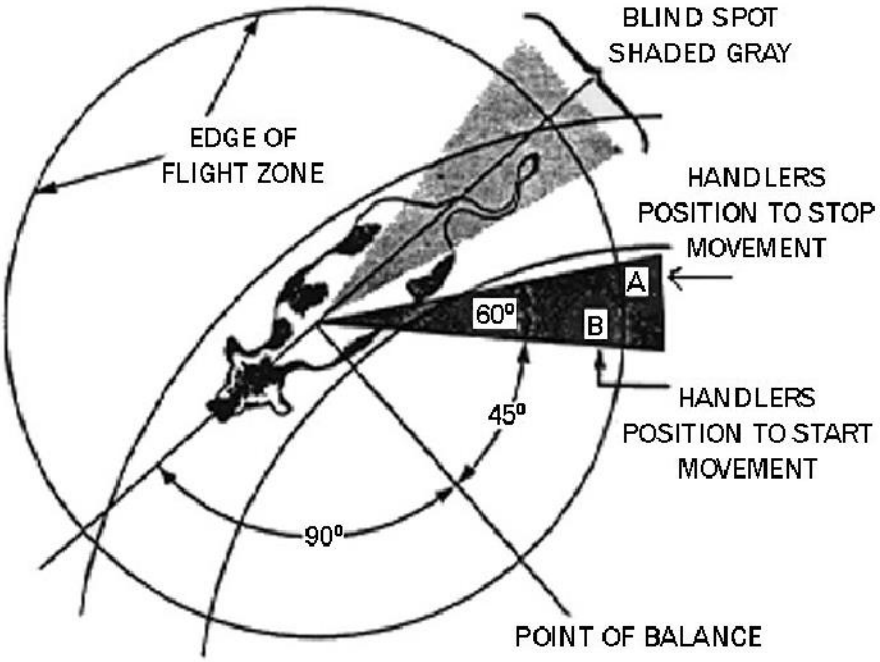
A cow also has a "pivot point" or a "point of balance" at her shoulder. The cow will move backward or turn if the handler crosses the pivot point towards her head. Conversely, the cow will move forward if the handler crosses the pivot point approaching her hindquarters. Cows in a group can be encouraged to move forward if the handler walks slowly past the pivot point on their shoulders, steadily approaching the back of the herd.

Additionally, cows have a blind spot directly behind them. Handlers should never approach from directly behind a cow as she may become nervous and kick.



Restraints

Dairy cattle are commonly restrained in squeeze chutes for various procedures.

- Use a chute with solid sides for more wild cattle. Cows will remain calmer in chutes that have covered sides that prevent the animal from seeing human movement. Solid sides can be used for loading, and then a portion may be removed for certain procedures.
- Close the chute slowly and steadily to apply even pressure to the animal. Moderate, even pressure will result in a calm animal whereas sudden excessive or insufficient pressure will result in struggling.

- Ensure employees have a good working knowledge of the squeeze chutes on your facility. Eliminate protruding levers that can cause injury or make them highly visible.
- To eliminate the temptation to treat a cow that has become hung up in the chute, (for example, caught in the headgate by her hips) install a sorting gate in front of the chute. This allows an animal to be released and run back through the chute easily.

There are additional forms of restraint used for milking. When a cow is identified as being kicky, dangerous, or unpredictable consider the use of restraints to protect employees.

One option includes hobbles that remain on the cow full time to protect employees milking or moving her.

A common option in tie-stall or stanchion barns is the use of a kicker to allow employees to prep and apply the unit safely, as well as prevent the unit from being kicked off.

Bulls

Dairy bulls are known to be more aggressive than other bulls. Research has shown that this may be due to the difference in calf raising methods; beef bulls are typically reared on the mother cow whereas dairy bulls are bottle/bucket fed by people. This causes dairy bulls to direct their challenges to people rather than towards other cattle. The risk of bull attacks may be lessened by raising dairy bull calves together starting at 6 weeks of age. The treatment of a bull as a working animal rather than a pet may also make him easier to handle.

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Identifying aggression:

- Turning broadside with his back arched
- Head lowering or shaking
- Flexing of neck
- Protruding eyeballs
- Hair along back standing at end

Responding to a threat:

- Look away from the bull
- Back away slowly
- Withdraw by at least 20 feet to remove yourself from the flight zone

General safety:

- Design or modify bull holding facilities so bulls may be fed, watered, and used for breeding with employees having minimal direct contact.
- Create man gates, or 14" wide openings in bull enclosures for employees to exit without climbing a fence or opening a gate in case of an emergency.

- Post warning signs on bull enclosures to caution employees and visitors of the bull's presence.
- Train employees to report aggressive behavior immediately.
- Cull bulls that show any signs of aggression or that reach over 2 years in age, as they become unpredictable.
- Never work bulls alone or allow an employee to work a bull alone. Plan an escape route before beginning work.
- Placing a "cow bell" around the neck of the bull can be helpful in alerting employees to the bull's whereabouts.

Post-Parturition Cows

"Parturition" refers to the act of giving birth. Cows that have just given birth are much more dangerous to handle and employees should be aware of the risks and trained to deal with these animals appropriately.

- Know your escape route. Have a plan for exiting in case of an emergency before entering a pen with a new mother.
- Separate the calf from the heifer or cow quickly, before she has a chance to bond with her calf. This will not only make separation less dangerous, it will also be less stressful for the animals.
- It may be safer to remove the cow from the calf rather than try to take the calf away from the cow.

Zoonosis

Any disease that can be transmitted between animals and humans is termed a "zoonotic" disease. These diseases pose a safety hazard to employees if they are uninformed or are not trained on how to prevent their spread.

Routes of infection

- Amniotic fluids, placenta and fetal membranes
- Urine, milk, manure
- Contact with sores or wounds
- Accidental needle sticks
- Inhalation of dust from bedding or manure

Best preventative measures

- Remind employees to wash hands with soap after handling animals. Provide soap and hand washing areas for employees.
- Avoid unpasteurized milk that could be contaminated; do not allow employees to consume unpasteurized milk.
- Isolate infected animals to prevent the spread of disease; use warning signs to label pens containing infected animals.

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- Provide PPE for employees working with sick animals. Enforce the use of PPE such as rubber gloves, goggles or face masks when treating or handling infected animals.
- Thoroughly disinfected tools, clothing, etc. that come in contact with infected animals.
- Test and quarantine new, incoming animals to the farm.
- Use sharps containers to prevent accidental needle sticks.

Common Diseases		
Disease	**Spread**	**Symptoms**
Brucellosis (Undulant Fever in humans)	Ingesting unpasteurized infected milk, or through birthing tissues, milk, urine, blood	Fever, weakness, headache, joint pain, night sweats
Leptospirosis	Contact with urine of infected animal	Flu-like symptoms, followed by meningitis, liver damage and kidney failure.
Cryptosporidiosis	Consuming food or water infected with the bacteria or failure to wash hands after contact with infective manure or animals	Diarrhea, abdominal pain, vomiting, fever, muscle cramps. Most common in children and pregnant women.
E. coli	Ingesting contaminated water or milk, failure to wash hands after contact with infective manure or animals	Severe, bloody diarrhea
Ringworm	Direct contact with infected animals	Round, itchy areas on the skin, skin irritation
Salmonellosis	Shed in manure from infected animals. Spread to humans through unwashed hands, infected unpasteurized milk	Diarrhea, cramping, fever
Tuberculosis (TB)	Inhalation of bacteria, ingestion, or through skin contact	Moist and persistent cough, fever, chest pains, swollen glands

Hormones

The use and administration of hormones poses a risk for women of childbearing age and especially women who are pregnant. Women who are pregnant should not handle prostaglandins, progestins or estrogens as absorption of this product through skin contact or a needle stick presents great risks for the fetus and may cause fetal damage or abortion. These products also pose a risk for creating hormone imbalances in men. Ensure that workers handling these products have been warned about the health risks and wear proper PPE, including impermeable gloves.

Conclusions

The risks associated with animal injury can be minimized by training employees on proper animal handling as well as worker positioning. Many injuries occur when a person is forced into contact with a structure by an animal. Ensure that workers are trained on how to position themselves safely when working with cattle. Train employees to communicate with each other about their positioning, where the cattle are being moved to, etc. when working with cattle to minimize the risk of injury.

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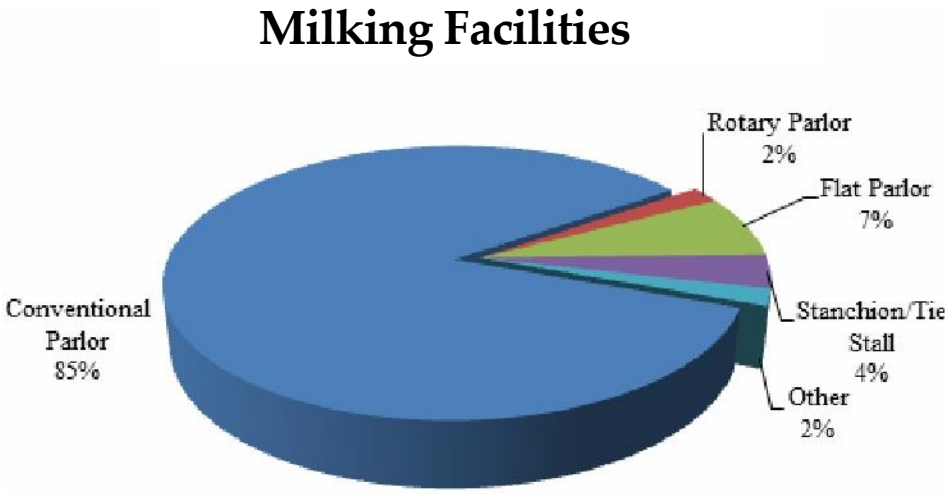
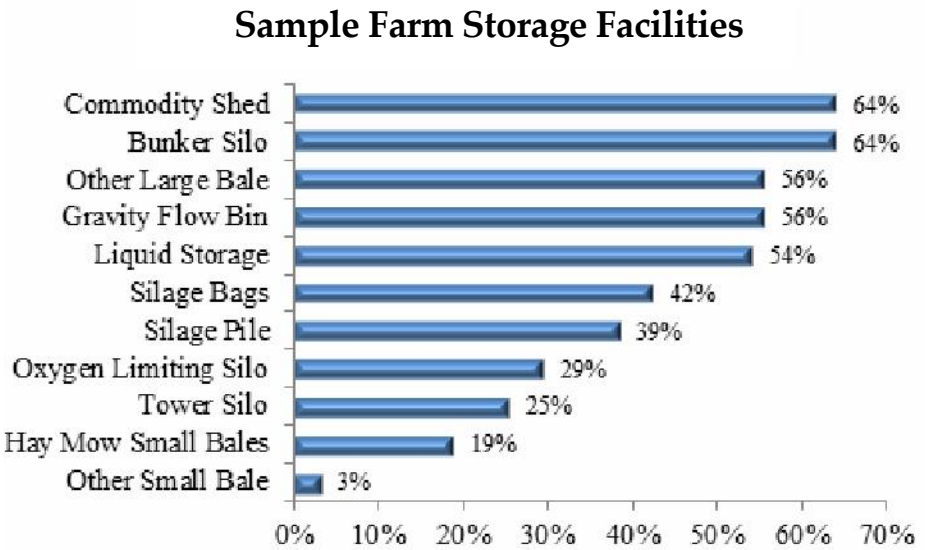
Farm Structures

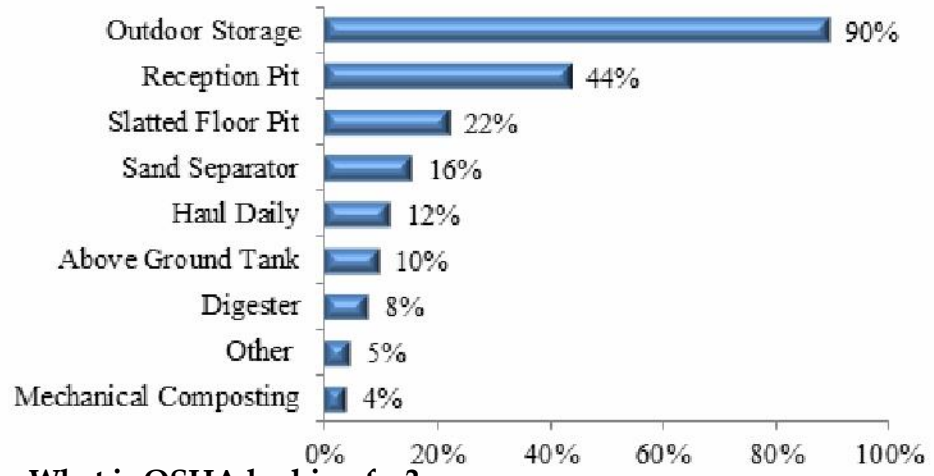
The Dairy Safety Survey results show the complexity of facilities on Wisconsin Dairy Farms. There are a variety of configurations of structures and storage areas on each farm, and each structure has a variety of machinery and equipment being used. At the same time there are common factors when it comes to addressing safety and health issues.

*The following data was provided by the needs assessment performed by UW-River Falls





Manure Handling on Sample Farms



What is OSHA looking for?

As we have previously discussed in the Hazard Identification and Risk Assessment unit there is the potential for many hazards to be present on a dairy operation. There are many possible ways to eliminate a single hazard. OSHA will use the Agriculture Standard 29 CFR 1928 which has limited parameters; they will also use a variety of consensus standards from (ASABE, ANSI, EPA, FDA) and OSHA 1910 General Industry standards. (Consensus standards are regulations that have been adopted by other professional organizations and are used to maintain a safe work and living environment). These can be used to evaluate the hazard control options and identify ways to correct a hazard on your operation.

- ASABE: American Society of Agricultural and Biological Engineers
- ASAE: American Society of Agricultural Engineers
- ANSI: American National Standards Institute
- EPA: Environmental Protection Agency
- FDA: Food and Drug Administration

Organization and housekeeping

Safety starts with organization and housekeeping.

Situation	Outcome
needle outside of sharps container	needlestick injury
disorganized storage of barn scrapers and pitchforks	strains and sprains from falls, infected puncture wounds
unwound firehoses	tripping injuries
slippery floors and broken concrete from manure corrosion	slip and fall injuries

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- Walk through your facilities regularly and maintain a clear path of travel for employees.
- Keep floors in good repair and remove any tripping hazards
- Implement a footwear program to reduce your slips and trips in the milking areas and barns.

An **agricultural structure** by definition is "a shelter for farm animals or crops; or when incidental to agricultural production, a shelter for processing or storing equipment. An agricultural building is not for use by the public, or for any human habitation."

The following is a list of common elements of farm structures to assist you in identifying hazards on your farm:

- walking and working surfaces
- holes and floor openings
- handrails and railings
- stairs
- fixed ladders and cages

ASABE Standard ASAE S412.1 Ladder, Cages, Walkway and Stairs and OSHA Subpart D - Walking and Working Surfaces provide technical information related to each of these items.

Holes and floor openings

Floor hole (OSHA definition)

- Less than 12 inches but more than one inch in its least dimension
- Placement in any floor, platform, pavement or yard
- Materials but not people may fall
- May include opening for water or waste pipe

Floor opening (OSHA definition)

- 12 inches or more in its least dimension
- Placement in any floor, platform, pavement or yard
- People may fall through
- May include hatchway, stair or ladder opening, pit, large manhole, uncovered haymow opening

Manure storage or septic systems may provide the most common floor opening hazard.

- Guarding for these openings is required regardless of equipment used for manure handling (from alley scrapers to skidsteers)
- Options include grates or gates
- If grates are removed and not replaced in winter due to freezing, other options need to be explored

Never leave a floor opening unprotected and be sure to inform affected workers in the barn of the work being done.

Handrail and Railing Requirements

An elevation change of over 4 feet brings railings into consideration.

Handrail and Railing Requirements under ASAE S412.1 section 7: A railing shall consist of top rail, intermediate rail and posts and shall have a vertical height of 42 inches from upper surface of top rails to floor, platform or catwalk.

- If someone can walk underneath an elevated storage area or landing (such as a mezzanine) the railing system should also include a 4 inch toe board.
- The system should be able to withstand 200 lbs. of force.
- Where railings transition to handrails the slices should be smooth and free of burrs.
- Handrails should be positioned 30"-34" from the upper surface of the handrail to the upper surface of the stair tread.

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Stairs

- Minimum width for stairs is 22 inches
- Stair treads of less than 9 inches should have open risers
- Riser height may range from 7.0-8.75 inches
- Handrails are required when:
  - the stairs are open on both sides
  - the stairs meet the railing requirements as previously
  - mentioned

Fixed Ladders and Cages

Falls can cause injuries and substantial loss of productivity. Milking parlors, upright silos, gravity flow feed bins, grain storage bins, and pump reception pits are a few agricultural structures that have fixed ladders, cages and landing platforms. There are special requirements for agricultural structure related to grain bins and external wall ladders and chute ladders for silos.

- The fixed ladders, cages and landing platforms should be inspected on an annual basis.
- Ensure that rungs are clear from debris, slip-free, free of sharp edges, burrs and projections, and well lit.
- Create a written ladder safety program and train employees on its use:
  - o Check all ladders for damage prior to use.
  - o Replace ladders that are damaged (cracked, dented or missing rungs).
  - o Place straight ladders at a 4:1 distance ratio against the support (i.e. 1 foot of distance from the base for every 4 feet of height against the support).
  - o Make sure permanently affixed ladders are securely fastened. Free-standing ladders should only be placed on an even, non-slip surface.
  - o Always utilize the 3-point climb (keep 3 points of contact against the ladder at all times).
- Utilize fall protection devices and such as protective cages, lifelines or safety harnesses.
- Require employees to wear slip-resistant footwear.

Animal Handling Structures

Slips and falls are significant hazards when working in animal handling facilities such as freestalls, holding pens and parlors. The use of grooving in the floor provides drainage and traction for cattle and humans, reducing the risk of slip/fall injuries. Eliminate obstacles that may be in a milker's way such as unwound hoses or extra buckets.

Chemical hazards may come in the form of footbaths, teat dips or applications, cleaning supplies or animal medications. Ensure that employees know the risks associated with chemicals, are trained to use them, and have access to MSDSs.

Crowd Gates

An additional hazard within animal handling structures involves crowd gates.

- Ensure that crowd gates have the appropriate stop measures installed.
- Install the gate to allow a gap between the furthest wall to prevent a person from becoming entrapped or crushed
- Ensure there is a gap large enough from the bottom of the gate to the floor to prevent a person from being crushed or tangled.

Electricity

Electrical energy is used on a daily basis by your employees. Employee exposure to electrical hazards will vary depending upon their work environments. Milking facilities and all types of animal housing are "corrosive" environments and feed rooms and commodity sheds are considered "damp and dusty." Regardless of the type of environment there are specific codes for electrical agricultural equipment and buildings. The Wisconsin Electrical Code adopts the National Electrical Code (NEC). NEC 2011 is the current code published by the National Fire Protection Association (NFPA). NEC Article 547 relates to agricultural structures. NEC is the minimum safety standard for materials and installation methods used for electrical systems. The NEC is updated every 3 years and

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although existing electrical systems don't need to be updated to the newest electrical code, any new wiring does need to meet the current NEC. OSHA may use the General Duty Clause to address electrical hazards in agriculture. OSHA's General Industry Subpart S - Electrical is another reference document.

It is difficult to provide an overall electrical hazard assessment for your operation. In assessing electrical hazards and safety requirements, you may find it beneficial to work with an electrical consultant. Some electrical hazards and items for a basic assessment include:

- Instruct employees to keep a distance of 10 feet when working around overhead power lines or near high voltage conductors. The 10-foot rule applies to field equipment too.
- For grain storage structures there are minimum clearance distances for overhead power lines based on the National Electrical Safety Code (NESC) from the Institute of Electrical and Electronic Engineers. Check with your local power supplier on these power line clearances. When moving tall equipment or loads under power lines, it is recommended to have secondary people serve as spotters.

- Clues that an electrical hazard exists include:
  - o Tripped circuit breakers or blown fuses
  - o Warm tools, wires, cords, connections, or junction boxes
  - o Ground Fault Circuit Interruption (GFCI) that shuts off a circuit
- Worn or frayed insulation around wire or connection. If an employee notices any of these conditions, the problems should be reported immediately.
- The grounding path from ground to circuits, equipment, and enclosures must be permanent and continuous.

- Check that all hand-held tools meet one of these criteria to prevent burns, shocks or electrocutions:
  - o have a three-wire cord with ground and are plugged into a grounded receptacle
  - o double insulated

If not meeting one of these criteria or any damage to the cord is present, take out of service and repair or replace.

- Electric equipment operating at 50 volts must have live parts of electric equipment guarded to prevent accidental contact by:
  - o Approved cabinets/enclosures, or
  - o Location or permanent partitions making them accessible only to qualified persons, or
  - o Elevation of 8 ft. or more above the floor or working surface.
- Mark entrances to guarded locations with conspicuous warning signs.
- If electrical equipment is located where it can be exposed to physical damage, it must be enclosed or guarded. Look for physical damage to exposed conduits as a hazard indicator.
- Check that junction boxes, pull boxes and fittings have approved covers and that unused openings in cabinets, boxes and fittings are close. Cover any missing knockouts.
- Flexible cords should not be:
  - o used in place of fixed wiring;
  - o run through walls, floors or ceiling; or
  - o concealed behind any building structure

Flexible cords should be checked for any signs of damage. Damaged cords should be repaired according to code or taken out of service.

Employee training should include:

- De-energizing electric equipment before inspecting or making repairs. Do not work on energized circuits or equipment.
- Using electric tools that are in good repair.
- Using good judgment when working near energized lines. Jobs
- that are to be completed by a "qualified" employee or certified electrician.

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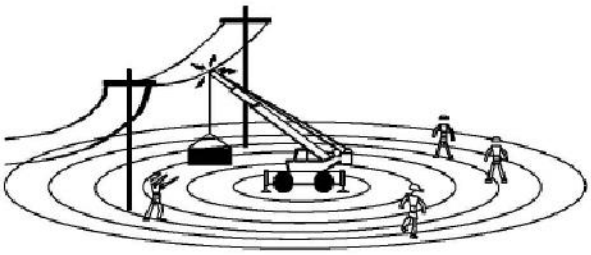
- Procedures for reporting any electrical concerns in their workspace or with equipment.

In the case of an electrical incident such as contact with an overhead power line follow these steps:

- Remain in the vehicle cab and call for help whenever possible.
- If the risk of staying in the vehicle is higher than the danger presented by electric shock, jump out of the cab. Don't step down.
- Shuffle away from the site of the incident.
- Do not re-enter cab if you didn't receive a shock. A large number of electric shocks happen upon re-entry of seemingly safe equipment.

Confined Spaces



Presently, there is not an OSHA agricultural standard for confined spaces. The discussion of "confined spaces" is relatively new to agriculture even though these spaces have existed for decades. Examples of confined spaces include septic systems, sump pump pits, manure pump pits, manure reception pits, manure tankers, upright silos, grain bins, gravity flow feed bins, bulk milk tanks, and milk silos. Children under the age of 16 are not permitted to work in any confined spaces.

To better understand the risks and hazards associated with these structures, here's a review of the definitions of a confined space based on ANSI/ASSE Z117.1-2009 Safety Requirements for Confined Spaces and OSHA 29CFR1910.146.

A work area that is considered a "confined space" has the following characteristics:

- large enough and configured to allow a person to bodily enter
- not designed for continuous employee occupancy
- limited or restricted means for entry or exit.

A "permit-required confined space" describes a work area that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has walls that converge inward or floors that slope downward and taper into a smaller area that could trap or asphyxiate an entrant.
- Contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress.

These permit –requires confined spaces are considered hazardous until determined otherwise.

The permit is an internal document that ensures that proper precautions have been taken and there is an emergency rescue plan in place prior to entrance in the confined space. A sample permit is available in your toolbox.

Perform a confined space assessment on all spaces. Determine if you or your employees would ever need to enter the space. If no entry is required, put an appropriate sign near the entrance point and prohibit entry by a positive means such as locking the cover or putting a grate over the entry point.

If you are not qualified to perform the assessment, contact a qualified professional to contract the assessment and possibly perform the required work.

When considering whether to purchase the equipment necessary to perform work in a confined space (such as SCBA and specialized equipment for cleaning and servicing pits) also consider the amount of training required for employees and the scope of the investment you are making. You may wind up with a "stranded investment" in that the cost of your input is never recovered throughout the life of purchased equipment and training. It may prove to be more cost effective to contract a professional company rather than make a personal investment.

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Minimum Atmospheric Oxygen Levels	
21%	Normal atmospheric oxygen
19.5%	Minimum healthful level
15-19%	Decreased coordination and stamina
12-14%	Breathing rate and pulse increase. Impaired perception and judgment.
10-12%	Breathing increases further in depth and rate. Lips tinged blue.
8-10%	Nausea, vomiting, mental incapacity, fainting, unconsciousness
6-8%	Fatal in 6 to 8 minutes
4-6%	Convulsions, cessation of respiration, coma and death

Lockout-Tagout/De-energization Procedures

Lockout-tagout (1910.147) is not required under OSHA 1928 but is considered best practice. Farmstead equipment must be turned off, verified stopped, and locked out before servicing or maintaining. The best practice would be to follow the requirements in 1910.147 Lockout/Tagout standard which discusses a written procedure, verification and application of locks for any type of energy such as electrical, gravity, kinetic, and potential.

Never work under a piece of equipment unless it is blocked, braced or secured in position.

Lockout-tagout is a safety measure used to prevent equipment from being activated while servicing or to prevent entry to unauthorized areas.

A lockout device physically prevents a piece of machinery from becoming activated or a space from being entered. A tagout only warns of the hazards associated with activation or entry; it does not physically prevent the action.

Employees must be trained on lockout-tagout procedures. Only authorized employees who are performing the maintenance or servicing of equipment should perform the lockout or tagout.

Manure Storage and Handling

Four main deadly gases:

1. Carbon dioxide: Colorless, odorless and heavier than air. It settles at the top of manure or slurry. Causes asphyxiation, or suffocation.
2. Methane: Also colorless and odorless but lighter than air, thus tending to rise towards the top of the manure storage. Also causes suffocation.
3. Ammonia: Replaces oxygen at the rim of a manure storage structure. Acts as an eye and respiratory system irritant.
4. Hydrogen sulfide: A highly poisonous gas that smells like rotten eggs in low concentrations. It acts as an irritant and a nerve paralyzer, resulting in the inability to breathe. It is heavier than air and settles on top of manure or slurry.

Servicing manure pits:

Only qualified people should be allowed to enter a manure pit.

- Manure pits should only be entered when absolutely necessary.
- Manure pits should be ventilated prior to and during worker entry.
- The air quality inside the pit should be tested prior to worker entry.
- A safety belt or harness with a lifeline should be worn whenever a worker enters or services a manure pit. In addition, a mechanical lifting device, such as a winch, should be available in case rescue is needed.
- There should always be a standby person in constant contact with the worker entering the pit. A pit should NEVER be entered alone.
- If, when tested, the air is shown to be toxic, consider hiring out or contracting this job with qualified professionals who have access to the proper PPE.

Manure pit and lagoon guidelines:

- Manure pits should be completely fenced with visible and secure fencing.
- Post signs that warn of manure pit danger.
- Create an emergency action plan to be used in the case of an incident.

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- Implement proper machine guarding where necessary to prevent equipment from falling into the pit.
- Fit openings to underground pits with metal grill covers to prevent falls while providing natural ventilation.

- When building a new pit prevent the need for entry by providing access to serviceable parts from the outside.
- Train employees on manure pit safety before they work in or around pits.
- Designate pit areas as "no smoking" areas due to the explosive nature of methane gas.

Silo Hazards

There are different hazards associated with different types of silos. Employees working with upright, bunker, or drive-over pile types of silos should be trained on the hazards associated with each type.

Upright silo

One of the most serious hazards associated with an upright silo is silo gas. Silo gas, or nitrogen dioxide (NO_2) forms as a product of chemical reactions that occur immediately after plant material enters the silo. It is heavier than air and can flow out and settle towards the ground or in enclosed structures attached to the silo. Nitrogen dioxide can appear as a yellow-brown or reddish haze. Exposure to nitrogen dioxide causes a burning sensation in the nose, throat and chest and can cause permanent damage. The effects are not always immediate, creating a need for anyone exposed to silo gas to seek immediate medical attention. Carbon dioxide (CO_2) also poses a suffocation risk when entering a silo.

- Do not enter a silo for the first 3-6 weeks after filling.
  - o Perform any leveling or other work immediately after the last load of silage with the blower running.
  - o If you must enter a silo in that time wear appropriate PPE (SCBA respirator). Air-purifying respirators are not sufficient in oxygen-limited environments.
  - o Run the blower for 15 minutes or more before entering the silo and leave the blower running while inside the silo to freshen the air.
- Post silo gas or asphyxiation hazard warning signs outside of silos.
  - o Oxygen limiting silos require a sign that warns people of the absence of oxygen.
- Ensure that ladders are installed inside and outside of all silos.
- Utilize a rope and safety harness when entering a potentially dangerous silo situation.
- Have at least one person outside or on the ground to help in case of an emergency.
- Lock unloading mechanisms to prevent tampering.

Horizontal silos

The risks associated with bunker silos and drive over piles are similar. The greatest risks are related to tractor roll overs and silage avalanches.

Fence off the silage pile or bunker silo and post warnings to keep people away from the area.

Filling safety:

- Use tractors with roll-over protective structures (ROPS) and require employees to wear a seat belt.
- Do not pile silage on top of protective plastic sheeting. This causes a high risk of avalanche on the slippery surface.
- Back tractors up steep slopes to reduce rollover risk. Use
- low-clearance, wide wheel base tractors.
- Ensure that trucks are parked on a firm, even surface prior to dumping.
- Do not pile silage higher than the unloading equipment can reach to prevent creation of an overhang.

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- Maintain a slope of 3 feet of horizontal fill to every 1 foot of vertical fill to reduce rollover risk.
- Carry the bucket of a front-end loader low to keep a better center of gravity.

Feeding safety:

- Shear the silage face evenly to create a smooth surface. This reduces the risk of avalanche.
- Keep vehicles parked away from the face of the silage.
- Do not take samples from the silage pile or face. Instead, take samples from the unloading equipment away from the silo.
- Be cautious when removing plastic and tires or weights from the silage pile. Stay 3 feet from the edge and avoid disturbance. Consider using a hooked pole to pull plastic and tires away to keep an even safer distance.

Additional Bunker Silo Safety Considerations

- Install sight rails on above-ground walls to indicate the location of the wall to tractor operators. This rail is NOT intended to hold an over-turning tractor.
  - o Install lights on the sight rail if filling will occur at night.

Grain Bins

Grain bins have two special hazards: engulfment and falls.

Workers can quickly become engulfed in corn, especially when an unloader is running. When a worker stands on flowing grain their weight forces the grain to flow to the outlet more quickly which causes a rapid sink into the grain. A 6 foot tall worker can be engulfed in grain in 11 seconds, but would be unable to free themselves after the first 5 seconds. *Statistic from OSHA website. Another engulfment hazard exists from piles of grain, which may cave in onto workers.

Additional hazards exist from falls if the worker is walking across or standing on a "crust" or "bridge" of grain. These formations often occur when grain is stored with excess moisture. Crusts can become dislodged when a worker tries to shovel the grain, knock the grain away from the edge of the bin, or simply from the weight of the worker. Crusts are not always obvious; a crust formed completely across the bin may look like a solid floor of grain.

Grain bin deaths doubled between 2006 and 2010. The following are some possible reasons for the high number of incidents:

- New grain bins are larger and grain handling rates are faster than workers may be used to.
- Wet harvest years cause an increase in grain crusting and clogging of equipment, resulting in an increased number of workers entering bins to dislodge the grain.
- Employees may work alone, creating a hazard even for short durations.
- Workers inadvertently start grain handling equipment, fill grain bins, or start grain transfer before identifying where other workers are and what they are doing.
- The lack of an accident response plan understood by and made available to fellow employees can slow down or hinder rescue operations.
    - The lack of a trained emergency response team can also slow a rescue effort. Consider contacting your local fire department or accident response team to determine whether they have been trained in confined space rescue or if they would consider completing training.

Important Safety Measures (supported by standard 1910)

- Turn off, lockout/tagout or block off all mechanical, electrical and hydraulic equipment that presents a danger before a worker enters a grain bin.
- Never run grain moving equipment while a worker is inside a bin.
- Prohibit and prevent workers from "walking down" grain to make it flow.
- Prohibit and prevent workers from entering on or below a bridging condition or where grain is built up along the side of the bin.

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- Train workers for the specific hazards associated with grain bins.
- Provide all workers entering grain bins with a safety harness that will prevent them from getting engulfed or sinking past their waist.
- Provide workers with rescue equipment, such as winch systems.
- Station an observer who is equipped to provide assistance and perform rescue operations outside the bin.
- Ensure that communications are maintained between the observer and the workers within the bin.
- Test the air in the bin for oxygen content and the presence of hazardous gases.
- Provide and continue ventilation until unsafe air conditions are eliminated. If they may not be eliminated provide workers with the appropriate respirator.
- Issue a permit each time a worker enters a bin unless the employer is present during the entire entry operation.
- Have a specific confined space entry procedure.

Characteristics of a Dust Explosion

There are two phases in a major dust explosion: a primary explosion and a secondary explosion. The explosions, however, can happen almost simultaneously, so distinguishing between the primary and secondary explosions can be difficult. The dust from the first explosion may actually provide fuel for the secondary explosion by shaking loose settled dust. If fuel, oxygen, and an ignition source are present in a confined space, a series of destructive explosions can occur that may cause structural damage.

Most grain dust explosions occur at grain transfer points. At the transfer points, the movement of grain causes dust to be released at high levels, resulting in suspended dust particles. The suspended dust may collect in leg boots and elevator legs. Dust concentrations in bucket elevators can exceed minimum explosive concentration (MEC) levels and pose the risk of explosion.

Preventing Grain Dust Explosions

To reduce the risk of a grain dust explosion or fire, focus on controlling dust and reducing the sources of ignition. Preventative measures include continuous housekeeping, sanitation, and regularly scheduled maintenance. Implement a housekeeping or sanitation program to decrease grain dust in all work areas. Leg boots should be cleaned routinely to remove excess dust and kernels.

Shops

Take an inventory of all agricultural chemicals that are stored in your shop and obtain MSDSs for these chemicals.

A particular hazard to assess is machine guarding in the shop. Ensure that all tools have the proper guards in place (on saws, sheet metal shears, etc.) and employees are properly trained on the use of these tools.

Ensure that the building complies with OSHA standards with regards to stairs and railings, especially in the case of a mezzanine.

Clean up hazards such as oil spills that could create a slip and fall hazard. Ensure that workers communicate their positioning to prevent collisions between workers causing an injury (moving heavy machinery, swinging boards, etc).

Store oxygen and acetylene tanks separately and always chain tanks for transport.

Contractors

Contractors for your farm perform a variety of duties, from building design to custom harvesting, as well as service contractors such as hoof trimmers, AI technicians and veterinarians. Some of these outside companies may not be aware of the hazards related to dairy farming. Therefore it is your responsibility to make outside employers and employees aware of the hazards on your farm.

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- Contractors should be made aware of your emergency plan as well as the location of your written Haz Com plan and MSDSs.
- Contractors need to agree to comply with OSHA standards.
- Contractors should be made aware of the hazards on your farm, including staying out of the irrigation ponds, the lagoon area or cow/youngstock holding facilities, etc.

Review:

1. What is a cows "flight zone" and how does it affect her movement? _____

2. What aspects of electrical safety should employees be trained on? _____

3. What are some risks associated with manure storage and handling? _____

4. What are some risks associated with silos? _____

5. List confined spaces on your operation that should only have a qualified person enter: _____

Confined spaces that should never be entered: _____

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