

**OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF CONSUMER AND BUSINESS SERVICES**

PROGRAM DIRECTIVE

Program Directive: **A-189**

Issued: September 1, 1981

Revised: April 25, 2011

SUBJECT: Grain Handling Facilities

PURPOSE: This instruction provides guidelines for inspections conducted in grain handling facilities and clarifications of 1910.272.

SCOPE: This instruction applies to all of Oregon OSHA.

**AFFECTED STANDARDS/
DIRECTIVES:** Division 2, Subdivision R, 1910.272 Grain Handling

ACTION: Field office supervisors will ensure that all inspections of grain handling facilities are conducted in accordance with the guidelines given in this directive.

BACKGROUND: The standard for grain handling facilities, 1910.272, was promulgated on December 31, 1987, at Federal Register Volume 52, No. 251 (52 FR 49592) and became effective March 30, 1988, except for housekeeping provisions which were delayed by Federal Court Order until August 1988. March 8, 1996, amendments were added in Federal Register Volume 61, No. 147 (47FR9578) and became effective April 8, 1996.

- A. The standard is the result of several years of effort by OSHA in response to known hazards to employees (particularly fires and explosions) found in grain handling facilities. The final rule also addresses other safety hazards (e.g., bin entry).

- B. Although the final rule applies to all grain handling facilities, it is not a "vertical" industry standard. It is not intended to address all hazards found in workplaces of this type. Therefore, the standards contained in 1910 for general industry and 1917 for marine terminals, as appropriate, will continue to apply to grain handling facilities. 1910.272, however, takes precedence inside the grain handling facility over other provisions in 1910 and 1917 for the specific hazards the grain standard addresses.

- C. The amendments made in the March 8, 1996, Federal Register revise paragraph 1910.272(g) and create a new paragraph 1910.272 (h) addressing engulfment hazards in bins, silos, and tanks and in flat storage structures, respectively.

**S/HCO SAFETY
AND HEALTH:**

The S/HCO must take appropriate precautionary measures for the particular hazards presented in grain handling facilities.

- A. Personal Protective Equipment (PPE). In addition to normal personal protective equipment, it is recommended that staff conducting inspections and consultations in grain handling facilities wear natural fiber (e.g., cotton), non-spark-producing clothing.
- B. Manlifts. Care will be taken that manlifts and other means of access to upper levels of a facility are used by Oregon OSHA staff only when this can be done safely.
 - (1) Conduct an in-depth safety evaluation of manlifts, ladders, stairways, etc., in the facility before using them to gain access to upper levels. If they are found to be unsafe or not in compliance, and no alternative safe means is provided, stop the inspection and follow normal enforcement procedures to achieve compliance, and return to finish the remainder of the inspection after abatement of the hazard has been verified. If you are a consultant, do not access that part of the facility.
 - (2) Extreme caution must be used on belt manlifts. Belt manlifts, even when totally in compliance with Oregon OSHA standards (1910.68), pose a potential fall hazard. Use alternate routes, when available, when you feel your safety is in question. When using a belt manlift, do not carry clipboards or other equipment except when it is secured in a bag or container that leaves the hands free (e.g., a secured bag with a neck strap).
 - (3) If you are not familiar with the particular type of manlifts used at the facility request specific hazard training and/or instruction from an appropriately knowledgeable employer representative.

**STANDARD
CLARIFICATIONS:**

The following clarifications of specific provisions of 1910.272 are provided to assist in conducting inspections and consultations at grain handling facilities.

A. Scope and Application of 1910.272(a) and (b).

- (1) The majority of facilities covered by the standard are in Standard Industrial Classifications (SICs) or North American Industrial Classifications (NAICs).
 - (a) SIC 2041, Flour and other Grain Mill products; NAIC 311211;
 - (b) SIC 2044, Rice Milling; NAIC 311212;
 - (c) SIC 2048, Prepared Feeds and Feed Ingredients for Animals and Fowls, Not Elsewhere Classified; NAIC 311119;
 - (d) SIC 4221, Farm Product Warehousing and Storage; NAIC 493130, and,
 - (e) SIC 5153, Grain and Field Bean Merchant Wholesalers; NAIC 424510.
- (2) Covered workplaces may also be found in other SICs or NAICs 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.)
- (3) Facilities in the following SICs or NAICs are generally not covered by the standard:
 - (a) SIC 2043, Cereal Breakfast Foods; NAIC 311230;
 - (b) SIC 2045, Blended and Prepared Flour; NAIC 311822;
 - (c) SIC 2047, Dog, Cat, and Other Pet Food; NAIC 311111;
 - (d) SIC 2051, Bread and Other Bakery Products, Except Cookies and Crackers; NAIC 311812, and

- (e) (SIC 5191, Merchant Wholesale Distribution of Farm Supplies such as seeds for future crops;
NAIC 424910
- (4) See Division 4/A for information about the scope, application, and coverage of the Division 4/Agriculture rules (1910.272 does not apply to farm storage or feed lots).
- (5) If the S/HCO 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 A, References, of this instruction.)

B. Emergency Action Plan, 1910.272(d).

- (1) Division 2, Subdivision E, OAR 437-002-0042 requires employers to develop a written emergency action plan unless they have 10 or fewer employees. Employers with 10 or fewer employees still need a plan and need to substantiate that the plan is communicated orally in an effective manner.
- (2) All employees, including truck drivers, sales and office personnel, seasonal employees, and part-time employees, will be included in determining the total number of employees at a given workplace.

C. Training, 1910.272(e). Employees are required to be trained in the recognition and prevention of hazards associated with grain handling facilities.

- (1) You must verify whether employees are trained in all aspects of safety and health related to their job tasks. Employers must verify that employees are trained not to introduce ignition sources (sparks, arcs) through the use of electric tools, grinding or drilling in hazardous areas containing combustible dusts. Other ignition sources include welding, cutting, use of open flames or smoking materials in hazardous areas.
- (2) The standard does not require that training records be kept to verify that employees have been adequately trained. Therefore, substantiate the adequacy of training by reviewing any training records offered by the employer, and by interviewing a sample of employees.
- (3) Employers must start training employees prior to their beginning an assignment.

D. Hot Work Permit, 1910.272(f).

- (1) If a permit is issued, the employers' representative does not have to be at the specific "hot work" site during the entire time the work is performed. It is reasonable to expect that the employer monitor frequently, at least each shift, to ensure permit requirements are being followed.
- (2) If the employer elects to have a representative present in lieu of a written permit, the employer must follow the same requirements as if a permit were issued in accordance with 1910.252(a). In this situation, the representative must be present for the entire duration of the job.
- (3) The term "flame producing" used in the definition of "hot work" in 1910.272(c) includes ignition sources (sparks, arcs) produced by operations such as welding, cutting, and brazing. Hot work permits are necessary for these types of operations.

E. Entry into Grain Storage Structures 1910.272(g).

Bins, silos, and tanks are covered by paragraph (g). Flat storage structures including certain tanks, which do not have any atmospheric hazards, are covered in paragraph (h).

- (1) A life line (body harness attached) used for entry procedures must be of a length that would not allow the employees to sink any further than waist deep in the grain. The body harness with lifeline or boatswain's chair must meet the requirements of Division 2/D of this part. (1910.272(g)(2))
- (2) 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. (1910.272(f)(1))
- (3) If fumigants have been applied, review the employer's program for fumigation procedures and testing of the atmospheres for toxicity. The hazard analysis under 1910.132(d) should also be reviewed for appropriate PPE use.
- (4) Ask the employer to verify the procedure(s) used to ensure that testing equipment used to determine hazardous atmospheres e.g., pesticides, fumigants, dust, and oxygen deficiency is properly calibrated and maintained prior to use.

- (5) If testing the atmosphere indicates oxygen deficiency and/or the presence of toxic and flammable gases above the specified limits, ensure that employees are provided with required ventilation and/or PPE before entry. (1910.272(g)(1)(iii)(A))
- (6) Aeration fans can qualify as forced air ventilation even when grain is covering the aeration ducts, provided that the air exits the duct at above the grain level. (Appendix A)
- (7) Evaluate available rescue equipment to determine its adequacy for each particular situation, i.e., types and configurations of bins, which may be somewhat different at each facility. The employer may have to establish that the equipment is suitable to perform the task for the particular facility. (1910.272(g)(4))
- (8) Employees are forbidden to walk or work on the surface of the grain 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 stay on the grain to conduct tests, the worker must be protected from engulfment. 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 employer if they are involved in the entry. The employer must be able to show 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 must verify that all employees, before being permitted to walk on stationary grain, have completed the training required in paragraph 1910.272(e).
- (9) 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. (1910.272 (g)(1)(iv))
- (10) When employees need to free caked, plugged, or bridged grain to move it, such as to a center draw off, the employee's body weight must be supported in a boatswain's chair with a life line suspended from the top. The boatswain's chair must be supported by slings attached to a suspended rope, and must be designed to accommodate one person in a sitting position.

Verify that employers provide a body guard, equipped with communication mode, who maintains contact with the employee entering the silo, bin or tank. Verify that the observer or the body guard 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 identifies a greater hazard exists, both engulfment and mechanical hazards must be addressed by alternate means.

- (11) 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 must verify that the employee will not be exposed to mechanical hazards. Employers must not permit employees to enter silos whenever bridging conditions or grain funneling (side building) exists.

F. Entry into Flat Storage Structures 1910.272(h).

This paragraph addresses grain storage structures that will not empty completely, without the use of mechanical equipment or manual means, 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 structures that may have atmospheric hazards is covered in the 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.

- (1) 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, transport equipment) is de-energized, disconnected and locked out. The employer must 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. The employer must verify that there is no recent history of draw-off problems that could create cavities in the grain pile. The employer must also verify that employees involved in this task will have completed the training required in paragraph 1910.272(e) before walking on the grain or grain products. (1910.272(h)(2)(i))

- (2) Where lifelines are used, their length must not allow the employees to sink any further than waist deep in the grain. (1910.272(h)(1))
- (3) "Walking down grain" for the purpose of making the grain flow or any other purpose is prohibited in flat storage structures. See (1910.272 (h)(2)(ii)).
- (4) No employee will be permitted to work underneath bridging conditions or in any location where the possibility of engulfment from falling grain exists. (1910.272(h)(3))

G. Contractors, 1910.272(i).

- (1) The intent of the phrase "shall inform," is that an employer will 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.
- (2) 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 while 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.

H. Housekeeping: General, 1910.272(j). The standard incorporates strict and clear requirements for employers to adopt housekeeping practices that best reduce accumulations of grain dust.

- (1) 1910.272(j)(1) is applicable to grain elevators and those mills specified in 1910.272(b)(1), application.
- (2) 1910.272(j)(2) applies only to grain elevators and not to processing or mill operations.
- (3) In order to substantiate violations of the employer's housekeeping programs, S/HCOs must carefully prepare the evidence by documenting the specific procedures the employer uses to keep dust accumulations at a minimum. Documentation must address at least the following:
 - (a) Manual dust removal procedures, including frequency and extent.

- (b) 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).
- (c) Representative measurements and photos must be taken to document apparent violations of the general housekeeping provision of the standard. (See 1910.272, Appendix A.) It may be necessary to take several measurements at specific locations within the general area. The locations must be identified on a plant sketch.

NOTE: Because of spark-producing potential, no equipment including flash bulbs and electronic flashes (cameras) or electrical equipment will be used in hazardous areas in grain handling facilities unless the equipment is approved for use in these types of areas.

- (d) Areas of particular concern beyond the priority areas are the grain transfer points, such as galleries (bin floors) and tunnels.
- (e) Representative samples of dust must be taken in areas where apparent violations of the general housekeeping provision exist to verify organic dust percentage, moisture content, and particle size. Sample quantities will not normally have to exceed one-half pint at each location.
- (f) When the employer elects to use additives to control the dust rather than collection and other control methods, document the types used, specific application points and application rate, and verify the effectiveness of the method through appropriate sampling and measurement.

- I. Housekeeping: Priority Areas in Grain Elevators, 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 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, such as 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, 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.

- (1) A representative number of measurements, photos, and samples must be taken of all floor areas within a priority area to document a violation of the 1/8 - inch action level; and noted on a plant sketch.

NOTE: Because of spark-producing potential, flash bulbs and electronic flashes must under no circumstances be used in grain handling facilities.

- (2) The S/HCO will use professional judgment to assess the extent of a hazard caused by 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 must be identified and documented as a potential violation of the overall housekeeping program specified by 1910.272(j)(1).
- (3) A priority area will 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.

J. Blowdown Operations, 1910.272(j)(3).

- (1) Equipment may be operated during blowdown operations if the following conditions exist:
 - (a) 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); and
 - (b) The bearings are effectively monitored; and
 - (c) All ignition sources in the area are removed or controlled; and
 - (d) An effective preventive maintenance program has been implemented.
- (2) Isolation techniques, shrouding, etc., should be encouraged and can be acceptable to minimize dust suspension and dispersal of accumulated dust.

- K. Grain and Product Spills, 1910.272(j)(4). Product spills, especially in flour mill operations, should receive prompt attention. These spills must 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.
- L. Grate Openings, 1910.272(k). Employers should be encouraged to use magnets and openings as small as possible in the receiving grate to minimize the hazard potential. 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 openings may be used to accommodate the commodity if magnets are used at the receiving pit or if suspended magnets are used over conveyance systems prior to entering the boot of the elevator leg.
- M. Filter Collectors, 1910.272(1). Product and/or process filters are not covered by this paragraph. An excellent reference for both the S/HCO 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 A, References, of this instruction.)
- N. Preventive Maintenance, 1910.272(m).
- (1) 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.
 - (2) The S/HCO must 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 be focused on the harvest season. If the inspection is being conducted at a time other than harvest season, conduct an evaluation of programs (e.g., interviewing sufficient key employees) to determine conditions and adequacy of preventive maintenance.
 - (3) Manufacturers' recommendations for equipment can assist in determining adequacy of maintenance frequency criteria.
 - (4) Bearings not associated with inside bucket elevators (i.e., those located on gallery and tunnel belts, mechanical equipment) must have inspections and proper lubrication as required by 1910.272(m)(1)(ii).

- O. Emergency Escape, 1910.272(o)(1).
- (1) Employers will need to provide at least two means of emergency escape from galleries (bin decks) and one means of emergency escape in tunnels of existing grain elevators. Tunnels in grain elevators constructed after the effective date of this standard must be provided with at least two means of emergency escape in accordance with Division 2/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 provisions in Division 2/E.
- (2) If controlled descent devices are used, they must 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 must 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.
- P. Continuous-flow Bulk Raw Grain Dryers, 1910.272(p)(1)(ii). Use the manufacturer's recommendations for maximum operating temperature of the drying section to determine or evaluate what is considered "excessive" temperature.
- Q. Inside Bucket Elevators, 1910.272(q). Elevator legs in mills must comply with the requirements in 1910.272(m)(1) for preventive maintenance even though they are not covered by 1910.272(q). (See 1910.272(b), Application.)
- R. 1910.272(q)(2). When an employer has documentation identifying that the belt characteristics meet the 300 megohms requirement for belts purchased after March 30, 1988, it will be considered to be in compliance.
- S. 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.
- T. 1910.272(q)(6). The preamble of the standard indicates that the hydraulic boot take-ups 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.

- U. 1910.272(q)(7).
 - (1) Permanent Storage Capacity. In determining the permanent storage capacity of an employer's workplace, 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 consist of 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 not be counted.
 - (2) Daily Visual Inspection. The employer will verify that daily visual inspections are being conducted where required and include this in training and preventive maintenance program. It should be documented.
- V. 1910.272(q)(8)(ii). The employer will ensure 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.

ADDITIONAL DOCUMENTATION TO SUPPORT VIOLATIONS:

The S/HCO must obtain the following information to support violations.

- A. Type and age of facility.
- B. Type of construction including;
 - (1) A sketch of the workhouse showing names of floors from the basement roof;
 - (2) Type of fire protection/fire alarm system;
 - (3) Evacuation plan, with the location of emergency exits including fixed ladders;
 - (4) Explosion venting capability;
 - (5) Type of fumigation systems; and any other significant factors.

- C. 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.

MINIMUM DOCUMENTATION NECESSARY FOR ELECTRICAL HAZARDS:

Electrical installation and equipment in grain handling facilities are covered under Division 2/S 1910.301 through 1910.399. Most areas of grain handling facilities where dust accumulations can occur are considered to be hazardous locations, as defined in 1910.307.

- A. Hazardous Locations, 1910.307 is a performance-oriented standard which permits the employer to follow any of three options. Options are that equipment, wiring methods, and installations of equipment in hazardous (classified) locations must be: 1) intrinsically safe, or 2) approved for the hazardous (classified) location, or 3) safe for the hazardous (classified) location.
 - (1) 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).
 - (2) Acceptable evidence might be test date, 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.
- B. Classification of an area as Class II, Division 1 (see 1910.399(a)), will require documentation of the possibility that minimum explosive concentration 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.
- C. Classification of any area within a grain handling facility will normally, at the very least, be Class II, Division 2, as defined in 1910.399(a)(25)(ii).

- D. Some locations within a facility such as rooms or offices that are provided with positive pressure ventilation and self-closing doors, and are constructed so that the room will not allow grain dust to enter during normal operating conditions, are considered nonhazardous locations.
- E. Any electrical citation issued must be adequately documented in the case file. If the citation involves a hazardous location, documentation must address the following matters to the degree possible:
 - (1) Type and quantity of accumulated grain dust, the amount likely to be in suspension, the conditions likely to give rise to such suspensions and their extent; the length of time over which such dust deposits have been accumulating together with any evidence of charring of layered dust; 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); evidence supporting the possibility that dust deposits or suspensions could be ignited. (See the section titled **Laboratory Support-Dust Sample Collection** below).
 - (2) Location and type of potential electrical ignition sources; type and condition of electrical equipment located in the area; evidence that electrical equipment is not safe for the location.
 - (3) The presence or likelihood of mechanical failure or electrical malfunctions or abnormal operation of machinery or equipment; combinations of factors which could result in explosive conditions.
 - (4) Degree of confinement at the location.

LABORATORY SUPPORT--DUST SAMPLE COLLECTION:

- A. The Salt Lake City Analytical Laboratory has the capability to analyze bulk grain dust samples for:
 - (1) Particle size.
 - (2) Combustible fraction of sample and percent combustible dust.
 - (3) Minimum explosive concentration.

- B. Collect and Prepare dust samples for laboratory analysis in the following manner:
- (1) Collection size of sample will be:
 - (a) Approximately 1/2 pint (0.25 liter) concentration of dust to determine particle size, combustibility and moisture content.
 - (b) Approximately one quart (1.0 liter) for analysis for minimum explosive concentration
 - (2) Place the sample in a wide-mouth plastic container with a tight-fitting screw cap. Do not use plastic bags.
 - (3) Seal the containers with an OSHA Sample Seal. Package the containers securely, using packing materials to cushion them during shipment.
 - (4) Follow normal OR-OSHA chain-of-custody procedures for all aspects of sample handling.
 - (5) Indicate on Form OSHA 91A, Item 30, that grain dust tests analysis described above are being requested.

APPENDIX A

References

The primary list of references relating to grain handling facilities is contained in Appendix C of 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. 15026, Commerce Station, Minneapolis, Minnesota 55415-0026.