

**SUBJECT:** Inspection of Grain Handling Facilities, 29 CFR 1910.272

**Purpose:** This instruction provides guidelines for inspections conducted in grain handling facilities and clarifications of 29 CFR 1910.272.

**Scope:** This instruction applies OSHA-wide.

**References:**

1. 29 CFR 1910.272, Grain Handling Facilities, Final Rule, adopted by MN OSHA on May 30, 1988.
2. Federal OSHA Instruction CPL 02-01-004, "Inspection of Grain Handling Facilities, 29 CFR 1910.272," dated November 8, 1996.
3. 29 CFR 1910.68, Manlifts
4. MN Rules 5205.0550 - 5205.0580, Platform Manlifts.
5. 29 CFR 1910.146, Permit-Required Confined Spaces.
6. MNOSHA Division Policy, STD 1-11.1, Industrial Trucks in Class II, Division 1 & 2 Areas.

**Cancellation:** This instruction cancels MNOSHA Instruction CPL 2-1.4, "Inspection of Grain Handling Facilities," dated October 18, 2013.

**Background:** The standard for grain handling facilities, 29 CFR 1910.272, was adopted by Federal OSHA on December 31, 1987, and went into effect on March 30, 1988, except for housekeeping provisions which were delayed by Federal Court Order until August 1988. On March 8, 1996, amendments were published in the *Federal Register* and became effective April 8, 1996. Minnesota adopted 1910.272 on May 30, 1988; the March 1996 amendments were adopted by Minnesota on August 12, 1996.

1. The standard culminates several years of effort by OSHA in response to the hazards found in grain handling facilities, particularly fires and explosions. The final rule addresses both hazards to employees presented by potential fires and explosions and other safety hazards (e.g., bin entry).
2. Although the final rule applies to all grain handling facilities, it is not a "vertical" industry standard. That is, it is not intended to address all hazards to be found in workplaces of this type. Therefore, the standards contained in Minnesota Rules and 29 CFR Part 1910 for general industry and 29 CFR Part 1917 for marine terminals, as appropriate, will continue to apply to grain handling facilities. 29 CFR 1910.272, however, takes precedence inside the grain handling facility over other provisions in 1910, 1917 and the Minnesota Rules for the specific hazards the grain standard addresses.
3. The amendments made in the March 8, 1996, *Federal Register* revise paragraph (g) and create a new paragraph (h) addressing engulfment hazards in bins, silos, and tanks and in flat storage structures, respectively.

ACTION:

A. Inspection Personnel.

1. Joint Inspection. Grain handling inspections shall be conducted jointly by both a safety investigator and a health investigator.
2. Experienced Personnel Only. Only those OSHIs who are well trained and experienced in grain handling inspections shall normally be assigned to conduct inspections in grain handling facilities. At least one of the two investigators will have attended the OTI grain handling course. The OMT will ensure that an appropriate number of trained grain elevator specialists are available for such inspections.
3. Expert Services. The OMT Director, in consultation with the Attorney General, shall decide as soon as practicable whether or not expert services from outside the Agency (such as expert witnesses or an independent investigator) will be needed to support a grain handling case properly. If so, such services shall be involved at the earliest date practical.

B. OSHI Safety and Health. OSHIs shall take appropriate precautionary measures for the particular hazard presented in grain handling facilities.

1. Personal Protective Equipment (PPE). Personal protective equipment will normally consist of: hard hat, safety glasses with side shields, steel-toed boots, and leather gloves. Filtering face piece (dust mask) type respirators for nuisance dusts should be made available to OSHIs for voluntary use. Respirators may be worn depending on the conditions at the time of the investigation. Refer to FSHM, Chapter 4, and 1910.134, Appendix D, and notify your supervisor if you use this type of respirator.

In addition to routine personal protective equipment, it is recommended that OSHIs conducting inspections in grain handling facilities shall wear natural fiber (e.g., 100% cotton), non-spark-producing clothing and avoid clothing made of nylon or other fabrics that may melt or that may allow a static charge to accumulate. Coveralls made of 100% cotton or flame retardant clothing may be procured for OSHIs who conduct inspections in grain handling facilities.

OSHIs will bring only a limited amount of equipment to the facility due to the hazardous atmosphere they will be entering--normally, a camera to be used only in non-hazardous locations, tape measure, sample collection kit, intrinsically safe flash light appropriate for grain industry, and a non-spark-producing electrical tester. If a camera will be used, the precautions in paragraph 3 must be followed.

2. Precautions on Manlifts. Care shall be taken that manlifts and other means of access to upper levels of a facility are used by OSHIs only when this can be done safely.
  - a. Only OSHIs that have had special training on the hazards associated with hand-powered platform passenger type manlifts or special purpose personnel elevators may ride a manlift during an inspection.

- b. The OSHI, who has had special training, will conduct an inspection of the manlift prior to entering. If the OSHI detects a problem with the manlift and feels it is unsafe, he/she will not use the manlift. They will contact their supervisor to report the unsafe condition of the manlift. At this time the OSHI will continue with the inspection in areas that can be accessible without the use of a manlift.
- c. Employees who have not had this special training will not be permitted to ride hand-powered platform passenger type manlifts or special purpose personnel elevators.
- d. Extreme caution shall be used on belt manlifts. Belt manlifts pose a potential fall hazard to OSHIs. OSHIs shall utilize alternate routes, when available, when they feel their safety is in question. When using a belt manlift, OSHIs shall not carry clipboards or other equipment unless it fits in a pocket or can be secured in another manner that does not create a hazard to the OSHI while on the manlift. Equipment bags shall not be carried on a manlift.
- e. OSHIs who are not familiar with the particular type of manlifts used at a facility being inspected shall request specific hazard training and/or instruction from an appropriately knowledgeable employer representative. Also, the employer shall be the lead rider on the belt manlift, so that the OSHI will not be confused as to where to disembark.

**Endless belt manlifts** – Minnesota OSHA will enforce the requirements of CFR 29 1910.68.

**Hand-powered platform passenger type manlifts** – Minnesota OSHA will enforce the requirements of Minnesota Rules 5205.0550 to 5205.0580.

**Minnesota Rules 5205.0560 Inspections** – Before final approval, an inspection of each new or relocated manlift shall be made by the Dept of Labor & Industry/Elevator Inspectors.

Standards Clarification for Minnesota Rules 5205.0550 to 5205.0580 - Hand-Powered Platform Manlifts:

- a. MN Rules 5205.0580, subp. 10. Where the manlift has ½ inch cables and operates with reasonable ease so as not to create back or muscle injuries, no citations will be issued for failure to provide compensating cables or chains.
- b. MN Rules 5205.0580, subp. 21. Minimum requirements for cables: There needs to be at least a double 1/2-inch diameter wire rope used for suspension. There is no longer an exception for 3/8-inch diameter or single rope suspension cable.
- c. MN Rules 5205.0580, subp. 23.A. U-bolt clips may not be used to fasten hoist cables on hand-powered manlifts. Only “fist grip” type wire rope clamps and babbitted wire ropes sockets may be used.

- d. MN Rules 5205.0580, subp. 31. Tires may be used in lieu of spring-type buffers in manlift pits where installation of spring buffers may be difficult.

**Special purpose personnel elevators** – Labor and Industry/Electrical Elevator  
Inspectors will enforce the electrical code requirements of Minnesota Rules, Chapter 1307 (ASME Code A17.1).

3. Precautions for Camera Use: Because of the explosion potential that exists in grain handling facilities, steps must be taken to settle or reduce the amount of grain dust that is in suspension. If a camera will be used in a grain handling facility, the following guidelines and precautions shall be followed:

Only take photos from safe locations  
Avoid dust clouds  
Be a safe distance away from hazardous locations

**OSHIs shall use professional judgment in determining whether or not a camera will be used.**

- C. Standard Clarifications. The following clarifications of specific provisions of 29 CFR 1910.272 are provided to assist OSHIs in conducting inspections at grain handling facilities.

1. Scope and Application of 29 CFR 1910.272(a) and (b).  
a. The majority of facilities covered by the standard are in in North American Industry Classification System (NAICS) as indicated below:

NAICS Code	Description of Facility
311211	Flour and other grain mill products
311212	Rice milling
311119	Prepared feeds and feed ingredients for animals and fowls. Not pet food
493130	Farm Product Warehousing and Storage
424510	Grain & field bean wholesalers

- b. Facilities in the following NAICS are generally not covered by the standard;

NAICS Code	Description of Facility
311230	Breakfast cereal mfg.
311824	Prepared flour mixes and dough
311111	Dog and cat food mfg.
311812	Bread and other bakery products; commercial bakeries

- c. Covered workplaces may also be found in other NAICS (such as those listed in paragraph b. above) where they are not the primary business. If a facility has a

grain elevator onsite which receives, handles, stores and ships (including transfer to another part of the facility) a bulk, raw, agricultural commodity, the standard applies to the grain elevator. An example of this type of facility is a grain elevator used in support of a brewery. (The important factor is that a bulk, raw, agricultural commodity enters the facility, is handled and stored, and then leaves the facility in the same form: a bulk, raw, agricultural commodity.)

- d. The standard does not apply to “seed plants” which handle and prepare seeds for planting of future crops; however, such facilities are covered by the Part 1910 standards including 1910.146 and 1910.147. Agricultural operations (refer to NAICS) are not covered in Part 1910 except for 1910.142 – temporary labor camps; 1910.111(a) and (b) – storage and handling of anhydrous ammonia; 1910.266 – pulpwood logging; and 1910.145 – slow-moving vehicles. Reference Part 1928 Occupational Safety and Health Standards for Agriculture. Minnesota Rules 5206.0300, Subp. 3 farms – is applicable for farming operations employing greater than 10 employees. 182.653, subd 2, general duty, is applicable to farming operations employing greater than 10 employees. Reference: Field Compliance Manual – General Duty Violation.

Farming Operation Exemptions and Limitations – Refer to FCM Appendix E; Appropriation Rider

The hyperlink to the Appropriation Rider is below:

[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPR ETATIONS&p\\_id=20764](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPR ETATIONS&p_id=20764)

- e. If the OSHI is uncertain as to what constitutes “raw agricultural commodities” or the explosibility index of agricultural dusts, references include the Bureau of Mines report and the National Academy of Sciences’ “Classification of Combustible Dust in Accordance with NEC.” (See Appendix C, “References,” in this instruction.)

2. Emergency Action Plan, 29 CFR 1910.272(d).

- a. 29 CFR 1910.38(a), “Employee Emergency Action Plan,” requires the emergency action plan to be in writing except for employers with 10 or fewer employees. However, employers with 10 or fewer employees will still have to comply with 1910.38(a) requirements and be able to substantiate that the plan is being communicated orally in an effective manner.
- b. All employees, including truck drivers, sales and office personnel, seasonal employees, and part-time employees, shall be included in determining the total number of employees at a given workplace.

3. Training, 29 CFR 1910.272(e). Employees are required to be trained in the recognition and prevention of hazards associated with grain handling facilities, especially those hazards associated with their own work tasks.

- a. OSHIs shall verify whether employees are trained in all aspects of safety and health related to their job tasks. They shall also verify whether employees are trained not to introduce ignition sources (sparks, arcs) through the use of electric tools, and through grinding or drilling, in hazardous areas containing combustible dusts. Other ignition sources include use of unapproved forklifts, welding, cutting, use of open flames or smoking materials in hazardous areas.
  - b. The standard does not require that training records be kept to verify that employees have been adequately trained. Therefore, the OSHI shall substantiate the adequacy of training by reviewing the employer's training records, if offered by the employer, and by interviewing a sample of employees.
  - c. Employers shall commence the training of employees prior to their assignment.
  - d. In addition to the training information and references listed in Appendix A.3. and Appendix C of the standard, see also Appendix C, "References," in this instruction.
4. Hot Work Permit, 29 CFR 1910.272(f)
- a. If a permit is issued, the employers' representative need not be at the specific "hot work" site during the entire time the work is performed. It is reasonable to expect that the employer should monitor frequently--at least each shift--to ensure those permit requirements are being followed.
  - b. If the employer elects to have a representative present in lieu of a written permit, the employer must still follow the same requirements as if a permit were issued in accordance with 29 CFR 1910.252(a). The representative must in this situation be present for the entire duration of the job.
  - c. The term "flame producing" used in the definition of "hot work" at 29 CFR 1910.272(c)(4) includes ignition sources (sparks, arcs) produced by operations such as welding, cutting, and brazing. Hot work permits are necessary for these types of operations.
5. Entry into Grain Storage Structures, 29 CFR 1910.272(g). Cite 1910.272(g) for failure to follow appropriate Permit Required Confined Space entry procedures in grain storage structure. 1910.272 ONLY covers bins, silos, tanks and other "grain storage structures". There will be additional areas such as pits, tanks, hoppers, dryers, dust collectors and the bucket elevator boot – that may need to be addressed under 1910.146 Permit-required Confined Spaces.
- a. A life line (body harness attached) used for entry procedures shall be of such length that it would not allow the employees to sink any further than waist deep in the grain.
  - b. If the employer or representative (who would otherwise be authorized to issue the entry permit) elects to remain present during the entire operation, a written permit is not required. All other provisions of 1910.272(g) must still be complied

with.

- c. When the OSHI can verify that fumigants have been applied, the employer's program for fumigation procedures and testing of the atmosphere for toxicity shall be reviewed. The hazard analysis under 29 CFR 1910.132(d) should be reviewed for appropriate PPE being used.
- d. The OSHI shall ask the employer to verify the procedure(s) used to ensure that testing equipment used to determine hazardous atmospheres, including but not limited to pesticides, fumigants, dust, and oxygen deficiency is properly calibrated and maintained prior to use.
- e. If testing the atmosphere indicates oxygen deficiency and/or the presence of toxic and flammable gases above the specified limits, the OSHI shall ensure that employees are provided with the required ventilation and/or PPE before entry.
- f. Aeration fans can constitute forced air ventilation even when grain is covering the aeration ducts, provided that the air exits the duct above the grain level.
- g. The OSHI shall evaluate the type of rescue equipment available to determine its adequacy for each particular situation, i.e., types and configurations of bins. The employer may have to establish that the equipment is suitable to perform the task for the particular facility.
- h. Employees are forbidden to walk or work on the surface of the grain which is to support them until the employer has verified that engulfment hazards do not exist as a result of a bridging condition, air pocket, or void space below the surface of the grain, or that the depth of grain is not sufficient to present an engulfment hazard in the specific bin, silo, or tank. Probe tests sufficient to detect any air pockets or void spaces may be one way to assess the stability of the grain surface. However, if a worker must stand - on the grain to conduct such tests, the worker must be protected from engulfment during the tests. Grain depth may be analyzed based on use and documentation to show that there are no recent draw-off problems, moisture problems from open hatches, leaking roofs, etc., and that any previous problems have been corrected. Certain agricultural commodities such as flax, millet, and oil seeds present additional hazards that must be addressed by the employee if they are involved in the entry. The employer must be able to show that lockout and tagout procedures are in effect to prevent any grain or grain product conveying machinery from operating while the employee is supported on the grain. The employer is to verify that all employees, before being permitted to walk on stationary grain, will have completed the training required in paragraph 29 CFR 1910.272(e).
- i. Employees are forbidden to "walk down grain" for the purpose of making grain flow to the draw-off equipment which may or may not be running.
- j. When employees are to free caked, plugged, or bridged grain to move it, such as to a center draw off, the employee's body weight is to be supported in a boatswain's chair with a life line suspended from the top. The boatswain's chair

shall be supported by slings attached to a suspended rope, and shall be designed to accommodate one person in a sitting position. The OSHI shall ensure that employers provide an observer equipped with communication mode, who maintains contact with the employee entering the silo, bin or tank. The OSHI shall ensure that the observer is trained and equipped for rescue operations. The employee is expected to use a tool, such as a long rod, to force grain toward the draw off equipment or to remove it from the sides of the grain storage structure. The employer is to verify that the employee will not be exposed to mechanical hazards. Where the employer states a greater hazard exists, both engulfment and mechanical hazards must be addressed by alternate means.

- k. Employees are permitted to walk on the grain when cleaning bottoms of bins, or for other purposes, without a lifeline and harness when the employer has verified that the depth of the grain will not result in an engulfment hazard. The employer is also to verify that the employee will not be exposed to mechanical hazards. Employers shall not permit employees to enter silos whenever bridging conditions or grain funneling (side building) exists.

**Grain bin sweep augers:** Minnesota will adhere to the decision rendered recently in Illinois by the Occupational Safety and Health Review Commission, in regard to the operation of grain bin sweep augers (OSHRC dockets 11-2725 and 12-0624). Both company settlements can be viewed on the federal OSHA website at [www.osha.gov/SLTC/grainhandling](http://www.osha.gov/SLTC/grainhandling), under 'Highlights' and 'Sweep Auger Settlements' on the right side of the page. The 10-point safety principles can be found in Section III of the settlements and will need to be followed when operating a grain bin sweep from inside the bin. The hyperlink to the settlement agreements are below:

[www.osha.gov/SLTC/grainhandling/western\\_final.pdf](http://www.osha.gov/SLTC/grainhandling/western_final.pdf)  
[www.osha.gov/SLTC/grainhandling/northern\\_final.pdf](http://www.osha.gov/SLTC/grainhandling/northern_final.pdf)

6. Entry into Flat Storage Structures, 29 CFR 1910.272(h). This paragraph addresses grain storage structures that will not empty completely, without mechanical equipment or manual means being used, and can be entered from the ground level through regular or larger doorways or openings. Entry into these grain storage structures under this section is permitted only in the absence of actual or potential atmospheric hazards. Entry into those that may have atmospheric hazard is covered in new paragraph (g). Flat storage structures may include flat bottom tanks, buildings where grain is stored on the floor, tents, or other structures where grain is stored in a pile in bulk on a flat bottom surface.

**NOTE:** Cite 1910.272(h) for failure to follow appropriate Permit Required Confined Space entry procedures in flat storage structures where atmospheric hazards do not exist and are not a potential. Where atmospheric hazards exist or are a potential in flat storage structures, cite 1910.272(g). Do not cite 1910.146, "Permit Required Confined Spaces".

Reference: May 16, 2011, memorandum – clarification of the applicability of 29 CFR 1910.272(g) or (h) during grain storage structure

entry operations. See link below:

[www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&P\\_ID=27662](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&P_ID=27662)

- a. When employees are permitted to walk on the grain product without a restraint system, such as may be done by Federal or State grain warehouse inspectors, the employer must show that all equipment (e.g., augers and transport equipment) shall be deenergized, disconnected and locked out. The employer shall demonstrate that lockout and tagout procedures are in effect to prevent any movement of a grain or grain product in the area where the employee is expected to walk. Also the employer must verify that there is no recent history of draw-off problems that could create cavities in the grain pile. The employer is to verify that those employees involved in this task will have completed the training required in paragraph 29 CFR 1910.272(e) before walking on the grain or grain products.
  - b. Where lifelines are used, their length shall not allow the employees to sink any further than waist deep in the grain.
  - c. "Walking down grain" for the purpose of making the grain flow or any other purpose is prohibited in flat storage structures. See item 5.h.
  - d. No employee shall be permitted to work underneath bridging conditions or in any location where the possibility of engulfment from falling grain exists.
7. Contractors, 29 CFR 1910.272(i)
- a. The intent of the phrase "shall inform" is that an employer is to provide specific instruction to contractors on the safety rules of the facility, including applicable provisions of the emergency action plan. **Simply providing a copy of the safety program, for example, would not ensure that the contractor has received sufficient information to take adequate precautions to prevent exposure to potential hazards.**
  - b. A "contractor" is an individual, group of individuals, firm, or entity who enters the premises for the purpose of performing work and who may be exposed to hazards during the course of performing work. This normally would not include service or inspection-related persons (e.g., vendors, delivery personnel, or insurance representatives) unless they pose or could create a hazard to facility employees while performing their duties.
8. Housekeeping--General, 29 CFR 1910.272(j). The standard incorporates strict and clear requirements for employers to adopt housekeeping practices determined best to reduce accumulations of grain dust.
- a. 1910.272(j)(1) is applicable to grain elevators and those mills specified in 1910.272(b)(1), Application.

- b. 1910.272(j)(2) applies only to grain elevators and not to processing or mill operations.
- c. In order to substantiate violations of the employer's housekeeping programs, OSHIs shall carefully prepare the evidence by documenting the specific procedures the employer utilizes to keep dust accumulations at a minimum. Such documentation must address at least the following:
  - (1) Manual dust removal procedures, including frequency and extent.
  - (2) Condition and effectiveness of the system, including maintenance and repair on closed conveyance systems (i.e., leaking spouts, worn-out gaskets, flanges, and other similar emission sources).
  - (3) Representative measurements shall be taken to document apparent violations of the general housekeeping provision of the standard. It may be necessary to take measurements at several locations within the general area; those locations shall be identified on a plant sketch.

**Note:** If OSHI is citing housekeeping, do not take a photo of the housekeeping area.
  - (4) Areas of particular concern beyond the priority areas are the grain transfer points, such as galleries (bin floors) and tunnels.
  - (5) Representative samples of dust shall be taken in areas where apparent violations of the general housekeeping provision exist to verify organic dust percentage, moisture content, and particle size (Reference: Appendix A Explosibility of Agricultural Dusts). Take sample only when means of access is safe. There is a combustible dust collection kit in each state vehicle for use.
  - (6) When the employer elects to utilize additives to control the dust rather than collection and other control methods, the OSHI shall document the types used, specific application points and application rate, and shall verify the effectiveness of the method through appropriate sampling and measurement.
- 9. Housekeeping--Priority Areas in Grain Elevators, 29 CFR 1910.272(j)(2). The standard establishes a 1/8-inch action level for housekeeping regarding grain dust accumulations in priority areas in grain elevators. This provision requires either an initiation of a cleanup wherever the 1/8-inch action level is exceeded, or an alternative method (e.g. treating a grain stream with oil additives which inhibit the combustibility of any dust that is emitted from the grain handling system, or "wetting down" the areas of dust accumulation using either an oil- or water-based solution, which provides "equivalent safety.") If the employer chooses not to initiate cleanup actions whenever the grain dust level exceeds 1/8 inch, and instead chooses an alternative method as a means of compliance of this

standard, then the employer must demonstrate that those accumulations (oil or water treated) do not pose a greater fire explosion hazard than would exist if the grain dust was removed prior to its accumulation of more than 1/8 inch.

- a. A representative number of measurements and samples shall be taken of all floor areas within a priority area to document a violation of the 1/8-inch action level; and shall be noted on a plant sketch. Please note: follow all necessary guidelines in taking measurements and samples according to their specific paragraph. Please refer to section B3 of this directive for photos.
- b. The OSHI shall use professional judgment to assess the extent of a hazard presented by a given identified accumulation of grain dust. Small amounts of dust accumulation in isolated spots of the floor would not normally be classified as a violation of the requirement. Additionally, all other types of surfaces within the priority areas that have excessive accumulations of dust shall be identified and documented as a potential violation of the overall housekeeping program specified by 1910.272(j)(1).
- c. A priority area shall not be considered to include sections that are separated by walls, partitions, and/or control rooms or offices with positive pressure and self-closing doors.

10. Blowdown Operations, 29 CFR 1910.272(j)(3).

- a. Equipment may be operated during blowdown operations if the following conditions exist:
  - (1) The equipment is dust-tight and dust ignition-proof; or the equipment is intrinsically safe (i.e., insufficient heat or thermal energy to ignite combustible dust);
  - (2) The bearings are effectively monitored; and
  - (3) An effective preventive maintenance program has been implemented.
- b. Isolation techniques, shrouding, etc., should be encouraged and can be acceptable to minimize dust suspension and dispersal of accumulated dust.

11. Grain and Product Spills, 29 CFR 1910.272(j)(4). Product spills, especially in flour mill operations, should receive prompt attention. These spills shall be cleaned up after identification. Grain spills do not present the same hazard as product spills and should be cleaned up as soon as practical after identification.

12. Grate Openings, 29 CFR 1910.272(k). Employers should be encouraged to utilize magnets and openings as small as possible in the receiving grate to minimize the hazard potential.

- a. In special circumstances where commodities (such as corn cobs) cannot pass through the specified-sized grate openings (maximum width of 2.5 inches or 6.35 cm.), grates with larger opening may be used to accommodate the commodity if magnets are used at the receiving point or if suspended magnets are used over conveyance systems prior to entering the boot of the elevator leg.
  - b. Where applicable, OSHIs shall evaluate the compliance of grate openings with 29 CFR 1910.23.
13. Filter Collectors, 29 CFR 1910.272(l). Product and/or process filters are not covered by this paragraph. A reference for both the OSHI and the employer to evaluate and aid in abatement of problems with filter collectors is the National Academy of Science publication "Pneumatic Dust Control in Grain Elevators." (See Appendix C, "References," of this instruction.)
14. Preventive Maintenance, 29 CFR 1910.272(m).
  - a. The standard does not require a specific frequency for preventive maintenance. The employer is permitted flexibility in determining the appropriate interval for maintenance provided that the effectiveness of the program can be demonstrated.
  - b. The OSHI shall document and analyze the program and its effectiveness based on the time period. The program must be adequate for the peak period, such as during the harvest season. Particular attention should, therefore, be focused on the harvest season. If the inspection is being conducted at a time other than harvest season, the OSHI shall conduct evaluation of programs (e.g., by interviewing sufficient key employees) to determine conditions and adequacy of preventive maintenance.
  - c. Manufacturers' recommendations for equipment can assist OSHIs in determining the adequacy of maintenance frequency criteria.
  - d. Bearings not associated with inside bucket elevators (i.e., those located on gallery and tunnel belts or mechanical equipment) must have inspections and proper lubrication as required by 1910.272(m)(1)(ii).
15. Emergency Escape, 29 CFR 1910.272(o)(1)
  - a. Employers will need to provide at least one emergency escape from the headhouse or any floor between the headhouse and ground level, in accordance with 29 CFR Part 1910, Subpart E. Controlled descent devices and escape ladders are acceptable means of escape from galleries and bindecks. Manlifts (belt, caged, manual) are not considered an adequate means of escape; however, a fixed ladder in a manlift shaft is acceptable. Scale floors and headhouses must still meet appropriate provision in 29 CFR Part 1910, Subpart E.
  - b. If controlled descent devices are used, they shall be adequate to accommodate

employees or occupants from a given area of the facility. All employees who work in the area served by the controlled descent devices shall be trained in their use and provided with a sufficient amount of interface equipment such as body harness(es) and line to safely reach the ground or other walking surface.

16. Continuous-flow Bulk Raw Grain Dryers, 29 CFR 1910.272(p)(1)(ii). The OSHI can rely on the manufacturer's recommendations for maximum operating temperature of the drying section to determine or evaluate what is considered "excessive" temperature.
17. Inside Bucket Elevators, 29 CFR 1910.272(q). Elevator legs in mills will still have to comply with the requirements in 1910.272(m)(1) for preventive maintenance even though they are not covered by 1910.272(q). [See 29 CFR 1910.272(b), "Application."]

**Note:** Inside bucket elevator means a bucket elevator that has the boot and more than 20 percent of the total leg height (above grade or ground level) inside the grain elevator structure. Bucket elevators with leg casings that are inside (and pass through the roofs) of rail or truck dump sheds with the remainder of the leg outside of the grain elevator structure, are not considered inside bucket elevators. (reference 1910.272 (c) definitions)

18. 29 CFR 1910.272(q)(2). When an employer has documentation that will identify that the belt characteristics meet the 300 megaohm requirement for belts purchased after March 30, 1988, it will be considered to be in compliance. Note: The employer has the responsibility for compliance with OSHA regulations. If the test method is not one of the test methods specified in 1910.272, Appendix A, #13, the employer will make certain that the test method assures the required 300 megaohm electric resistance of belts.
19. 29 CFR 1910.272(q)(4)(ii). If any portion of the bearing (including inner dust seal) is making contact with the interior of the leg casing, the bearing will be considered partially inside the leg.
20. 29 CFR 1910.272(q)(6). The preamble of the standard indicates that the hydraulic boot takeups can be used in lieu of a belt alignment monitor. This is primarily designed to ensure proper belt tension; however, if there are features of the device that ensure proper alignment, it will be accepted.
21. 29 CFR 1910.272(q)(7).
  - a. Permanent Storage Capacity. In determining the permanent storage capacity of an employer's workplace, the OSHI should consider the total storage for the entire complex. This storage would not necessarily have to be serviced by the same house or leg. It can comprise separate facilities that are a part of the same complex, e.g., an old wooden house with a new concrete facility across the road where employees of the same manager work at both locations. Those facilities or complexes where there are separate houses beyond a given geographical area (e.g., further apart than a square block) would not be considered in the total quantity. Temporary storage such as grain piled outside would also not be counted.
  - b. Daily Visual Inspection. The employer shall verify the methodology being used to

ascertain proper observation. The employer should also have this as a part of training and the preventive maintenance program and it should be properly documented.

22. 29 CFR 1910.272(q)(8)(ii). The employer will certify that concentrations are in fact, at least 25 percent below the lower explosive limit (LEL). The employer may use instruments, tests, surveys, or data developed on legs that are identical in size, configuration, speed, etc., to meet the intent of the requirement.
- D. Additional Documentation to Support Violations--Construction and Functional Details. The OSHI shall obtain the following information to support violations:
1. Type and age of facility.
  2. Type of construction including:
    - a. A sketch of the workhouse showing names of floors from the basement roof;
    - b. Type of fire protection/fire alarm system;
    - c. Evacuation plan, with the location of emergency exits including fixed ladders;
    - d. Explosion venting capability;
    - e. Type of fumigation systems; and any other significant factors.
  3. Type of grain receiving, handling and shipping procedures and equipment; number and location of elevator legs with a description of belt type and size, bucket design, belt speed, etc.; grain drying facilities, location, type of fuel, safety devices; etc.
- E. Minimum Documentation Necessary for Electrical Hazards. Electrical installations and equipment in grain handling facilities are covered under 29 CFR 1910.301 through 1910.399. Most areas of grain handling facilities where dust accumulations occur are considered to be hazardous locations as defined in 1910.307.
1. "Hazardous Locations," 29 CFR 1910.307, is a performance-oriented standard which permits the employer to follow any of three options: equipment, wiring methods, and installations of equipment in hazardous (classified) locations must be intrinsically safe, or approved for the hazardous (classified) location, or safe for the hazardous (classified) location.
    - a. If the employer chooses the third option of providing equipment that is "safe for the hazardous location," then the employer must demonstrate that the equipment is of a type and design that will provide protection from Class II hazards [see classifications of hazardous locations in § 1910.399(a)]; i.e., that it is at least as safe as equipment following the guidelines contained in the National Electrical Code (NEC).
    - b. Acceptable evidence might be test data, manufacturer's information, approved

equipment markings, or proof of conformity with the requirements of the edition of the NEC in effect at the time that the equipment was installed together with proof that the equipment has not been subsequently changed.

2. Classification of an area as Class II, Division 1 [see 1910.399(a)], will require documentation of the possibility that minimum explosive concentrations of dust might occur under normal operating conditions. Such concentrations normally could occur within the bucket elevator enclosure, within scales, in the upper garner, or at open grain transfer points that create airborne dust clouds. They may occur at unventilated loading points or discharge points of equipment.
3. Classification of any area with a grain handling facility will normally, at the very least, be Class II, Division 2, as defined in 29 CFR 1910.399(a)(25)(ii).
4. Some locations within a facility such as rooms or offices that are provided with positive pressure ventilation and self-closing doors, and are so constructed that the room will not allow grain dust to enter during normal operating conditions, are considered as nonhazardous locations.
5. Any electrical citation issued must be adequately documented in the case file. If the citation involves a hazardous location, such documentation must address the following matters to the degree possible:
  - a. Type and quantity of accumulated grain dust (e.g., "OSHI observed within the circuit breaker box very fine, powdery, dry dust which appeared to have entered through the top of the break box door where there was a crack due to this not being a sealed box; the dust was at an angle of repose, which was 1-1/2 inches high, etc...");

The length of time over which dust deposits have been accumulating together with any evidence of charring of layered dust;

The conditions likely to give rise to the suspension of dust and their extent; and

The ignition temperature of the dust and the humidity conditions within the facility at the time of the inspection, if known (local atmospheric data may be obtained from the National Weather Service). [This is evidence supporting the possibility that dust deposits or suspensions could be ignited; that this dust could be thrown into suspension; and if there is a large quantity of dust, enough could be thrown into suspension to support an explosion. The ignition temperatures of common agricultural dusts are listed in Appendix A of this directive. If at all possible, a few bulk samples of dust shall be collected to be sent to Salt Lake City for testing if the case proceeds to a hearing. See also paragraph F. of this instruction regarding laboratory support.]

Electrical boxes lacking seals, missing screws or bolts, covers that do not fit properly, or conduit that is broken open are unsuitable for a Class II location and must be documented and cited.

- b. Location and type of potential electrical ignition sources; type and condition of electrical equipment located in the area; and evidence that electrical equipment is not safe for the location (e.g. the electrical box had open holes which allowed dust to enter).
- c. The presence or likelihood of mechanical failure, electrical malfunctions, or abnormal operation of machinery or equipment or a combination of factors which could result in explosive conditions.
- d. Degree of confinement at the location.

F. Laboratory Support--Dust Sample Collection.

- 1. The Salt Lake City Analytical laboratory has the capability to analyze bulk grain dust samples for:
  - a. Particle size.
  - b. Combustible fraction of sample and percent combustible dust.
  - c. Minimum explosive concentration.
- 2. Dust sample collection and preparation for laboratory analysis shall be performed in the following manner:
  - a. Collection size of sample will be:
    - (1) Approximately one-half pint (0.25 liter) concentration of dust to determine particle size, combustibility, and moisture content.
    - (2) Approximately one quart (1.0 liter) for analysis for minimum explosive concentration.
  - b. Place the sample in a wide-mouth plastic container with a tight fitting screw cap. Do not use plastic bags.
  - c. Follow instructions in the Minnesota OSHA Operations System Exchange (MOOSE) Manual for Laboratory Submissions & Results. (NOTE: And ADM ADM 3.21)

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For the MNOSHA Management Team

Distribution: OSHA Compliance and WSC Director

Attachments: Appendix A Explosibility of Agricultural Dusts  
Appendix B Working Safely During Railroad Grain Car Loading  
Appendix C References  
Appendix D Grain Elevator Help Sheet

**NOTICE:** Minnesota OSHA Directives are used exclusively by MNOSHA personnel to assist in the administration of the OSHA program and in the proper interpretation and application of occupational safety and health statutes, regulations, and standards. They are not legally binding declarations and they are subject to revision or deletion at any time without notice.

## APPENDIX A - EXPLOSIBILITY OF AGRICULTURAL DUSTS

Explosibility data on agricultural products that may be commonly handled in Minnesota are summarized in Table A-1. The values given in this table represent the most severe hazard for each type of material.

The hazard of a dust is related to its ease of ignition and to the severity of the ensuing explosion. Among other parameters, the ease of ignition may be considered as a function of the ignition temperature, minimum energy for ignition, and minimum explosive concentration; the severity of an explosion is related to the pressure and the rate of pressure rise. To facilitate evaluation of the explosibility of dusts and to give a numerical rating for the relative hazard, empirical indexes were developed by the US Bureau of Mines in their Publication RI-5753, which is the source of the information contained in this appendix. The resulting indexes of ignition sensitivity, explosion severity, and overall index of explosibility were derived by comparing values obtained for these parameters with similar known values for a standard Pittsburgh coal dust, as defined below:

$$\text{Ignition Sensitivity} = \frac{(\text{Ign.temp.} \times \text{Min.energy} \times \text{Min.conc.}) \text{ Pittsburgh coal dust}}{(\text{Ign.temp.} \times \text{Min.energy} \times \text{Min.conc.}) \text{ Sample dust}}$$

$$\text{Explosion Severity} = \frac{(\text{Max.explo.press.} \times \text{Max.rate of press.rise}) \text{ Pittsburgh coal dust}}{(\text{Max.explo.press.} \times \text{Max.rate of press.rise}) \text{ Sample dust}}$$

$$\text{Index of Explosibility} = \text{Ignition Sensitivity} \times \text{Explosion Severity}$$

The indexes are dimensionless quantities and have a numerical value of **1** for dust equivalent to the standard Pittsburgh coal. An explosibility index greater than 1 indicates a hazard greater than that for the coal dust. The index is not derived from theoretical considerations, but provides a rating of explosibility that is consistent with research observations and practical experience. A complete list of data for all samples shown on the table is given in the above referenced Bureau of Mines publication.

The relative hazard of dusts may be further classified by ratings of **weak**, **moderate**, **strong**, or **severe**. These ratings are correlated with the empirical indexes as follows:

Type of Explosion	Ignition Sensitivity	Explosion Severity	Index of Explosibility
Weak	< 0.2	<0.5	<0.1
Moderate	0.2 - < 1.0	0.5 - < 1.0	0.1 - < 1.0
Strong	1.0 - < 5.0	1.0 - < 2.0	1.0 - < 10.0
Severe	≥ 5.0	≥ 2.0	≥ 10.0

Material	(A) Ignition Sensitivity Rating	(B) Explosion Severity Rating	(C) Index of Explosibility (A) X (B)	(D) Ignition Temperature (°C)	(E) Minimum Igniting Energy (joules)	(F) Minimum Explosive Concentration (oz./cu.ft.)	(G) Maximum Explosion Pressure (p.s.i.g.)	(H) Maximum Rate of Pressure Rise (p.s.i./sec)
Alfalfa	0.1	1.2	0.1	440	.32	0.100	66	1,100
Corn	2.8	3.0	8.4	400	.04	.045	95	6,000
Corn cob	4.2	2.9	12.2	400	.04	.030	110	5,000
Corn dextrine	3.2	3.8	12.2	400	.04	.040	105	7,000
Cornstarch	6.6	5.4	35.6	380	.02	.040	115	9,000
Flax shive	0.7	0.3	0.2	430	.08	.080	81	800
Grain, mixed	2.8	3.3	9.2	430	.03	.055	115	5,500
Grass seed	0.9	0.4	0.4	470	.08	.060	76	1,000
Malt, brewers'	3.1	2.1	.65	400	.03	.055	92	4,400
Milk, skim	2.0	2.0	4.0	490	.05	.090	83	2,100
Potato starch	5.1	4.1	20.9	440	.02	.045	97	8,000
Safflower	4.0	1.3	5.2	460	.02	.055	84	2,900
Soy protein <sup>1</sup>	2.2	3.3	7.2	520	.05	.035	96	6,500
Sugar	5.5	2.4	13.2	370	.03	.045	91	5,000
Wheat flour	2.1	1.8	3.8	380	.05	.050	95	3,700
Wheat starch	10.6	4.7	49.8	380	.02	.025	105	8,200

**TABLE A-1 - EXPLOSIBILITY OF AGRICULTURAL DUSTS**

<sup>1</sup>Source: "Classification of Combustible Dusts in Accordance with the National Electrical Code", National Research Council - NMAB Publication 353-3. All other data from "The Explosibility of Agricultural Dusts", US Bureau of Mines Publication RI 5753.

## APPENDIX B WORKING SAFELY DURING RAILROAD GRAIN CAR LOADING

Over the years, Minnesota OSHA has investigated several serious injuries involving the loading and moving of grain cars. The Grain Handling Facilities standard, 1910.272 does not address rail car loading operations. However, Minnesota Statute 182.653, subd. 8, (AWAIR) requires the establishment of an accident and injury reduction program, including a section on the methods used to identify, analyze and control new or existing hazards, conditions, and operations. During inspections, OSHIs should verify that the employer has addressed the hazards of rail car loading within the AWAIR program. Some items of concern include:

### SETTING UP

1. Has a blue flag been placed just after the switch on the track being used? This flag should be waist high and placed securely between the rails. This is a signal to the switch engine crew that this track is closed and they cannot pass the flag.
2. Have the conditions of the track, cars, or hoppers to be loaded been inspected? Look for bent rails, loose ties, bad ladders on hoppers, or other obvious defects.
3. Do cars or hoppers have a red placard indicating treatment with pesticide? If found, check date of expiration and use appropriate respirator if overexposure is possible.
4. If climbing hoppers, have personnel checked for wet conditions such as morning dew, snow, and ice? Icy hoppers should never be climbed without positive fall protection.
5. Are cars blocked, and wheels chocked on both sides of wheels, and brakes, including handbrake set? Are the cars properly aligned with the grain spouts?
6. The safest way to open a string of hoppers is with a **two** person crew with one person kneeling at each corner of the cover and working together. If only one person attempts to open the cover from the center position, it could easily lead to the employee falling into the hopper car. Has the employer addressed the hazard of a single person opening a hopper cover?
7. Has the employer addressed the fall potentials from rail cars with a requirement that fall protection equipment be utilized? (Cite 182.653, subd. 2)

### LOADING OF CARS

1. Has the employer developed a safe method for loading cars? If the employer uses a car puller, what procedures have been developed to make certain that car pullers are safe, maintained properly, and are controls located at the spout?
2. How has the employer addressed the issue of communication amongst the car loaders? One method for loading of cars is for the car loader to use hand signals to direct a person on ground level at the controls. Signals to stop, start, or slow down must be agreed upon before loading. Walkie-talkies may also be used as an effective means of communication.
3. Does the car puller have an alarm system which has a distinct loud sound to give a 5-10 second warning before the car actually moves?
4. Does the car loader have positive fall protection (body harness, lifeline, and an acceptable anchorage point) at the work station?

5. The least safe method of loading cars is to use a tractor, switch engine, payload, or other self-propelled vehicle to control the movement of the cars. In using this method, usually the operator of the vehicle cannot see the car loader and must rely on a third person to relay signals. This can result in delay or other human errors causing unexpected movement of the hopper being loaded. Also, there are more hazards to persons nearby since car moving alarms are not automatic. What procedures has the employer instituted to protect the car loaders in the above circumstances?

#### WORKING AROUND CARS AND HOPPERS BEING LOADED

Does employee training include instructions, such as the following:

1. **Never** get between the cable and the car or hopper being loaded.
2. **Never** step on or over a slack cable.
3. Stay out of the area behind the hook and cable unless you are protected by a steel barricade such as those built around cable controls.
4. Stay out of the danger area formed by a triangle of the puller, pulley and hopper. The pulley can fail causing the cable to act as a giant sling shot, shooting the pulley into this danger area.
5. Do not crawl under or climb over cars or hoppers via couplings. Take the time to walk around cars being loaded.
6. Do not distract or interfere with persons at the ground controls or giving relay signals.
7. Be alert for the sound of the warning signals.
8. Stay away from the doors of cars being opened or closed. These doors weigh up to 400 pounds and are mounted much like a shower door; they are not secure from falling.

## APPENDIX C

### REFERENCES

The primary list of references relating to grain handling facilities is contained in Appendix C of 29 CFR 1910.272. The following sources, some of which have been mentioned in this instruction, may prove useful in assessing compliance with the standard.

1. Bureau of Mines Report of Investigation--5753. See preamble to the standard, 52 FR 49601, for description.
2. Classification of Combustible Dust in Accordance with NEC. National Academy of Sciences, Washington, D.C. Available from National Technical Information Service, Springfield, Virginia 22151
3. Prevention of Grain Elevator and Mill Explosions. National Academy of Sciences, Washington, D.C. Available from National Technical Information Service, Springfield, Virginia 22151
4. Pneumatic Dust Control in Grain Elevators. National Academy of Sciences, Washington, D.C. Available from National Technical Information Service, Springfield, Virginia 22151
5. The Country Elevator Safety and Health Guidebook. Part of the "Grain Industry Safety and Health Center--Training Series," published under USDOL Grant No. E9F5B271. Grain Elevator and Processing Society, P. O. Box 15026, Commerce Station, Minneapolis, MN 55415-0026.
6. Fires and Dust Explosions in Agricultural and Food Products Facilities. 1995 edition, NFPA 61.
7. Website of the Grain, Milling, Feed and Seed Industries: <http://grainnet.com>

## GRAIN ELEVATOR HELP SHEET

Emergency Action Plan / develop and implement	1910.272(d)
Training / shall provide training at least annually	1910.272(e)
Hot Work Permit / shall issue a permit	1910.272(f)
Entry into Bins / permit – lockout/tagout – testing	1910.272(g)(1)
Entry into Bins / body harness	1910.272(g)(2)
Entry into Bins / observed stationed outside	1910.272(g)(3)
Entry into Bins / shall provide rescue equipment	1910.272(g)(4)
Entry into Bins / observer shall be trained	1910.272(g)(5)
Entry into Bins / when to not enter bins	1910.272(g)(6)
Entry in Flat Storage Structures / equipped with lifeline	1910.272(h)(1)
Entry in Flat Storage Structures / walking the grain	1910.272(h)(2)
Contractors	1910.272(i)
Housekeeping / shall develop a written housekeeping program	1910.272(j)
Grate Openings / shall be covered by grates	1910.272(k)
Filter Collectors / fabric dust filter shall be equipped with a monitoring device	1910.272(l)(1)
Filter Collectors / installed after March 30, 1988 shall be located outside of the facility	1910.272(l)(2)
Filter Collectors / located in an area inside the facility protected by an explosion suppression system	1910.272(l)(3)
Filter Collectors / located inside the building having at least a one-hour fire-resistance rating	1910.272(l)(4)
Preventive Maintenance / regularly scheduled inspection	1910.272(m)(1)(i)
Preventive Maintenance / lubrication – according to manufacturers' recommendation	1910.272(m)(1)(ii)
Preventive Maintenance / certification record	1910.272(m)(3)
Preventative Maintenance / use of locks and tags	1910.272(m)(4)
Emergency Escape / two means of escape from galleries	1910.272(o)(1)
Emergency Escape / one means of escape in tunnels	1910.272(o)(2)
Continuous-flow Bulk Raw Grain Dryers / automatic controls	1910.272(p)(1)
Continuous-flow Bulk Raw Grain Dryers / if installed after March 30, 1988 must be located outside of building	1910.272(p)(2)
Inside Bucket Elevators / jogged to free a choked leg	1910.272(q)(1)
Inside Bucket Elevator / the employer shall:	1910.272(q)(4) & (5)
Mount bearing externally to the leg casing or	
Provide vibration monitoring, temperature monitoring	
Equip bucket elevators with a motion detection device	
Equip bucket elevators with a belt alignment monitoring device	
Provide a means to keep the belt tracking properly	