

# Overview of Grain Handling Standard OSHA 1910.272

NGFA – AAI Safety Seminar  
Johnston,

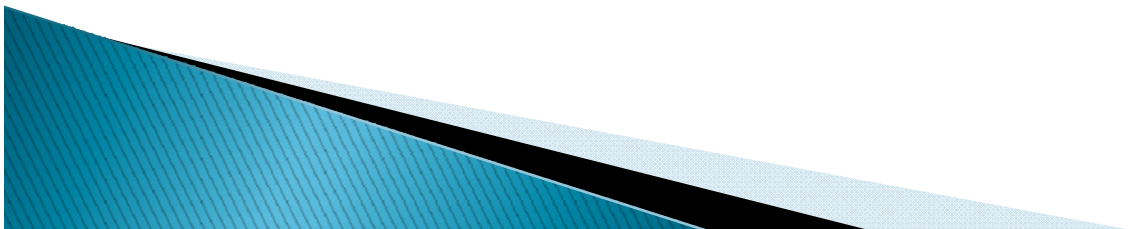
Presenter: Jim Maness,  
JEM Consulting

June 13, 2013



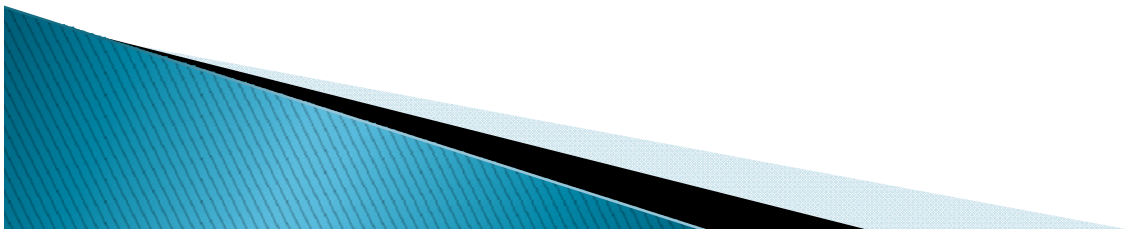
# Six Figure OSHA Initial Fines Grain Facilities 2012 / 2011

- ▶ \$144,400 CPI-Lansing, LLC; Red Cloud NE, December 2012
- ▶ \$157,500 Ware Milling Co., Inc.; Waycross GA, May 2012
- ▶ \$406,000 Bartlett Grain Company; Atchison KS, April 2012
- ▶ \$191,700 Alabama Farmers Co-op; Decatur AL, April 2012
- ▶ \$812,000 SD Wheat Growers; McLaughlin SD, March 2012
- ▶ \$758,450 All Feed Processing; Galva IL, November 2011
- ▶ \$132,000 C.O. Grain Inc.; Atkinson NE, November 2011



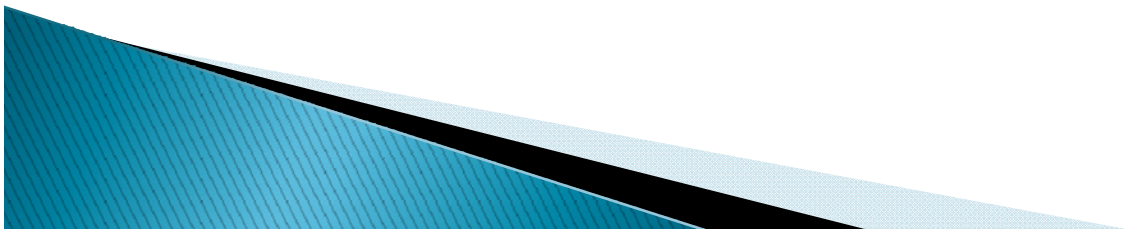
# Six Figure OSHA Initial Fines Grain Facilities 2011 (Continued)

- ▶ \$258,000 Corpus Christi Grain Co.; TX, October 2011
- ▶ \$229,000 Cenex Harvest States; Columbus MT, August 2011
- ▶ \$167,000 All Feeds Processing; Galva IL, June 2011
- ▶ \$122,500 Lakeland Feed; Hamilton MN, May 2011
- ▶ \$378,000 North Central Coop; Ipswich SD, March, 2011
- ▶ \$465,500 Gavilon Grain LLC; Morral OH, March 2011



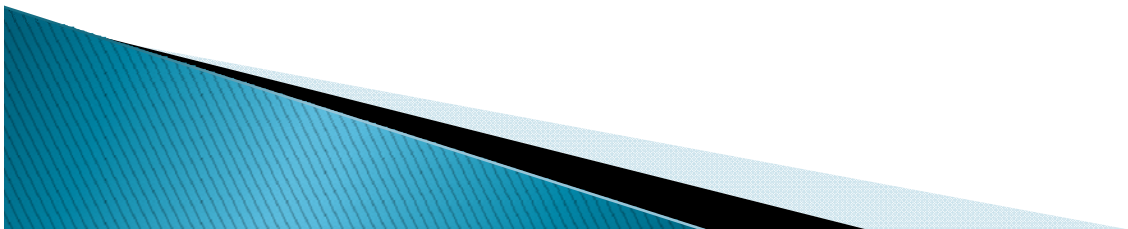
# OSHA Citations and Local Emphasis Programs

- 1910.272 – Grain handling facilities
- 1910.219 – Mechanical power–transmission apparatus
- 1910.023 – Guarding floor and wall openings and holes
- 1910.146 – Permit–required confined spaces
- 1910.305 – Electrical wiring methods and components
- 1910.1200 – Hazard communication
- 1910.134 – Respiratory protection
- 1910.147 – Lockout / Tagout of equipment
- 1910.027 – Fixed ladders
- 1910.303 – Electrical, general requirements



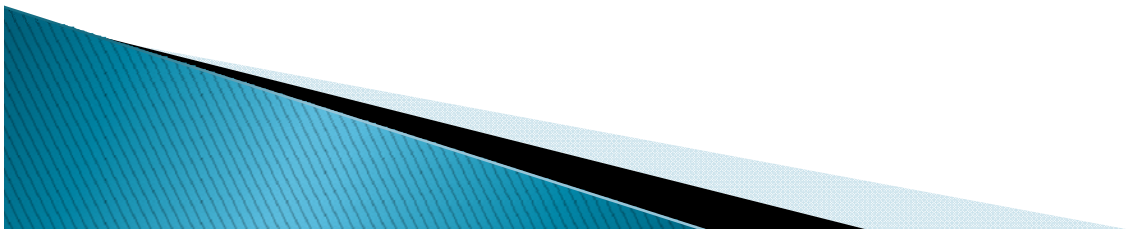
# OSHA's Most Frequent Citations of Grain Handling Standard 1910.272

- J01 No written housekeeping program for dust.
- G01 I Did not issue a permit prior to entering the bin.
- G01 II Failure to lockout equipment in a bin prior to entry.
- G04 Did not have rescue equipment suitable for the bin.
- E02 Did not train workers for special tasks: bin entry.
- G02 No lifelines and harnesses for employees entering the bin.
- J02 II Did not immediately remove dust accumulations.
- D Failure to implement an emergency action plan.
- G01 III Failure to test the atmosphere within a bin before entry.
- M03 Failure to maintain certification record of PM & Inspections.



# Lack of a Combustible Dust Standard is Not Stopping OSHA

- ▶ “Layers of combustible dust were allowed to accumulate to depths over surface areas in quantities that exposed workers to fire and or explosion hazards.” This citation references 29\_CFR\_1910.22(a)(1).
- ▶ 1910.22 is “General Requirements” (a) “Housekeeping” (1) “All places of employment, passageways, storerooms, and service room shall be kept clean and orderly and in a sanitary condition.”
- ▶ So the layers of dust in this citation were in direct violation of the current “housekeeping” regulation. This combustible dust accumulated on I-beams, inside trough of ceiling joists and on the floor.



# Lack of a Combustible Dust Standard is not stopping OSHA

- ▶ The “general duty clause” is Section 5(a)(1) of the Occupational Safety and Health Act of 1970.
- ▶ Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.
- ▶ The general duty clause is basically an all-encompassing regulation that OSHA uses if there is a perceived violation that is NOT covered by any other regulation.

1910.145 !

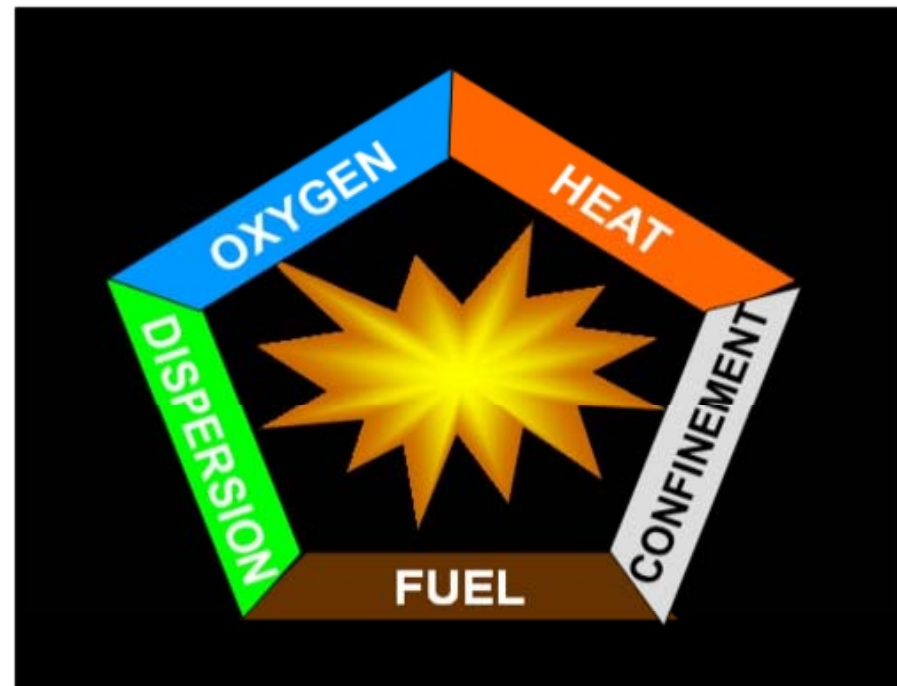




# Dust Explosion Pentagon

5 basic elements needed for an explosion:

1. A fuel is needed to burn (combustible dust)
2. Oxygen is needed to sustain the fire (air)
3. Heat from an ignition source is needed (spark)
4. A high concentration of dust is dispersed into the air (deflagration)
5. The dust must be confined within an enclosure or structure (explosion)



# Goodpasture Grain Elevator Houston, Texas Before:



# Goodpasture Grain Elevator Houston, Texas after 2/22/76:



# Goodpasture Grain Elevator Houston, Texas after 2/22/76:



# Westwego, LA 12/22/77

## 36 fatalities



# Galveston, TX 12/28/77

## 18 fatalities

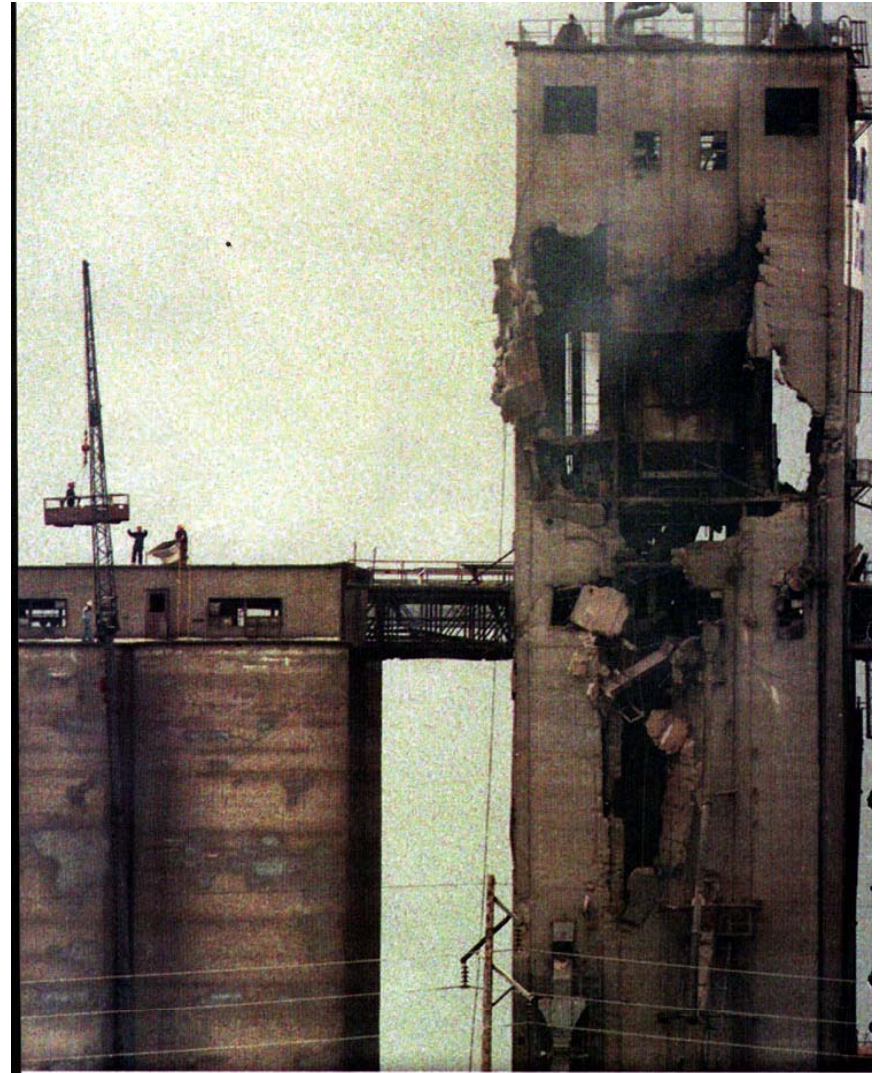


# Kansas Dust Explosion

SEVEN DEAD IN DEBRUCE GRAIN ELEVATOR BLAST



6/8/98 7 fatalities



# Imperial Sugar, Port Wentworth, GA

2/7/08, Sugar Dust Involved; 14 Killed, 42 Injured





# Bartlett Grain Atchison, KS

10/29/11

6 killed, 2 injured



# Grain Elevator in Greensburg, KS following May 4, 2007 EF 5 Tornado

(Excess of 200 mph winds)

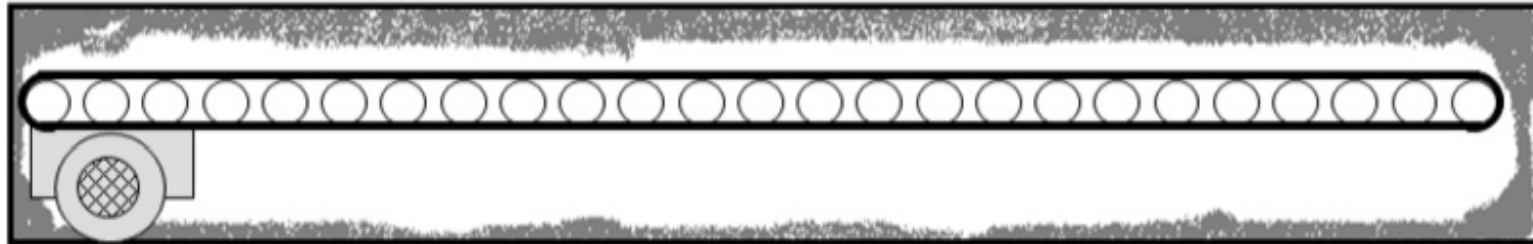


# Secondary explosions cause the most damage

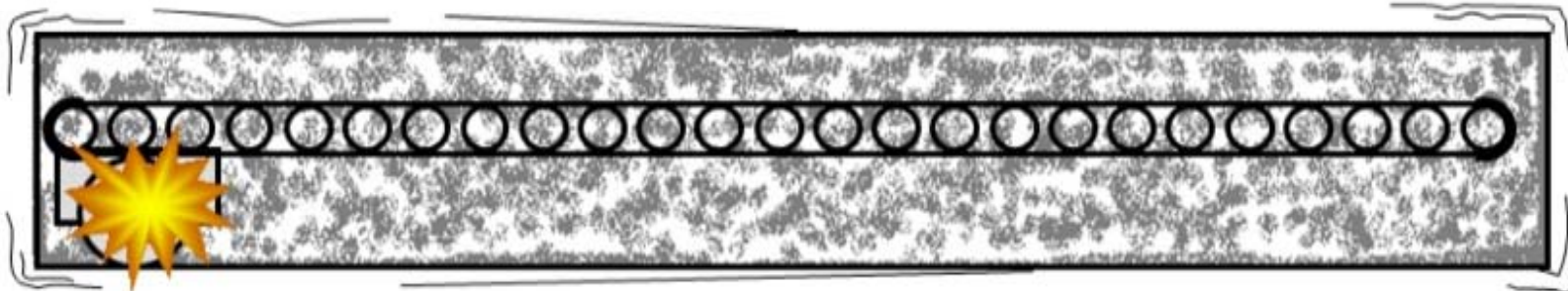


# Secondary Explosions

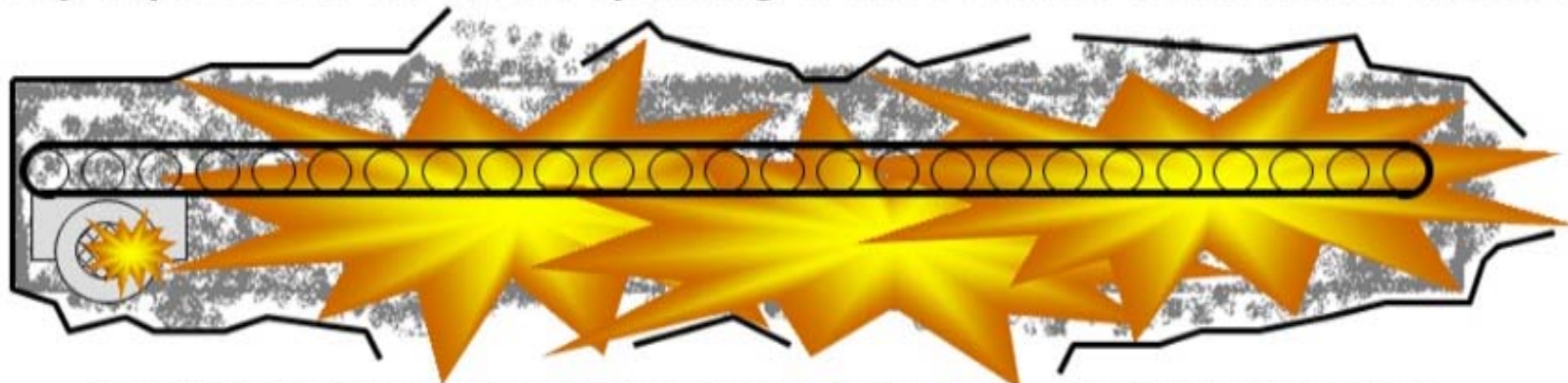
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Enclosed conveyor belt with dust build up on inside



Primary explosion from motor sparking creates a dust cloud inside enclosure



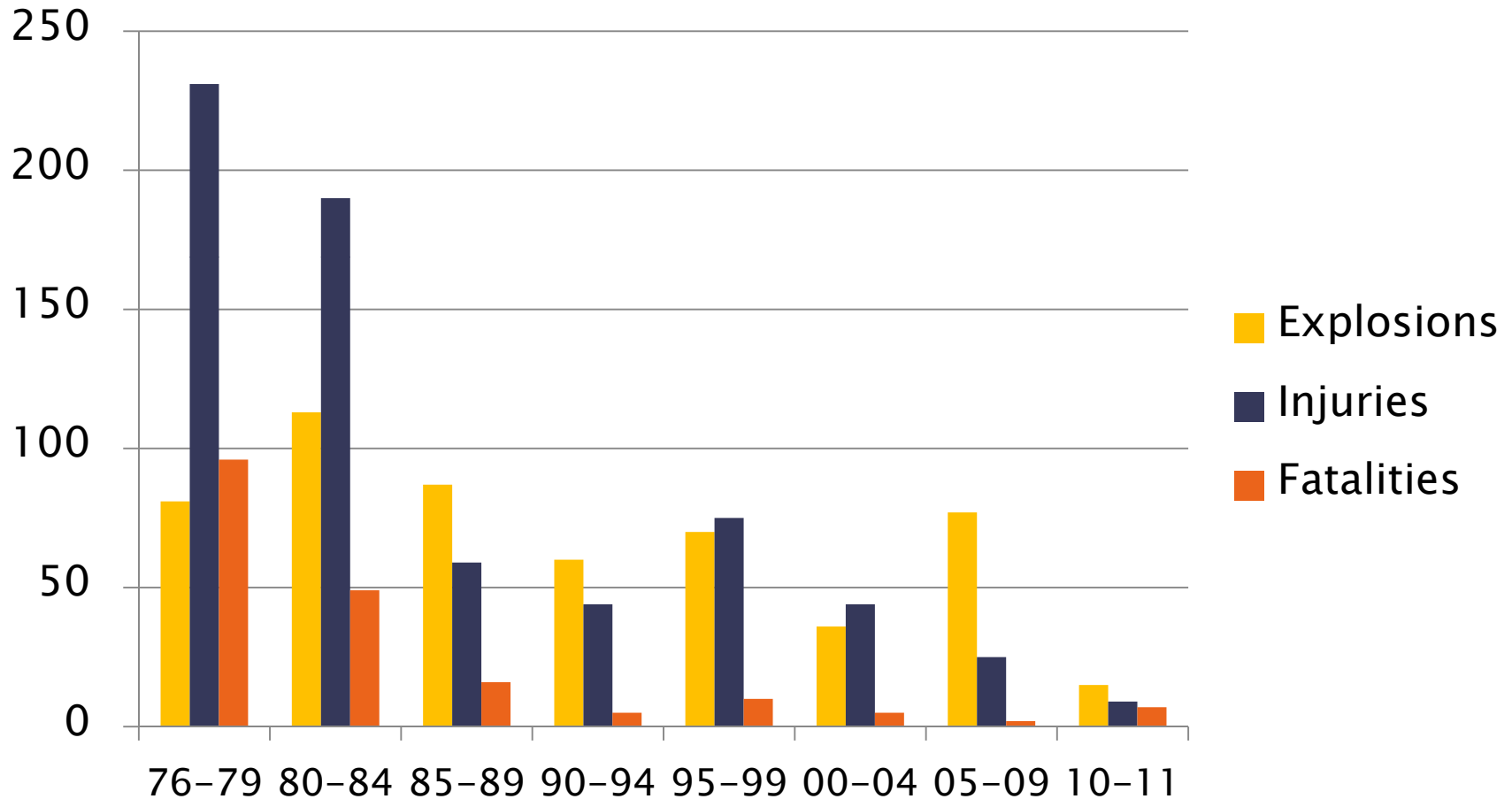
Dust cloud ignites causing much larger secondary explosion

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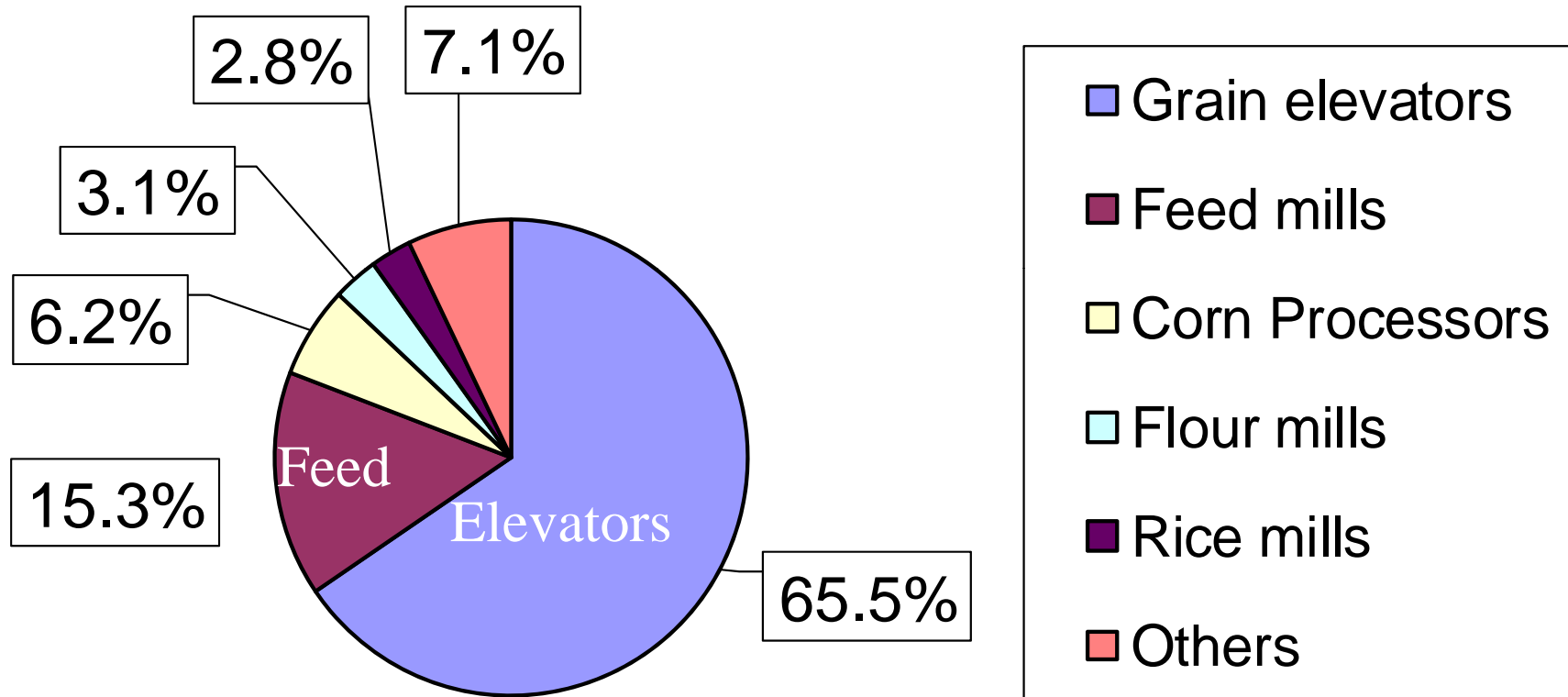
# US Agricultural Dust Explosions

## 1976 to 2011

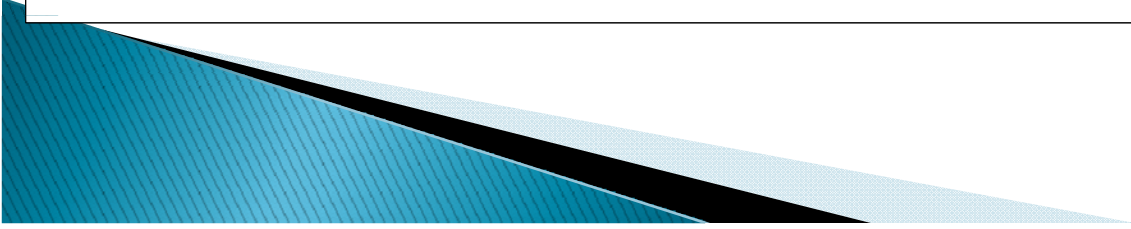
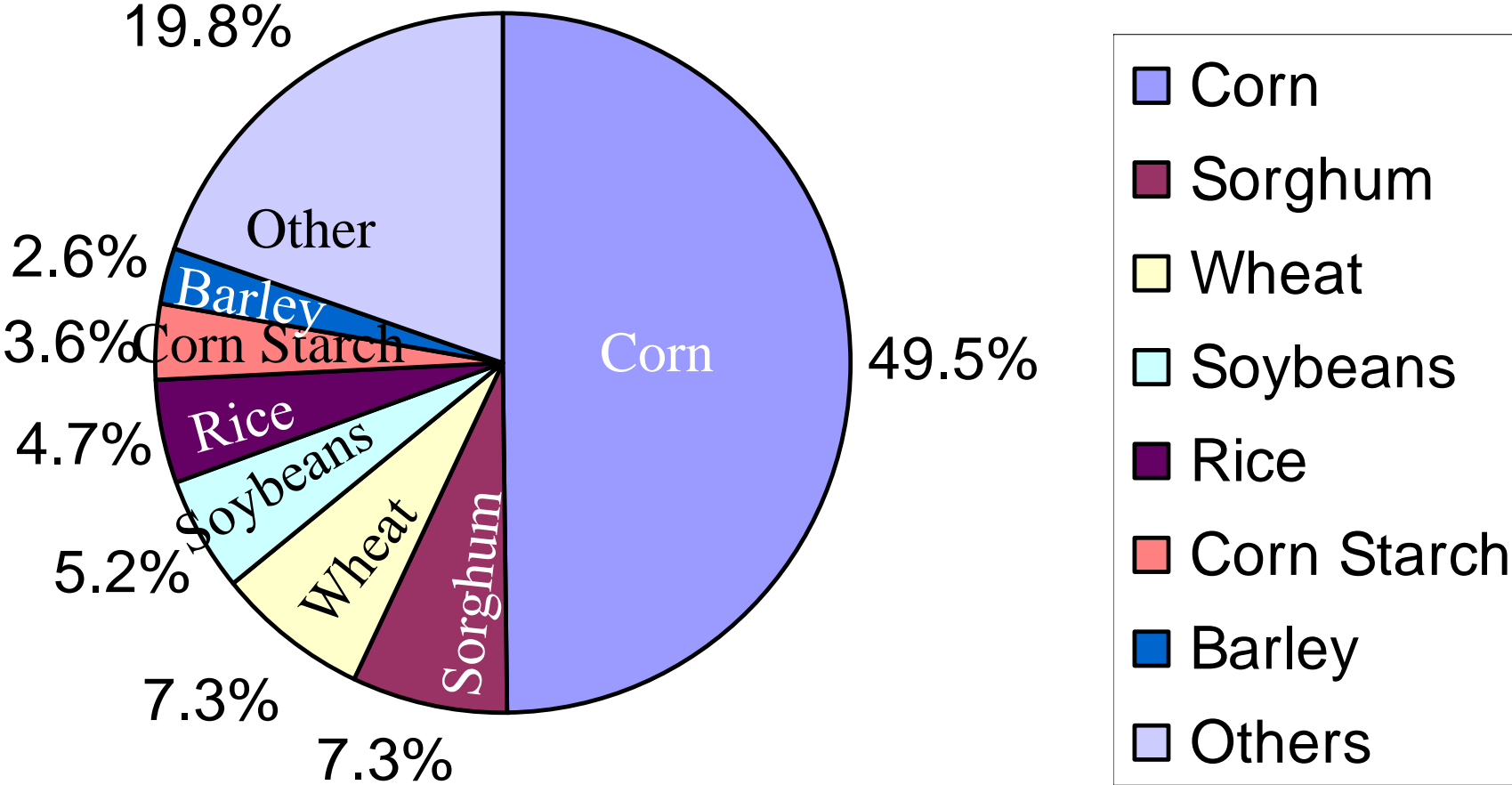


Source: OSHA Grain Handling Explosion Chart

# Grain Dust Explosion - Facility Type

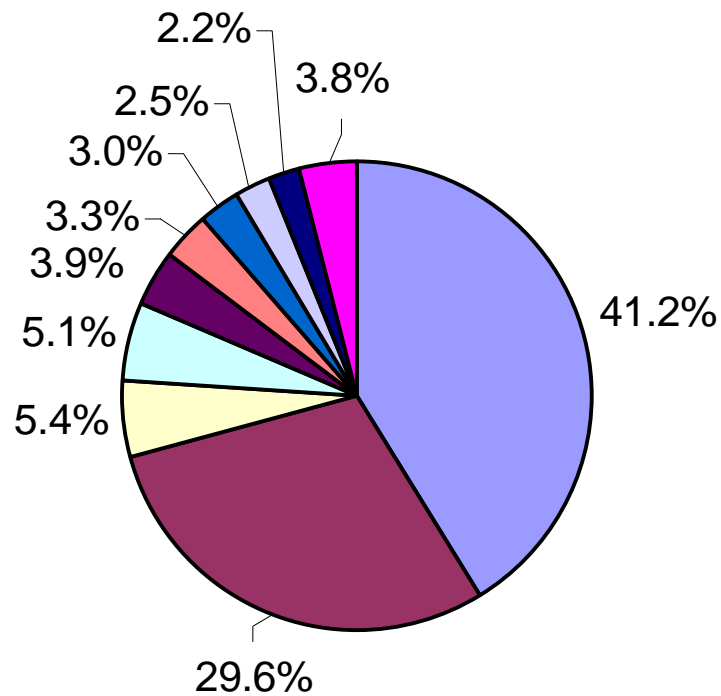


# Grains Involved in Explosions

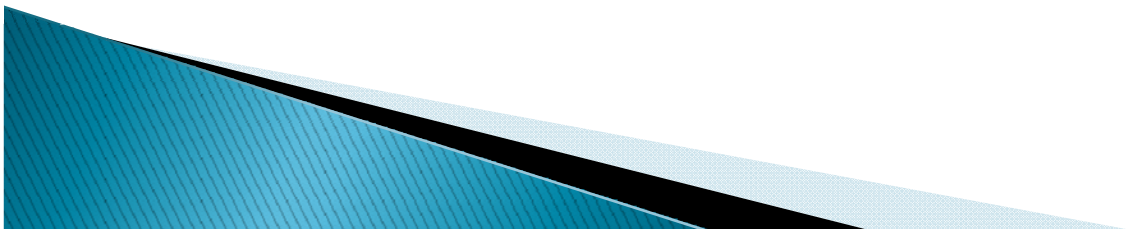




## Probable Location of Primary Explosions for a 27 Year Period

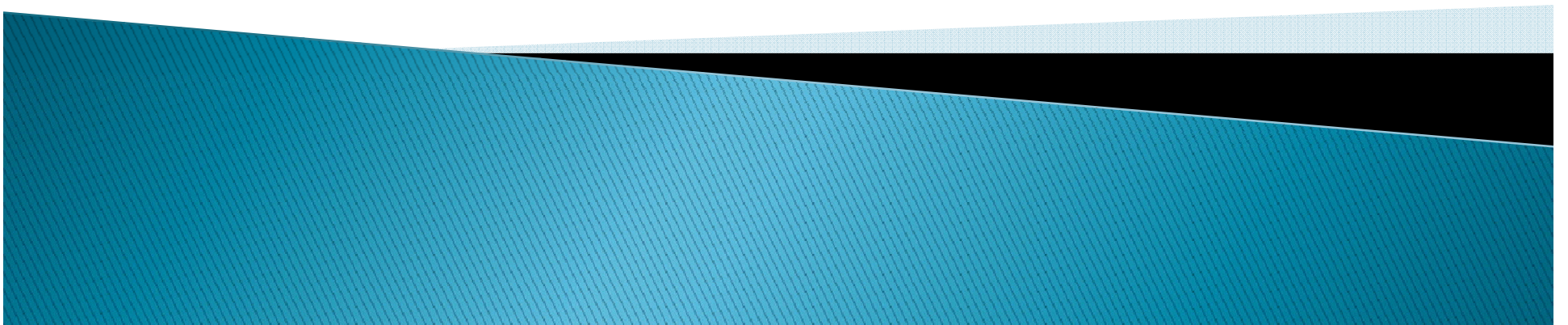


- Unknown
- Bucket Elevator
- Bins and Tanks
- Grinding Equipment
- Dust Collector
- Other areas inside elev.
- inside other equipment
- Headhouse
- Adjacent or attached Feed Mill
- Other



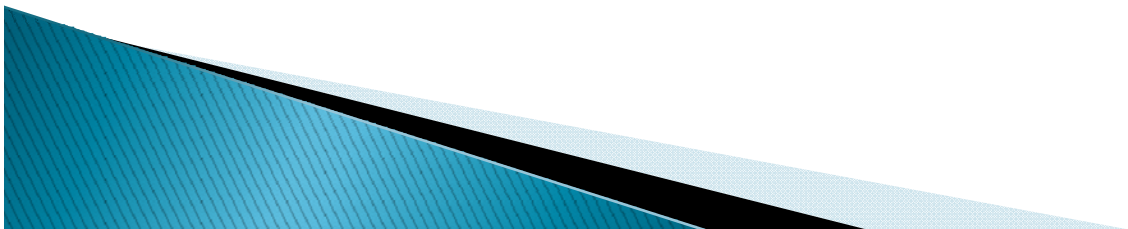
# Explanation of Grain Handling Facilities Standard

29 CFR 1910.272



# Emergency Action Plan §1910.272(d)

- ▶ “The employer shall develop and implement an emergency action plan meeting the requirements contained in 29 CFR 1910.38”
- ▶ Cover not only fires but weather related issues and other emergencies.
- ▶ See the suggested model plan in the emergency action tab.
- ▶ If you have less than 10 employees you do not have to have a written EAP but must cover all the elements outlined in §1910.38(a) orally with employees.



# Emergency Action Plan

- Establish an evacuation alarm and methods to contact fire department
  - Alarm system must use a distinctive signal for each purpose. (§1910.165)
  - For 10 or fewer employees, voice communication is acceptable provided all employees can hear the alarm.
- Designate escape routes, responsibilities and procedures
- Have an assembly area and account for personnel.
- Train workers and others as needed in the plan.
  - Frequency not prescribed, but recommend annually
- Meet with and include the Fire Department and emergency responders in the plan.

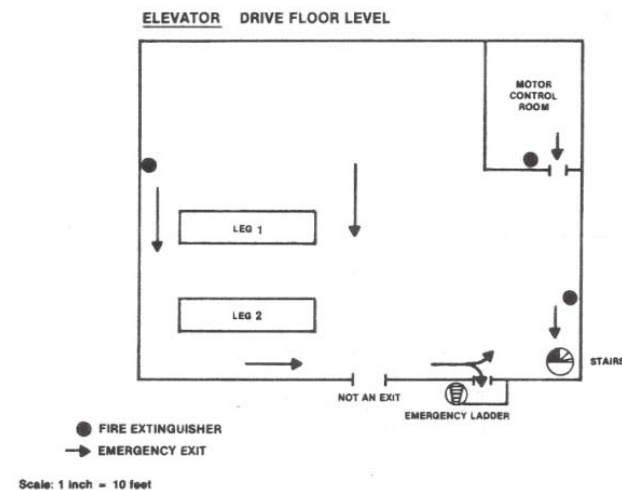
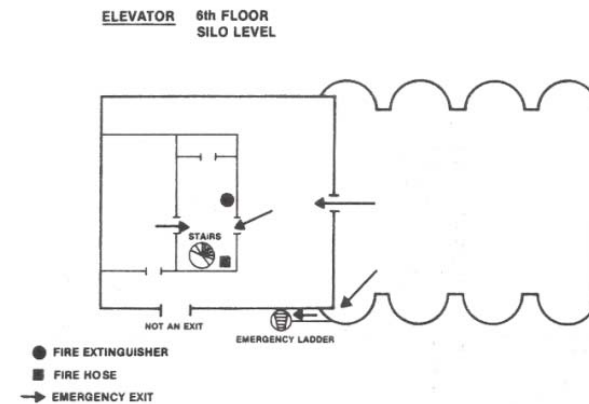


# Emergency Action Plan

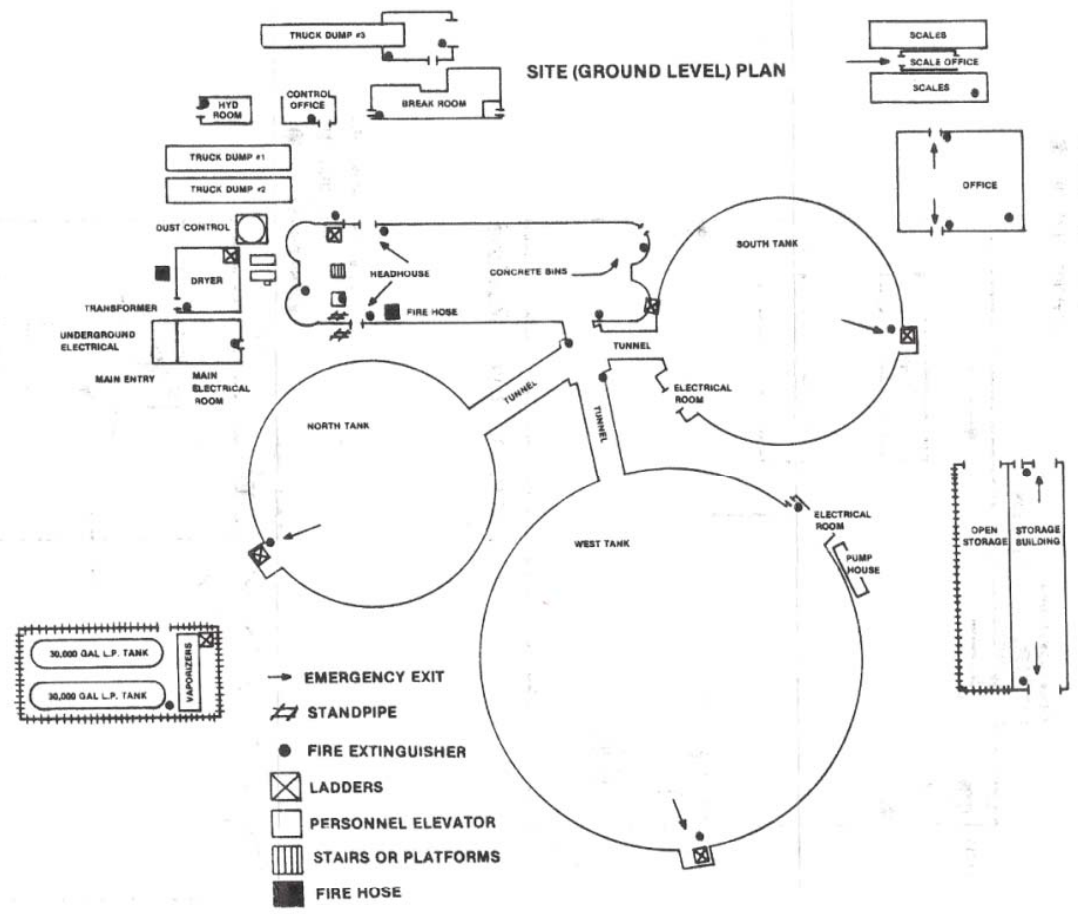
Develop floor plans for each level.

Show:

- 1) Exits
- 2) Escape routes
- 3) Assembly locations
- 4) Fire extinguisher locations
- 5) Water sources
- 6) Chemical storage rooms
- 7) Emergency ladders

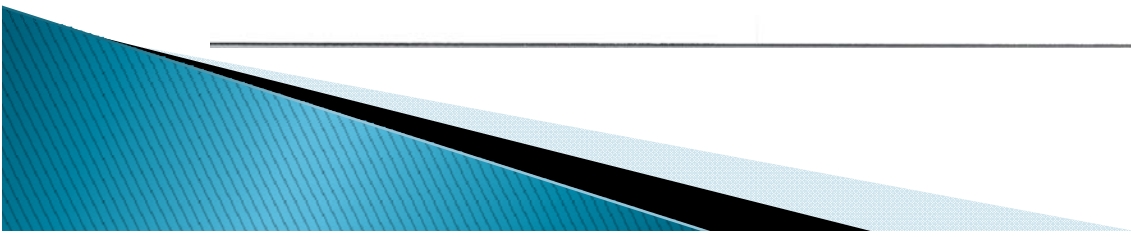


Floor plans indicating the interior layout of the elevator



Scale: 1 inch = 80 feet

Typical Site Plan of Ground Level of an Elevator



# Training

## §1910.272(e)

- ▶ Two requirements are mandated: Training conducted at least annually and when an employee is moved from one job assignment to another that presents new hazards.
- ▶ Training required prior to starting work for new employees.
- ▶ Requires employees to be trained in the hazards associated with their own work tasks
  - No differentiation between full time or temporary employees.
- ▶ **Must include:**
  - General precautions associated with facility...Dust and Ignition Sources.
  - Specific precautions applicable to job tasks.
  - Special task such as bin entry, handling toxic substances, hot work, etc.



# OSHA Required Training

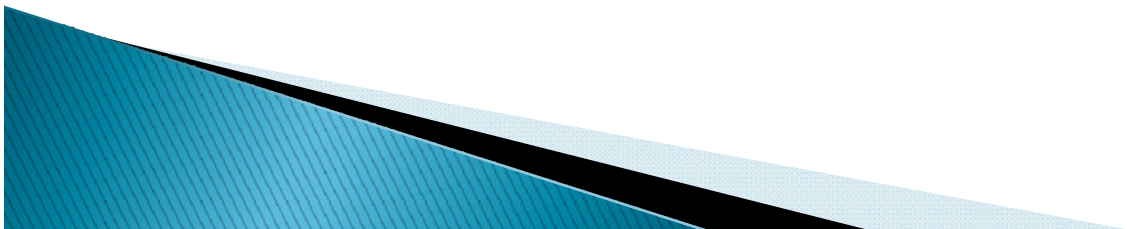
- Access to Medical Records
  - Bin Entry & Confined Spaces
  - Bloodborne Pathogens
  - Electrical Work Practices
  - Emergency Action Plan
  - Fall Protection Equipment
  - First Aid
  - Employee Orientation
  - Use of Fire Extinguishers
  - Forklift/Front-end Loader /Other PITs
  - Hazard Communication
  - Hearing Protection
  - Man Lifts
  - Exposure to asbestos, lead...
  - Lockout and Tagout
  - Personal Protective Equipment
  - Pesticide Application
  - Emergency Response & Rescue
  - Respiratory Protection
  - Truck Dumper Operation
  - Rail Operations Safety
  - Welding/Cutting/ Hotwork
  - Grain Handling Equipment
  - Planned Maintenance
  - Process Safety Management
  - River Operations Safety
  - Storage & handling of LP Gas
  - Storage & handling of AA
  - *Annual Training Required*
- 



# More Safety Training?

Additional training for special jobs & tasks.

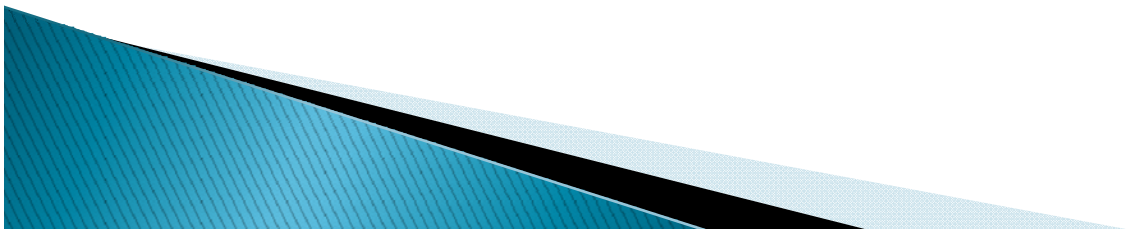
- Rail operations
  - Explosion Prevention – Hazards related to dust, ignition sources, smoking, cleaning procedures, clearing legs, housekeeping
- Truck receiving
- Loading operations
- Operating hammermills, blenders, etc.
- Running a dryer
  - Fumigation
- Proper lifting
- Special tools and equipment
  - Maintenance procedures



# Training Continued

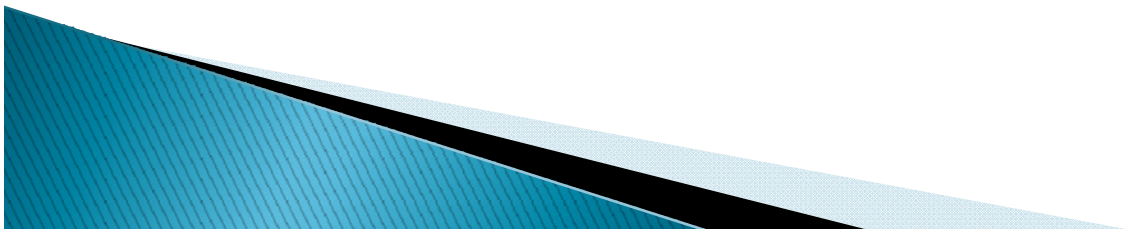
- ▶ Bin Entry – Engulfment & mechanical hazards §1910.272(g)
- ▶ Hot work §1910.272(f)
- ▶ Preventive maintenance §1910.272(m)
- ▶ Lockout/Tagout §1910.272(m)(4)
- ▶ Handling of flammable/toxic substances

*Document your training with list of materials used (or actual copies), attendees, instructor, date, location, and any quizzes used.*



# How do you manage so many topics?

- ▶ Determine all the required topics needed for all the workers.
- ▶ Determine specific needs for the various jobs.
- ▶ Conduct a hazard analysis of each job and area of the plant.
- ▶ Make training a team effort of supervisors and employees.
- ▶ Give support and resources: Equipment, time, and places to do training.
- ▶ Assign someone to ensure that training takes place.
- ▶ Use outside resources where available.



# Training Calendar

## ANNUAL TRAINING 2003

Employee	January		February		March			April		May		Comments
	8th	22	9	23	2	18	29					
Bill Goodboy	BC	BC	BC	BC	BC	Off - BC	BC					BC rec 3/23r
Sam Doesfine	SD	SD	SD	SD	SD	SD	SD					
George Couldve	GC	GC	GC	GC	GC	GC	Off - GC					Geo did on 4/5

Employee Orientation

Access to Medical Records

Hazard Communication

Emergency Action

Confined Space Entry

Entry into Grain Storage Spaces

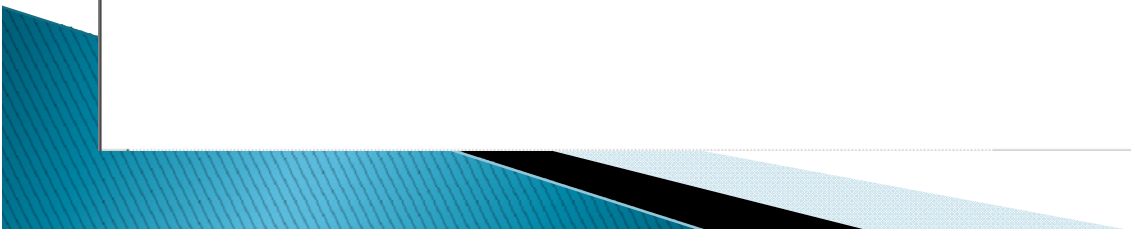
Rescue Squad or Fire Dept

Hearing Protection

Fire Extinguishers

Lockout/Tagout

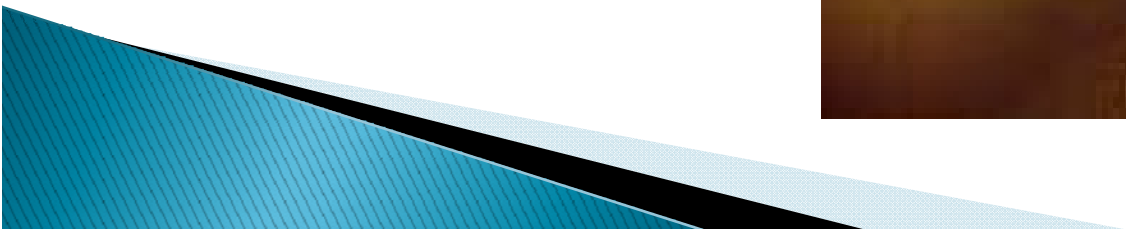
Electrical Work Practices



# Dealing with the “Fuel”



The grain industry is the only industry to have specific dust levels rules.



# Housekeeping, §1910.272(j)



Company Name:

Inspection Site:

[Redacted]

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Citation 2 Item 1 Type of Violation: **Willful**

29 CFR 1910.272(j)(1): The employer did not develop and implement a written housekeeping program that established the frequency and the method(s) determined best to reduce accumulations of fugitive grain dust on ledges, floors, equipment, and other exposed surfaces in the grain handling facility

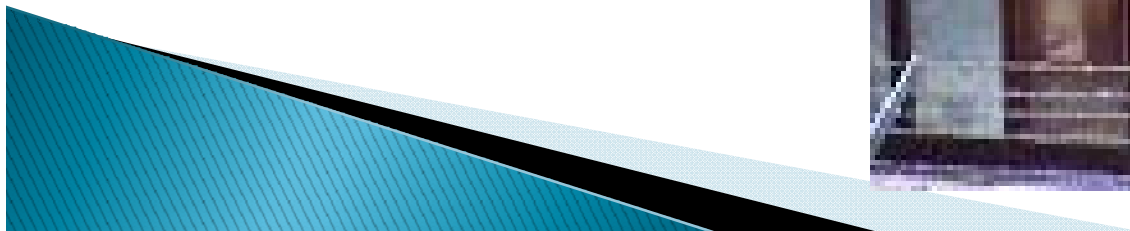
- (a) On or about 10/06/11 - Feed Mill, no housekeeping program was established to reduce the accumulation of combustible dust, allowing accumulation of dust on ledges, floors, platforms, electrical equipment, and other exposed surfaces.

**Abatement Documentation Required**

Date By Which Violation Must be Abated:	04/13/2012
Proposed Penalty:	\$ 63000.00



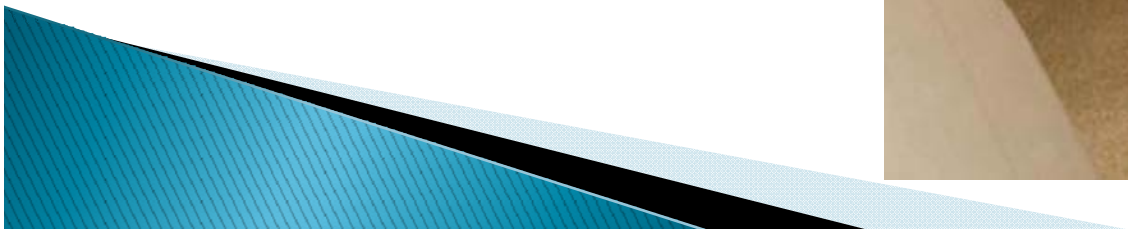
# A small amount of dust can fuel a secondary explosion





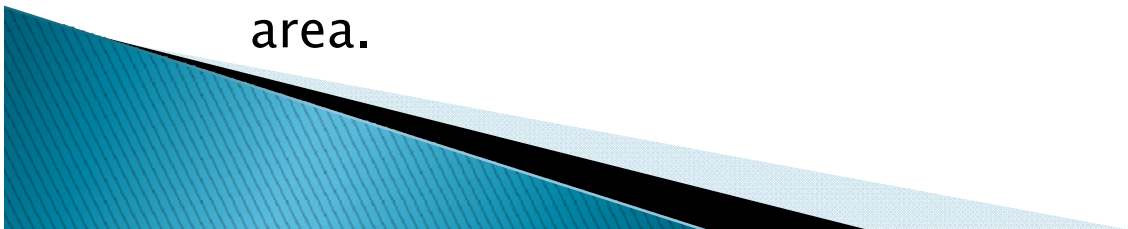
# Other Safety Issues

- Grain spills, moisture and dust accumulations can lead to slips, trips, and other problems.
- Promptly report spills and leaks.
- Clean-up as soon as practical (48 hrs.).
- Resolve the causes of leaks and spills.
- A well kept house implies good management.



# Housekeeping Requirements

- §1910.272 (j) requires :
  1. A **written housekeeping plan** that establishes **frequency and methods** to best reduce accumulations of fugitive grain dust on ledges, floors, equipment, and other exposed surfaces.
  2. Grain Elevators “shall immediately remove any fugitive grain dust accumulations whenever they exceed 1 / 8 inch (.32 cm) in priority housekeeping areas”:
    - Floors within 35 feet of inside legs.
    - Floors of enclosed areas containing grinding equipment.
    - Floors of enclosed areas containing grain dryers located inside the facility.
  3. Prohibits the use of compressed air to blow down dust with equipment operating unless all potential ignition sources are controlled.
  4. All grain spills must be addressed and cleaned up from the work area.



## Citation and Notification of Penalty

Company Name:

Inspection Site:

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Citation 2 Item 2 Type of Violation: **Willful**

29 CFR 1910.272(j)(2)(ii): Fugitive grain dust accumulations were not removed whenever they exceeded 1/8" at priority housekeeping areas, pursuant to the housekeeping program:

On or about October 29, 2011, employees working in the grain elevator were exposed to fire and explosion hazards. Dust was allowed to accumulate greater than 1/8 inch deep in the following locations:

- a) Boot pit - from ledge above an inspection door at the tail pulley on the southwest leg, bucket elevator leg #4.
- b) Boot pit - northeast corner, from the tail pulley casing for the northeast leg, bucket elevator leg #1. Measured approximately one-inch deep.

**29 CFR 1903.19(d)(1) requires certification and documentation that the abatement of the above violation is completed.**

Date By Which Violation Must be Abated:

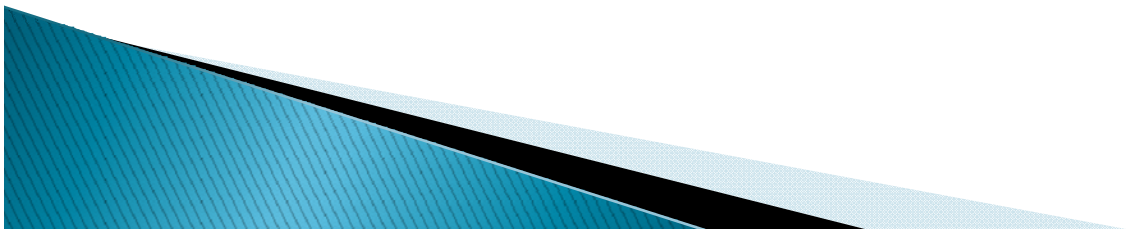
05/07/2012

Proposed Penalty:

\$ 70000.00

# Housekeeping Program

- ▶ Must be in writing
  - Areas to be cleaned
  - Frequency
  - Methods
  - Assignments
  - Address ledges, floors, equipment and other exposed surfaces
- ▶ Requires annual training of employees
- ▶ Grain or spilled products must be addressed in your housekeeping plan.



# Housekeeping Inspections

## Sample "Any Elevator" Housekeeping Log

Inspected By: \_\_\_\_\_

Clean = C  
Needs Work = NW

Week of: \_\_\_\_\_

Comments: Note floor areas and over heads needing cleaning and any equipment leaks needing repair. All floors areas near any portion of an inside bucket elevator, Legs X, Y, and Z. \_

### PRIORITY AREAS

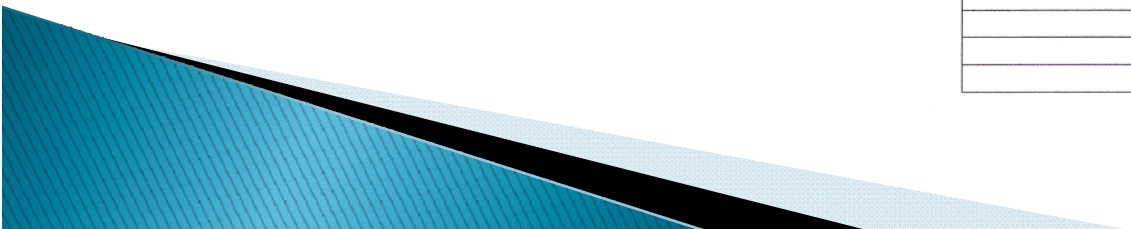
Location	Mon	Tue	Wed	Thur	Fri	Comments
Boot pit						
Affected Tunnel areas						
First floor near leg						
Work floor near leg						
Hammermill Room						
Gallery floor						
Leg casings/spouts						
Scale floor						
Upper garner						
Leg drive floor						

### OTHER OPERATING AREAS

Location	Mon	Tue	Wed	Thur	Fri	Comments
Receiving tunnel						
Reclaim tunnel A						
Reclaim tunnel B						
Lower annex						
Upper annex						
Upper garner						
MCC 1						
MCC 2						
Substation 1						
D.S.						
Bin deck						
Outside leg pits						
Truck Shed						
Rail loading area						

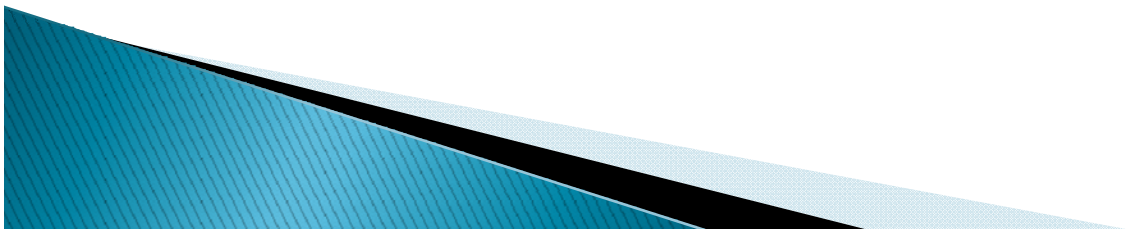
### Magnehelic Gage Readings (inches of water)

Location	Mon	Tue	Wed	Thur	Fri	Comments
D.S - 1						
D.S.- 2						
D.S.- 3						
D.S.- 4 annex A						
D.S - 5						
D.S.- 6						
D.S.- 7 truck rec.						
D.S.- 8 Rail loading						
D.S.-9						
D.S.-10 tripper						



# Frequency of Inspections

- Priority Areas:
  - Inspect and clean daily or as deemed necessary
  - Standard says “immediately remove any fugitive dust accumulations whenever they exceed 1 / 8 in”.
- Other inside areas, inspect and clean at least weekly, as needed.
- Outside areas must check weekly and clean as needed.
- Standard does not address record retention, but keep Housekeeping Logs for 3 to 12 months.



# Use Proper Cleaning Methods Including Overheads, Floors and Horizontal Surfaces



Use safe blow down operations

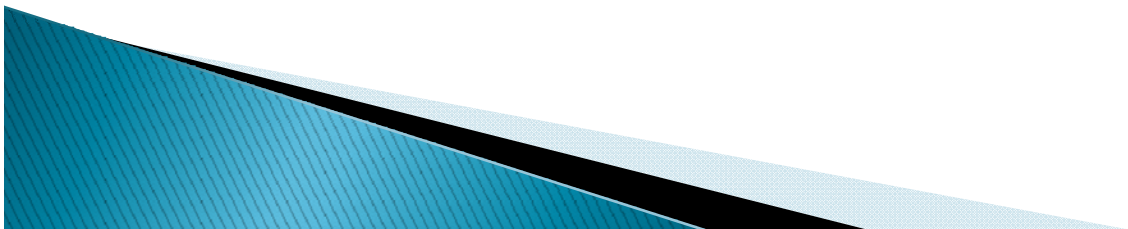
Permits and strict control of ignition sources



# Cleaning Methods

- ▶ Clean floors, overhead structures and all horizontal surfaces of accumulations.
  - Pick up all piles daily
  - Clean vertical walls and surfaces as needed but at least semi annually
- ▶ Sweeping and Shoveling
- ▶ Vacuuming, Blow down, and/or Wash down
- §1910.272 (j):

*Prohibits the use of compressed air to blow down dust with equipment operating unless all potential ignition sources are controlled.*





## Citation and Notification of Penalty

Company Name:

Inspection Site:

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Citation 2 Item 3 Type of Violation: **Willful**

29 CFR1910.272(j)(3): The use of compressed air to blow dust from ledges, walls, and other areas was permitted when machinery that presented an ignition source in the areas was not shut-down:

On or about October 15, 2011, employees working in and near the grain elevator were exposed to fire and explosion hazards in that compressed air was used for cleaning without first shutting down machinery that presented potential ignition sources.

**29 CFR 1903.19(d)(1) requires certification and documentation that the abatement of the above violation is completed.**

Date By Which Violation Must be Abated:	05/07/2012
Proposed Penalty:	\$ 70000.00

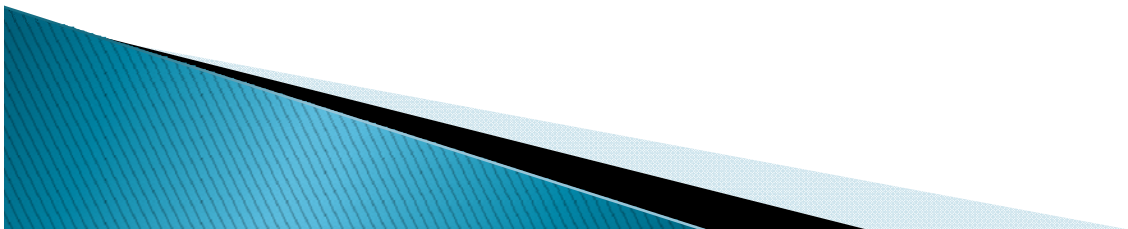


# Compressed Air Blowdown

- ▶ §1910.242 (b) “Compressed air shall not be used for cleaning purposes except where reduced to less than 30 PSI and then only with effective chip guarding and PPE.”
- ▶ An April 14, 1978 OSHA Letter of Interpretation states the use of compressed air for cleaning purposes at pressures greater than 30 PSI is permissible, if the outlet is fitted with a relief device that drops the pressure to less than 30 PSI if the flow is dead ended.
- ▶ Air guns used with long pipes are permissible if they meet these requirements.



# Options Include



# Blowdown Permits

## Sample Air blowdown permit

Date \_\_\_\_\_ Time \_\_\_\_\_ Expiration \_\_\_\_\_

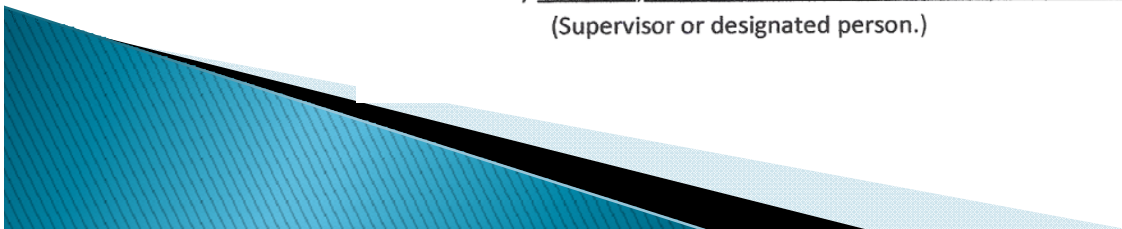
Areas to be cleaned by blowdown \_\_\_\_\_

Tasks or activity to be done	YES	NA	Initial
1. All equipment <i>in the area completely shut down in the grain elevator or other hazardous areas.</i>			
2. All lights and electrical equipment that is to remain energized is in good condition and rated for the area.			
3. There are no Potential ignition sources such as arcs, sparks or hot surfaces is in the area. (Check bearings, shut down equipment, eliminate heat sources (steam, etc.))			
4. All Personnel exposed to blowdown dust will wear proper PPE, such as, dust masks, and goggles.			
5. Air Pressure is limited to 30 psi at the end of the nozzle.			

Authorized Employees \_\_\_\_\_

Issued by (signed) \_\_\_\_\_

(Supervisor or designated person.)

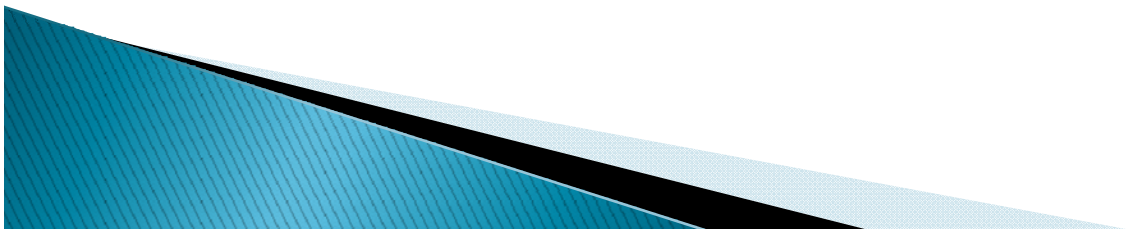


# Miscellaneous Housekeeping Areas

- ❑ Grounds Maintenance  
Curb Appeal/High emphasis on appearance.  
  
EPA – not just emissions, also general appearance
- ❑ Bird & Rodent Control  
USDA, FDA regulations

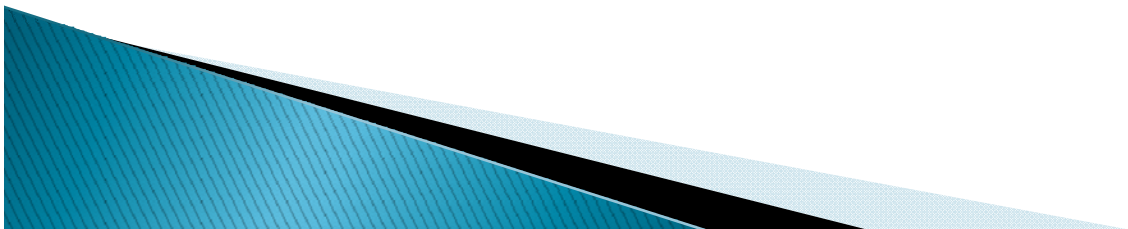


Don't forget your office areas, lunchrooms, and bathrooms.

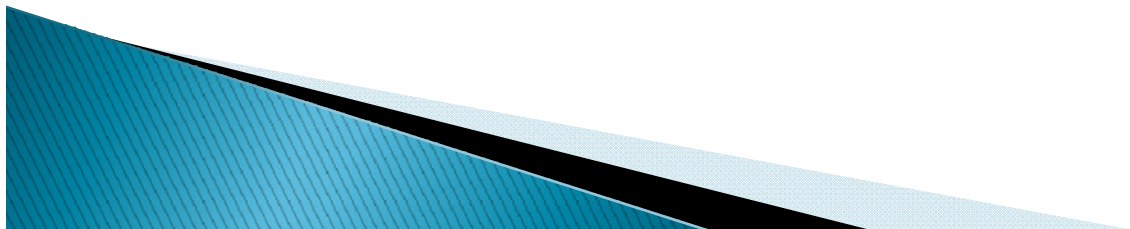


# Housekeeping Problem Areas

- ▶ Notify supervisor or manager of housekeeping concerns and needed projects.
- ▶ The best kind of housekeeping is the kind where little effort is required: 1) Equipment maintained; 2) Frequent to continuous...Follow written plan.
- ▶ Once you 'get it there', take pictures as a reference of how good your facility can look.
- ▶ Lack of **accountability** by management
- ▶ How good is your housekeeping in those “out of sight, out of mind” locations?... Boot pits, Galleries, Hard to reach ledges and conveying equip. lids



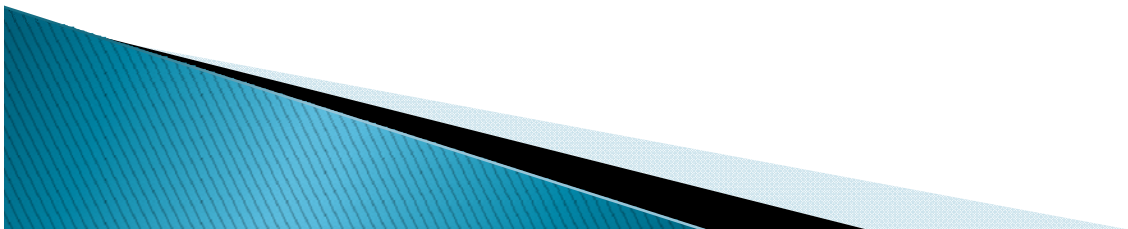
# Controlling Ignition Sources



# Hot Work and Welding Procedures

§1910.272 (f) and §1910.252 (a)

- ▶ Hot Work is any work that creates open flames, sparks, or high temperatures that could ignite grain dust. Welding, cutting, brazing, soldering, and sparks from grinding are examples.
- ▶ Hot work permitting referenced in 1910.272
- ▶ Permit system is intended to assure that employees maintain control over the process and that safeguards are used during hot work.
- ▶ Permits must be signed by management designate.





# Hot Work Permits

Hot Work Permit needed except:

1. Employer (permit signee) is present while the work is performed.
2. Done in a welding shop.
3. In hot work areas authorized by the employer located **OUTSIDE** of the grain handling structure.

## WELDING, CUTTING & HOT WORK PERMIT

This permit shall be filled out completely and each item initialed by the Plant Manager or designated Supervisor and the Employee, who is to perform the work, before any welding, cutting or hot work is performed in any grain handling or processing area. The authorizing Manager/Supervisor and employee shall physically inspect the area for all listed safety requirements. If equipment is being repaired or installed, proper lockout procedures shall be followed. **Welding and Cutting shall not be permitted inside or within 50' of any facility building/structure unless that building/structure is completely shut down and isolated from the rest of the facility. (All Managers, Supervisors, workers shall know and comply with Corporate safety procedures).**

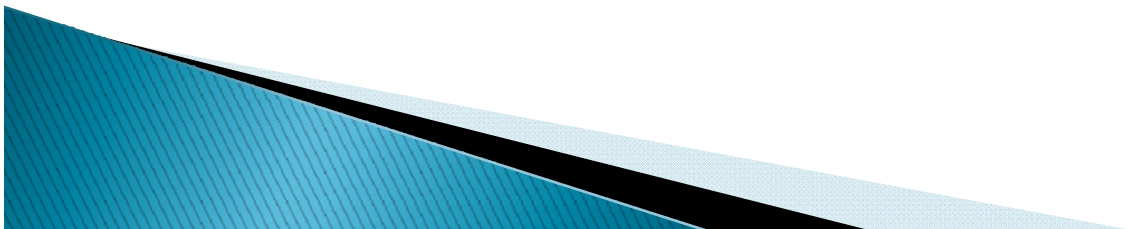
Location:	Date:	Time:
Description Of Work:		
Person(s) Performing Hotwork:		
<b>Safety Requirements:</b>	Yes	NA
1. All operations in the building/structure/area, including dust systems, are completely shut down and isolated.	<input type="checkbox"/>	----
2. Combustible gas test conducted, (if applicable) (tests should be done in all areas)	<input type="checkbox"/>	----
3. Conveyors, legs, fans and other equipment associated with the building/structure/area are shut down and locked out.	<input type="checkbox"/>	----
4. All spouts, ducts, floor, wall, and bin openings tightly covered and sealed. <b>Do not cut or weld on spouts lined with combustible materials</b> such as polyethylene, urethane, rubber or PVC.	<input type="checkbox"/>	<input type="checkbox"/>
5. Floors, walls, and surrounding area thoroughly cleaned of exposed combustibles and area wet down. (No exposed combustibles are allowed within 50' of the work area and shielded from sparks with non-combustible material). (If freezing conditions exist, wetdown may be omitted).	<input type="checkbox"/>	----
6. Fire extinguisher(s) readily available within 25' of the work area.	<input type="checkbox"/>	----
7. Welding, cutting and hot work equipment is inspected for safe condition before use and personal protective equipment is obtained before beginning work.	<input type="checkbox"/>	----
8. Fire watch scheduled to inspect work area, and areas below, every 30 minutes for a minimum of 4 hours after completion of work. <b>Fire watch time may be greater depending on conditions.</b>	<input type="checkbox"/>	----
Employee(s) or Contractor Performing Hot Work		
Facility Manager or Designate Issuing Permit		
Expiration of permit (not to exceed one shift duration)	Date:	Time:
Completion of Hot Work	Date:	Time:

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ORIGINAL – TO HOTWORK SITE COPY – HELD BY PERMIT WRITER  
COMPLETED PERMIT TO BE KEPT ON FILE FOR A 1 YEAR PERIOD MINIMUM.

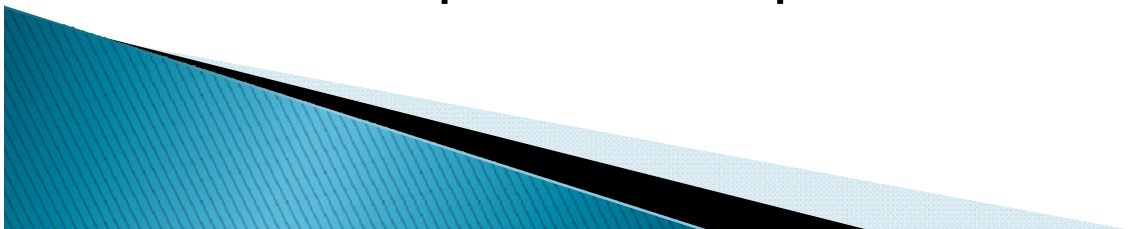
# Hot Work Permit System

- ▶ Complete the permit before beginning work.
- ▶ Can work be relocated to a safe location?
- ▶ Can combustible materials be relocated or covered?
  - Keep combustibles 35 feet away from sparks.
- ▶ Are fire extinguishers (or water, sand, etc.) available?
- ▶ Contractors must follow the permit program.
- ▶ Hot Work in confined spaces.



# Completion of Hot Work

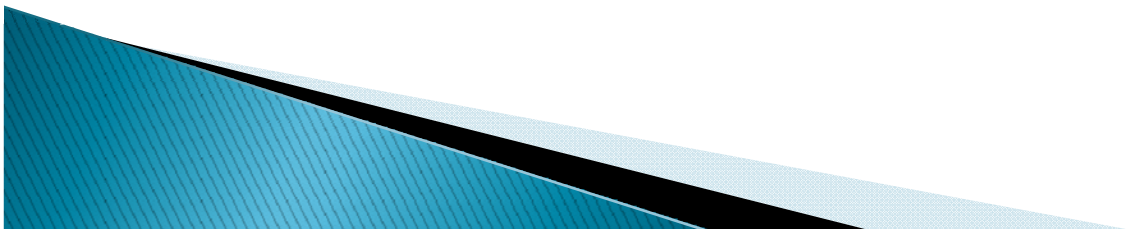
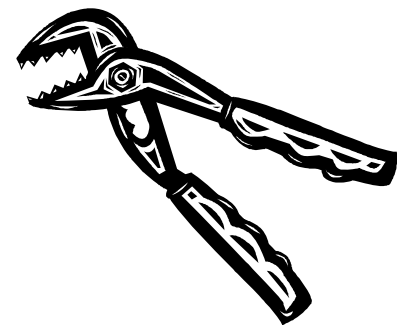
- ▶ Inspect for Hot Spots.
- ▶ Watch for radiant heating – Sparks fly!
- ▶ Fire watch to remain a minimum of 30 minutes after work completed.
- ▶ After hours, fire watch
  - Extend to 4 hours if welding near or on bins or silos.
- ▶ Permit shall stay on job site until work is completed.
- ▶ Permits are not a record, but an authorization of the signee certifying that certain safety precautions have been implemented prior to hot work beginning.



# Preventive Maintenance

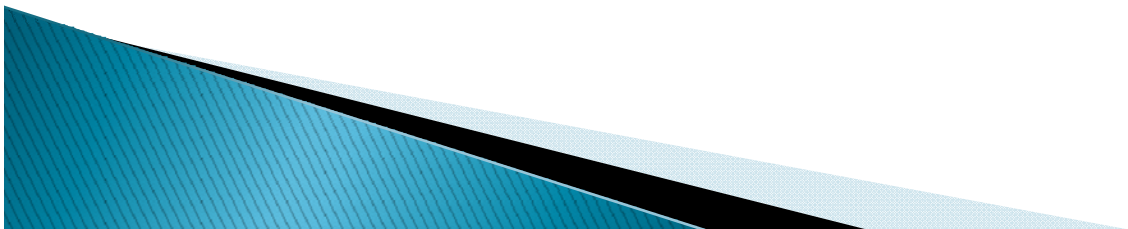
## §1910.272(m)

- ▶ **Very Important to your facility**
  - Controls ignition sources
  - Controls fuel sources
- ▶ **Benefits**
  - Improves housekeeping
  - Reduces unplanned downtime
  - Improve equipment performance
  - Provides for safer operations



# Preventive Maintenance Program Requirements

- ▶ Must be in writing (*or electronic*)
- ▶ Frequency of inspection not specified by standard
- ▶ Regularly scheduled inspections of mechanical and safety control equipment, dust collection equipment and bucket elevators and monitoring equipment
- ▶ Address **lubrication and other maintenance in accordance with manufacture's recommendation** or by prior operating records
- ▶ **Give priority to safety control equipment**, such as magnets, alarms, and shut down systems
- ▶ Training required for employees assigned PM tasks

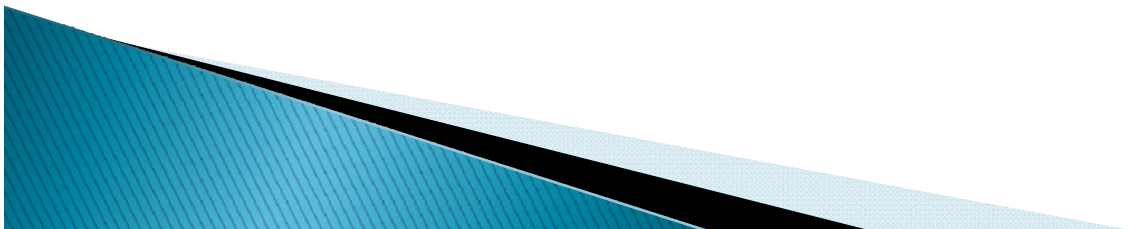


# Bearing Maintenance is Critical Along with Regular Inspections



# Preventive Maintenance

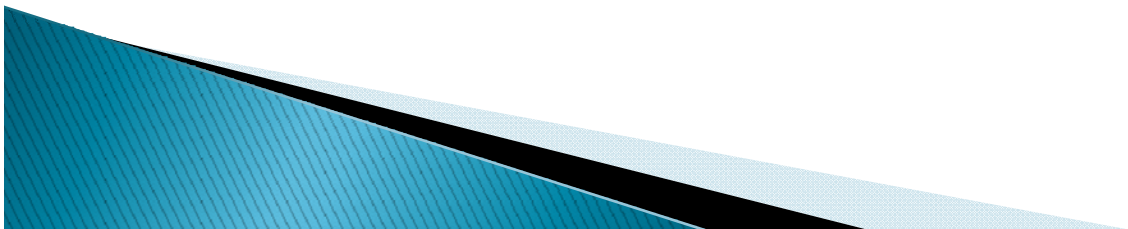
- ▶ Promptly correct malfunctioning critical safety equipment such as, dust systems, over heated bearings, slipping or misaligned bucket elevators.
- ▶ Certify each inspection by making a **written record** of what was inspected, by whom & date.
  - “Work Orders would be an indication of an effective PM program.”
- ▶ Use proper lock-out and tag-out procedures when servicing equipment.



# Filter Collectors

## §1910.272(I)

- ▶ Must be equipped with a monitoring device that measures pressure drop across the filter.
- ▶ Required for filters installed after March 1988.
  - Outside, or
  - Inside area protected by an explosion suppression system, or
  - Inside area separated by one hour firewall, adjacent to an outer wall, and vented to the outside with material designed to resist rupture.





# Dust Filter Maintenance

Malfunctions in filters must be promptly corrected.



- ▶ Filters must have pressure drop indication
  - Accessible location
  - Checked on a scheduled frequency
  - Maintain when pressure drop exceeds design value (between 2 and 6 inches of water pressure)
- ▶ Repair leaks and replace bags as needed.

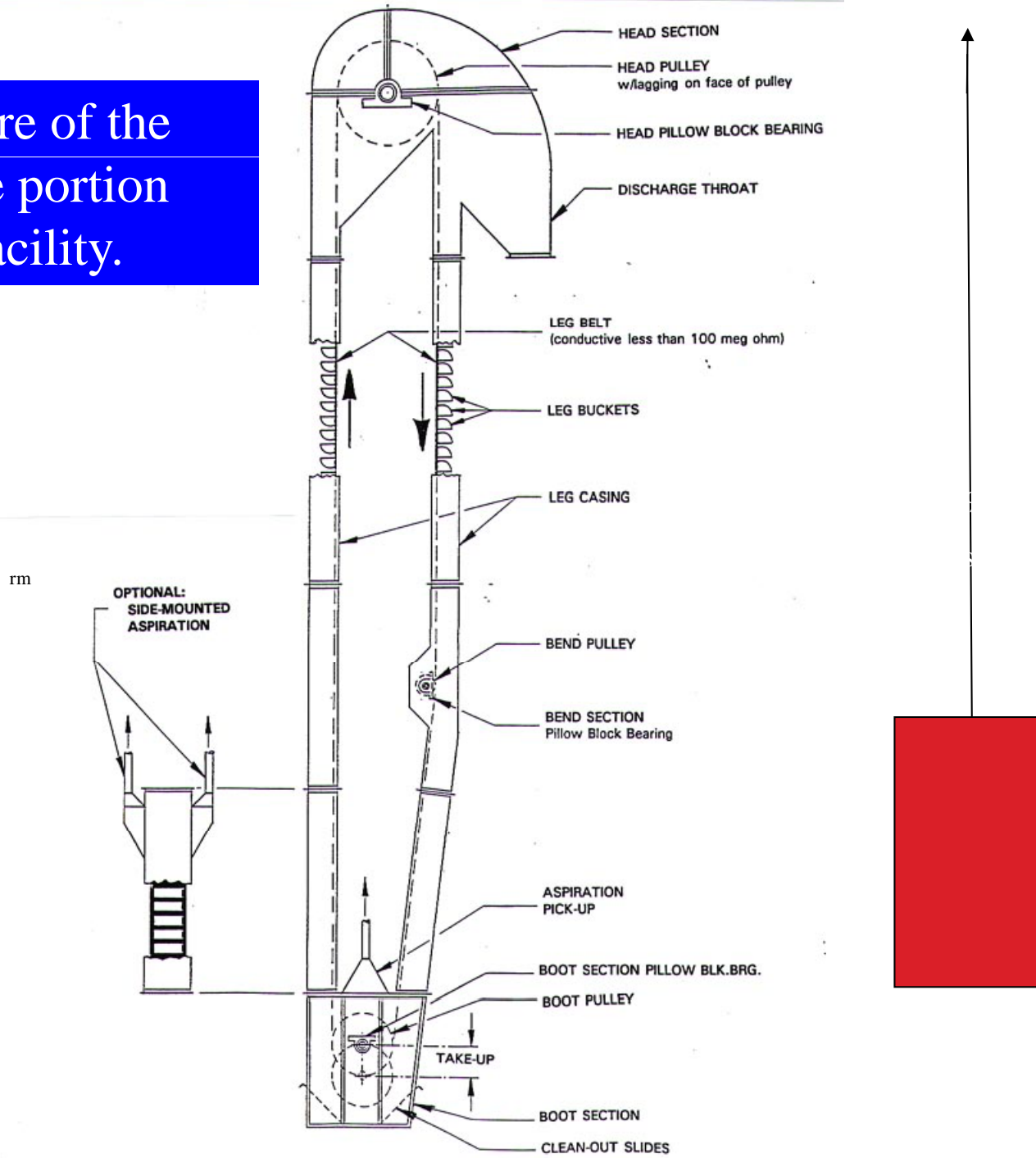
# Bucket Elevator Leg Requirements

## §1910.272(q)

- ▶ These requirements are some of the most important and touch on both equipment requirements and operating practices.
- ▶ The OSHA rules only apply to inside bucket elevators at grain elevator facilities.



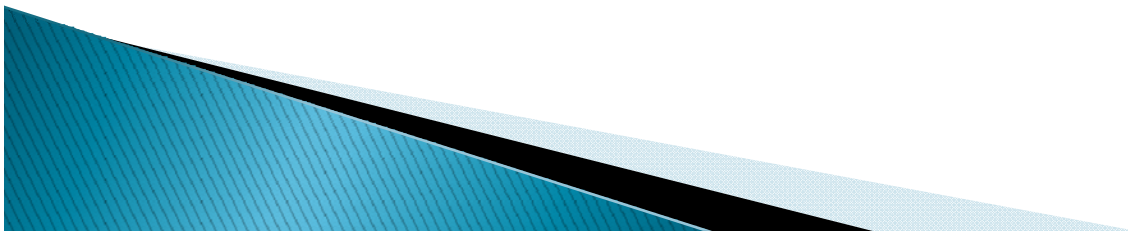
20 % or more of the above grade portion inside the facility.



# Specific Leg Requirements

(q)(1) Bucket elevators shall not be jogged to free a choked leg.

- "Jogging" means repeated starting and stopping of drive motors in an attempt to clear choked legs.
- Set the time on the motion switch for the leg to come to full speed to avoid jogging.



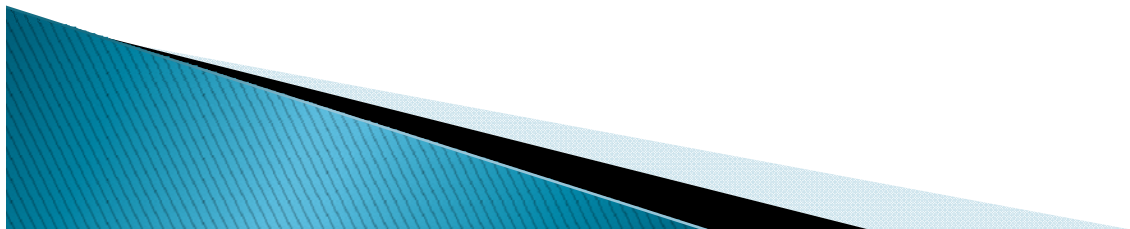
Citation 2 Item 4 Type of Violation: **Willful**

29 CFR 1910.272(q)(1): Inside bucket elevator(s) were jogged to free choked leg(s):

On or about October 27th, 2011, employees working in and near the grain elevator were exposed to fire and explosion hazards in that inside bucket elevator(s) were jogged to free choked leg(s), including but not limited to an instance in which approximately 20 buckets were torn off the bucket elevator leg #1 belt.

**29 CFR 1903.19(d)(1) requires certification and documentation that the abatement of the above violation is completed.**

Date By Which Violation Must be Abated:	05/07/2012
Proposed Penalty:	\$ 70000.00

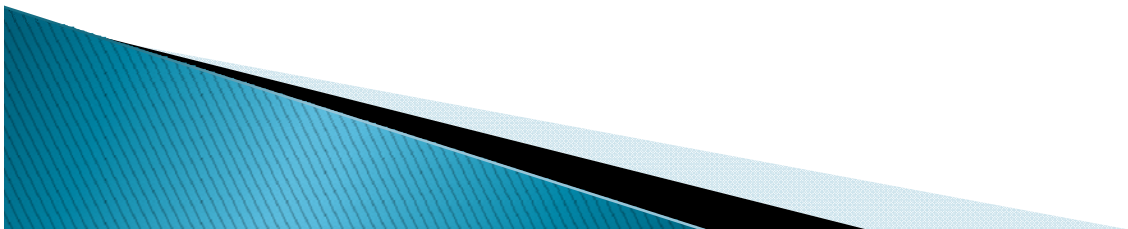


# Specific Leg Requirements

(q)(2) “All belts and lagging purchased after March 30, 1988 shall be conductive. Such belts shall have a surface electrical resistance not to exceed 300 megohms.”

- Get certification from manufacturer regarding belting and lagging.
- MSHA approved belting will meet rule.

(q)(3) Access to head and boot sections...

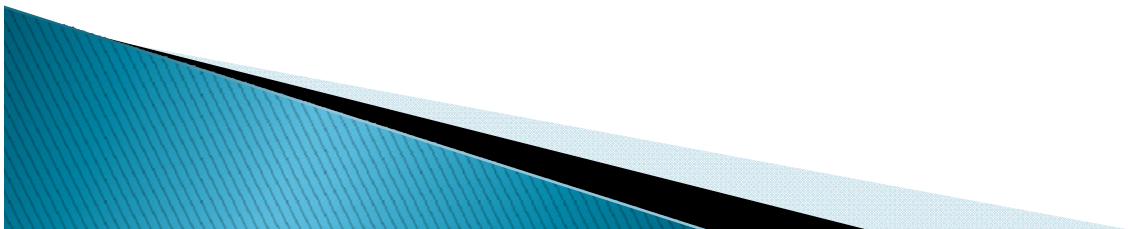




# Specific Leg Requirements

(q)(4) “The employer shall:

- (i.) Mount bearings externally to the leg casing; or,
- (ii.) Provide vibration monitoring, temperature monitoring, or other means to monitor the condition of those bearings mounted inside or partially inside the leg casing.







Pillow block bearing should have a non-flammable shaft seal behind it.

Flange mounted bearings must be separated from the inside of the leg casing with a sliding seal otherwise it is a partially inside bearing.



# Monitoring of Temperature and Vibration

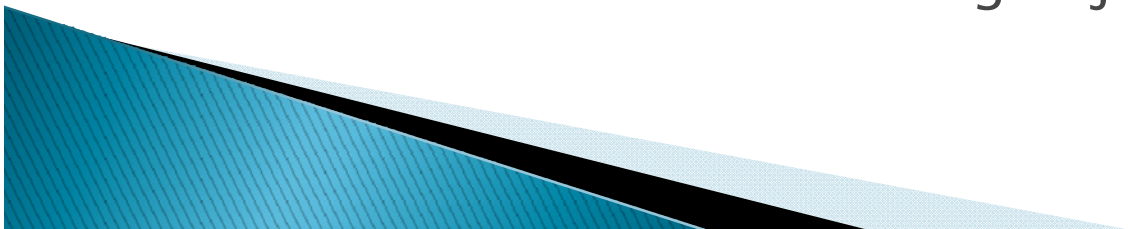


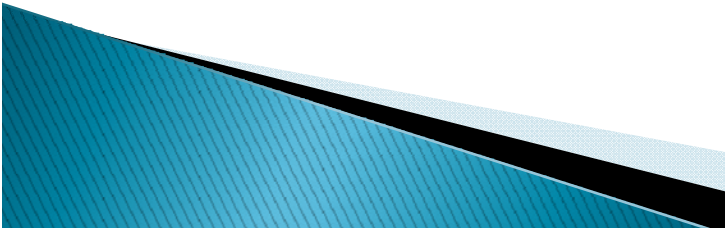
# Specific Leg Requirements

(q)(5) “The employer shall equip bucket elevators with a motion detection device which will shut down the bucket elevator when the belt speed is reduced by no more than 20% of the normal operating speed.”

▶ Options:

- Device to count revolutions of tail pulley and alarm when below design speed.
- A device to detect the presence of a magnetic or metallic object passing by its field of view. (Can count bolts on the belt or rotating objects.)

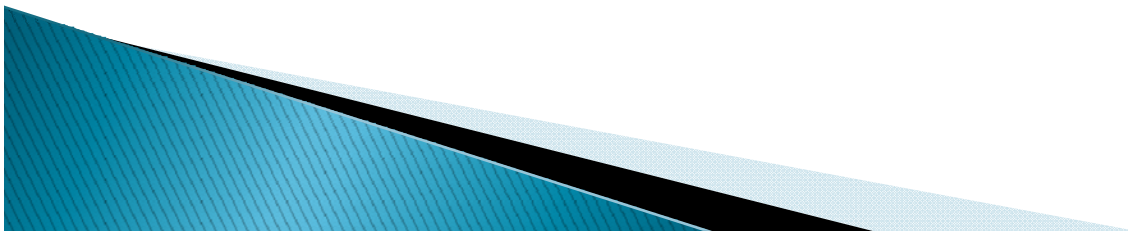




# Specific Leg Requirements

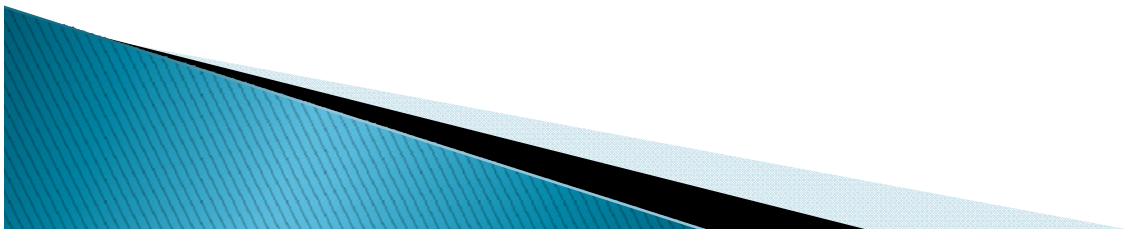
(q)(6) The employer shall:

- i.) Equip bucket elevators with a belt alignment monitoring device which will initiate an alarm to employees when the belt is not tracking properly; or,
- (ii.) Provide a means to keep the belt tracking properly, such as a system that provides constant alignment adjustment of belts.



# Specific Leg Requirements

- ▶ Leg alignment options:
  - A. Use a rubber Block Temperature Monitoring system to detect belt or pulley rubbing the leg casing.
  - B. Use a Micro switch or similar switch device that sounds an alarm when detecting the leg belt misaligns.
  - C. Place flanges on knee pulley of leg to require proper tracking.
  - D. Use a mechanical arm that activates when rubbed by the leg belt.
  - E. Hydraulic boot take ups can be used in lieu of a belt alignment monitor.



# Alignment Monitoring Rub Block on Leg



# Specific Leg Requirements

(q)(7) Paragraphs (q)(5) motion switches and (q)(6) belt alignment devices are not required for grain elevators having a permanent storage capacity of less than one million bushels, provided that daily visual inspection is made of bucket movement and tracking of the belt.

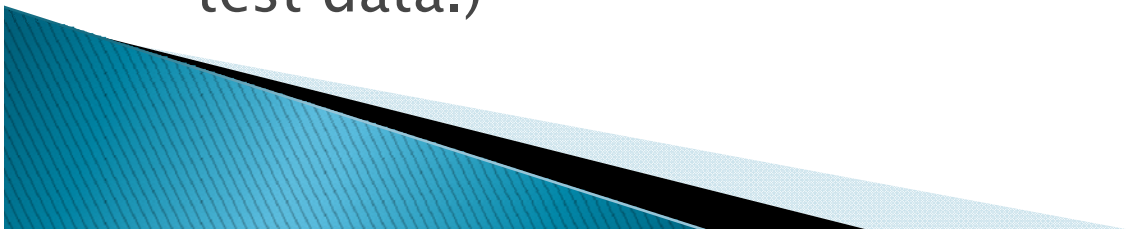
- Count storage capacity except for outside piles.
- You need to train workers to check legs daily and verify that it is being done.
- *Motion switches are a good practices even though not required.*





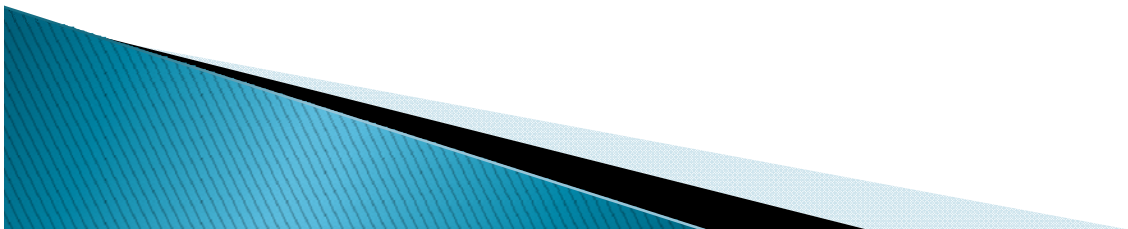
# Specific Leg Requirements

- ▶ (q)(8) Paragraphs (q)(4) (bearings), (q)(5), and (q)(6) of this section do not apply to the following:
  - ▶ (i.) Bucket elevators which are equipped with an operational fire and explosion suppression system capable of protecting at least the head and boot sections; or,
  - ▶ (ii.) Bucket elevators which are equipped with pneumatic or other dust control systems or methods that keep the dust concentration inside the bucket elevator at least 25 % below the lower explosive limit at all times during operations. (Must certify with valid test data.)

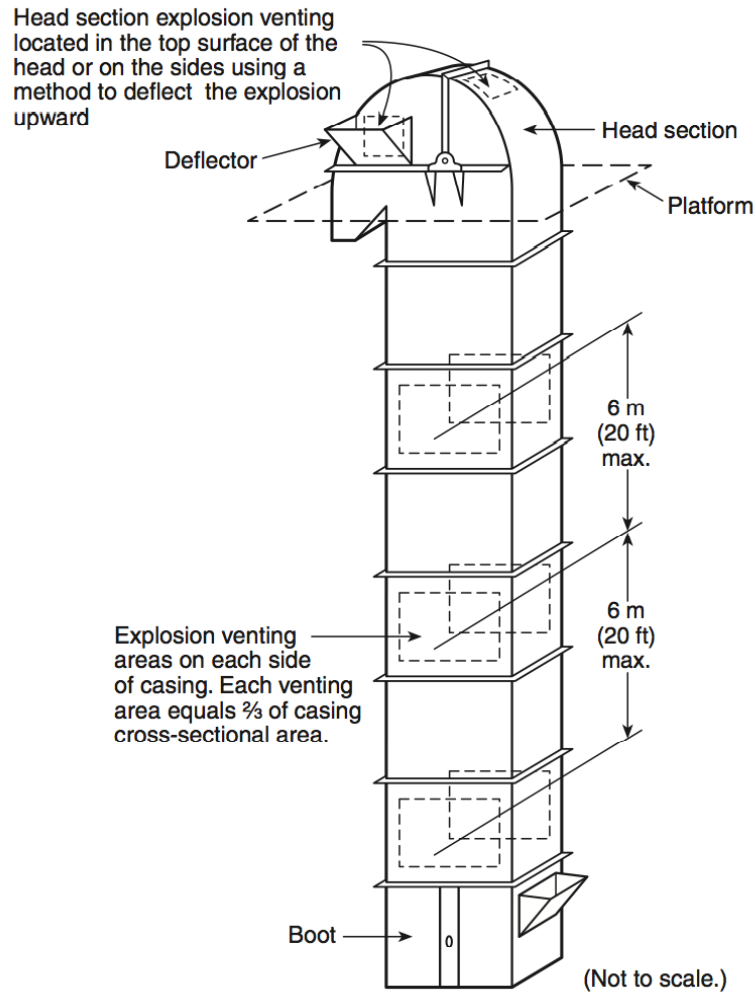


# Leg Venting

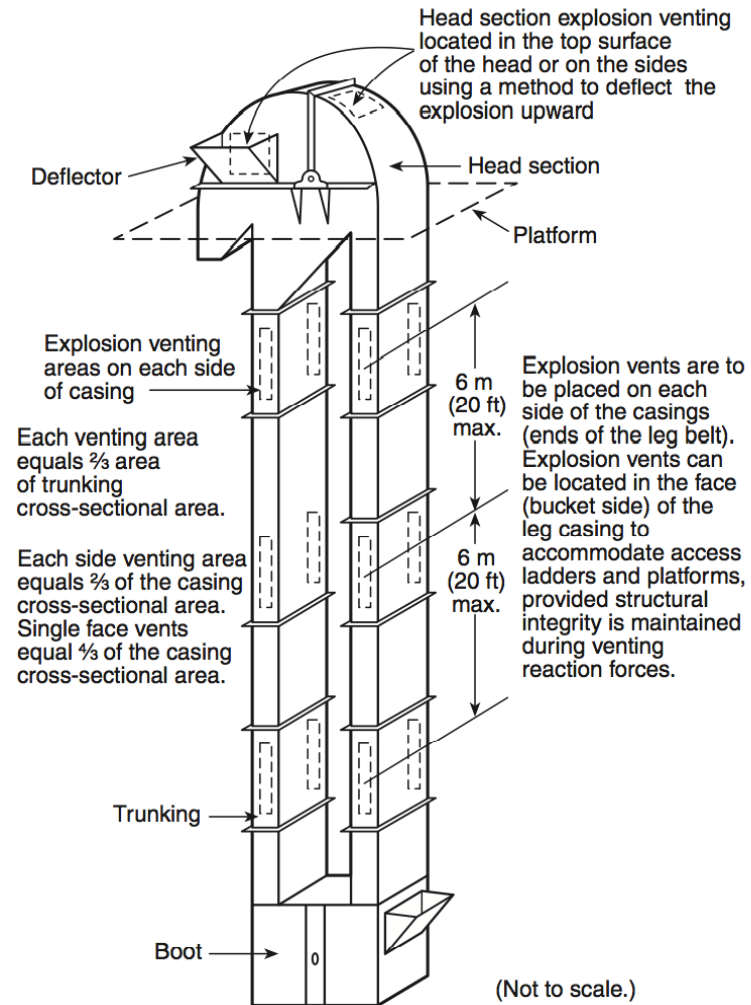
- Explosion venting of bucket elevators was developed thru research sponsored by NGFA to find ways to limit explosions in bucket elevators.
- You will need to request information on bucket elevator venting when you purchase a new leg from a supplier.
- All new legs should be installed outside of the facility per NFPA 61.



# Leg Venting – NFPA 61

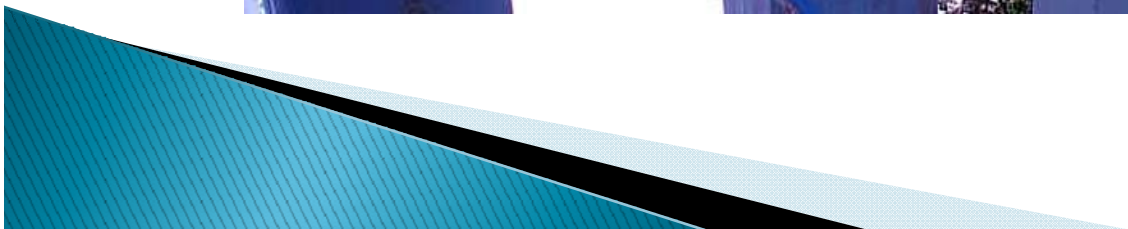


**FIGURE 7.4.2.2(a) Typical Elevator Explosion Venting for a Single Casing Leg.**



**FIGURE 7.4.2.2(b) Typical Elevator Explosion Venting for a Double Casing Leg.**

# Leg Venting



# Management Practices

## What you can do to minimize risk

- Emphasize **good housekeeping** (written plan with daily inspections)
- Execute effective **preventative maintenance**
- Use safe hot work procedures
- Establish an emergency procedure plan
- Effectively **train employees** (hazards and equipment)
- Ensure good safety communication
- Enforce safety rules incl. good housekeeping
- Install safety devices, slow-down devices, or plug switches where needed.
- Have a program to deal with outside contractors



# Always Be Safe – Avoid Explosions

- Never relax your guard.
- Remember it is often the simpler matters that causes the problem because someone doesn't think it is a problem.
- Dust Explosions are very unpredictable and complex.
- Be ever vigilant.

