ALASKA DEPARTMENT OF LABOR
DIVISION OF LABOR STANDARDS AND SAFETY

DOSH Program Directive 88-6

March 17, 1989

To: All DOSH Staff

Subject: Subchapter 16, Grain Handling Facilities - Inspection Guidance and Standard Clarification

A. Purpose: This program directive provides guidelines for inspections conducted in grain handling facilities and provides clarification of standards contained in Subchapter 16.

B. Background. The standard for grain handling facilities, Subchapter 16, was promulgated on September 1, 1988.

1. The standard culminates several years of effort by federal 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 intended to address all hazards to be found in workplaces of this type. Therefore, the standards contained in Subchapter 1, General Safety Code, as appropriate, will continue to apply to grain handling facilities. Subchapter 16, however, takes precedence inside the grain handling facility over other provisions in Subchapter 1, for the specific hazards the grain standard addresses.

C. Inspection Personnel.

1. Experienced Personnel Only. Only compliance safety and health officers (COs and IHs) who are well trained and experienced in grain handling facilities.

2. Expert Services. The Chief of Safety or Health Compliance, in consultation with the Director, Deputy Director and the department's legal counsel will decide as soon as practicable whether or not expert services from outside the Agency (such decide 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.

D. CO and IH Safety and Health. COs and IHs shall take appropriate precautionary measures for the particular hazards presented in grain handling facilities.

1. Personal Protective Equipment (PPE). In addition to normal personal protective equipment, COs and IHs conducting inspections in grain handling facilities shall wear natural fiber (e.g., cotton), non-spark-producing clothing. It is highly recommended that COs and IHs be provided with appropriate flame-retardant clothing.

2. Manlifts. Care shall be taken that manlifts and other means of access to upper levels of a facility are used by COs and IHs only when this can be done safely.

a. COs and IHs shall conduct an indepth safety evaluation of manlifts, ladders, stairways, etc., in the facility before using them to gain access to upper levels. If they are determined to be unsafe or not in compliance, and no alternative safe means is provided, the CO or IH shall stop the inspection, follow normal enforcement procedures to achieve compliance, and return to finish the remainder of the inspection after abatement of the hazards has been verified.

b. Extreme caution shall be used on belt manlifts. Belt manlifts, even when totally in compliance with OSH standards (01.0203 GSC), pose a potential fall hazard to COs and IHs. COs and IHs shall utilize alternate routes, when available, when they feel their safety is in question. When using a manlift, shall 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).

c. COs and IHs who are not familiar with the particular type of manlifts used at the facility being inspected shall request specific hazard training and/or instruction from an appropriately knowledgeable employer representative.

E. Standard Clarifications. The following clarifications of specific provisions of Subchapter 16 are provided to assist COs and IHs in conducting inspections at grain handling facilities.

1. <u>16.0101(a) and (b), Scope and Application</u>.

a. The majority of facilities covered by the standard are in Standard Industrial Classifications (SICs):

(1) 2041, Flour and Other Grain Mill Products;

(2) 2044, Rice Milling;

(3) 2048, Prepared Feeds and Feed Ingredients for Animals and Fowls, Not Elsewhere Classified;

(4) 4221, Farm Product Warehousing and Storage; and

(5) 5153, Grain.

b. Facilities in the following SICs are generally not covered by the standard:

(1) 2043, Cereal Breakfast Foods;

(2) 2045, Blended and Prepared Flour;

(3) 2047, Dog, Cat, and Other Pet Food; and

(4) 2051, Bread and Other Bakery Products, Except Cookies and Crackers.

c. Covered workplaces may also be found in other SICs (such as those listed at I.1.b. above) where they are not the primary business. If a facility has a grain elevator <u>onsite</u> 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, nor to on-farm storage or feed lots.

e. If the CO or IH 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.)

2. 16.0101(d), Emergency Action Plan.

   a. 02.320(a) OIS, Employee emergency action plans and fire prevention plans, 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 02.320(a) OIS 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. 16.0101(e), Training.

   a. The standard does not require that training records be kept to verify that employees have been adequately trained. Therefore, the CO or IH shall substantiate the adequacy of training by interviewing a sample of employees.

   b. Employers are to have commenced training of employees by the effective date of the standard, September 1, 1988. For special tasks, such as bin entry, training of employees shall have taken place before they are required to perform the work.

   c. In addition to the training information and references listed in Appendix A.3. and Appendix C of the standard, see also Appendix A, References, of this program directive.

4. 16.0101(f), Hot Work Permit.

   a. If a permit is issued, the employer 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 that 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 01.1002(d). 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 16.0101(c)(4), includes ignition sources (sparks, arcs) produced by operation of electric tools and grinding or drilling. Hot work permits are therefore necessary for these types of operations as well.

5. <u>16.0101(g), Entry into Bins, Silos, and Tanks</u>.

a. The life line shall be of such length that it would not allow the employees to sink any further than waist deep in the grain.

b. For unique operations within flat storage buildings or tanks where the diameter is greater than the height:

(1) Employers could use an alternative protective system, e.g., static line restraint devices or the equivalent.

(2) In addition, where lifelines are not feasible, the employer must have a standard operating procedure based on a written job hazard analysis which ensures that no employee enters the space while there is the possibility of either pockets in the grain or adherence of grain to the walls or sides of the building.

d. If the employer or representative elects to remain present during the entire operation, all provisions of 16.0101(g) must still be complied with.

e. When the CO or IH can verify that fumigants have been applied, the employer's program for testing of the atmospheres for toxicity shall be reviewed.

f. The CO or IH shall also check the testing equipment used by the employer to verify that it has been properly calibrated and maintained.

g. Aeration fans do not constitute adequate forced air ventilation when the bin has grain above the aeration fan.

h. The CO or IH shall evaluate the type of rescue equipment available to determine it adequacy for

each particular situation, i.e., types and configuration 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.

6. 16.0101(h), Contractors.

   a. The intent of the phrase "shall inform" is that an employer will have to provide specific instruction and training to contractors on the safety rules of the facility, including applicable provisions o the emergency action plan. Simply providing a copy of the safety program, for example, would not ensure that the contractor or the employer has taken adequate precaution to prevent exposure to potential hazards.

   b. A "contractor" is anyone actually performing work on or inside the facility who is not an employee of the employer. 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.

7. 16.0101(i), Housekeeping--General. The standard does not give employers leeway for establishing a token housekeeping plan; rather, it requires the employer to adopt housekeeping practices determined best to reduce accumulations of grain dust.

   a. 16.0101(i)(1) is applicable to grain elevators and those mills specified at 16.0101(b)(1), Application.

   b. 16.0101(i)(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, COs and IHs 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) If installed, type and design characteristics of the dust collection system, including the location of the pickup points (i.e., boot or head of leg, belt load transfer areas, trippers on bin floors, scale bins, distributors or turn heads) or any other transfer points where dust emission could occur.

(3) Condition and effectiveness of the system, including documentation of maintenance and repair on closed conveyance systems; i.e., leaking spouts, worn-out gaskets, flanges, and other similar emission sources.

(4) Representative measurements and photos shall be taken to document apparent violations of the general housekeeping provision of the standard. (Subchapter 16, Appendix A.) It may be necessary to take several measurements at specific locations within the general area. The locations shall be identified on a plant sketch.

NOTE: Because of spark-producing potential, flash bulbs and electronic flashes shall under not circumstances be used in grain handling facilities.

(5) Areas of particular concern beyond the priority areas are the grain transfer points, such as galleries (bin floors) and tunnels.

(6) 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. Sample quantities will not normally have to exceed one-half pint at each location.

(7) When the employer elects to utilize additives to control the dust rather than collection and other control methods, the CO or IH shall document the types used, specific application points and application rate, and shall verify the effectiveness of the method through appropriate sampling and measurement.

8. <u>16.0101(i)(2), Housekeeping--Priority Areas</u>. The standard establishes a 1/8-inch action level for housekeeping regarding grain dust accumulations in

priority areas. This provision requires cleanup wherever 1/8 inch accumulates in any part of a priority area, regardless of total amount.

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

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

b. The CO or IH shall use professional judgment to assess the extent of 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 serious violation of the requirement. Additionally, all other surfaces within the priority areas that have accumulations of dust shall be identified and documented as a potential violation of the overall housekeeping program specified by 16.0101(i)(1).

c. A priority area shall not be considered to include sections that are separated by walls, partitions, etc.; e.g., control rooms or offices with positive pressure and self-closing doors.

9. <u>16.0101(i)(3), Blowdown Operations</u>.

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); and

   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.

10. 16.0101(i)(4), Grain and Product Spills. Prompt attention to product spills, especially in flour mill operations, is critical. These spills shall be cleaned up immediately after identification. Grain spills do not present the same hazard as product spills and should be cleaned up as soon as possible after identification and as addressed by the standard's requirements.

11. 16.0101(j), Grate Openings. 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 openings may be used to accommodate the commodity if magnets are used at the receiving pit.

    b. Where applicable, COs and IHs shall evaluate the compliance of grate openings with 01.1103 GSC.

12. 16.0101(k), Filter Collectors. An excellent reference for both the CO or IH 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 of this PD, References.)

13. 16.0101(l), Preventive Maintenance.

    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 CO or IH shall particularly 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 CO or IH 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 COs and IHs 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, mechanical equipment) must have inspections and proper lubrication as required by 16.0101(l)(1)(B).

14. 16.0101(n)(1), Emergency Escape.

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 Subchapter 2, Article 3, means of Egress. Controlled descent devices and escape ladders are suitable means of escape from these areas. Manlifts (belt, caged, manual) are not considered an adequate means of escape; however, a fixed ladder in a manlift is acceptable.

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 shall be trained in their use and provided with interface equipment such as a body harness and line sufficient to reach the ground or other safe level.

15. 16.0101(o)(1)(B), Continuous-flow Bulk Raw Grain Dryers. The CO or IH can rely on the manufacturer's recommendations for maximum operating temperature of the drying section to determine or evaluate what is considered "excessive" temperature.

16. 16.0101(p), Inside Bucket Elevators. Elevator legs in **mills** will still have to comply with the requirements in 16.0101(l)(1) for preventive maintenance even though they are not covered by 16.0101(p). (See 16.0101(b), Application.)

17. 16.0101(p)(2). When an employer has written certification that will identify information pertaining to the belt, it will be considered to be in compliance.

18. 16.0101(p)(3)(B). If any portion of the bearing (including inner dust seal) is making contact with the interior leg casing, the bearing will be considered partially inside the leg.

19. 16.0101(p)(3)(c). The most reliable and accurate monitor is the type where the sensor is mounted in the leg casing and actually monitors the fasteners (bolts) on the buckets or cups. The target disc type that measures shaft/pulley rotation is acceptable; however, a significant speed variation could exist between the belt and the tail pulley, resulting in a very unreliable percentage indication. If the latter system is used, the employer should ensure that proper belt tension is maintained to ensure accuracy.

20. 16.0101(p)(3)(D). The preamble of the standard indicates that 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. 16.0101(p)(4).

    a. Permanent Storage Capacity. In determining the permanent storage capacity of an employer's workplace, the CO or IH 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 will have to verify the methodology being used to ascertain proper belt speed and alignment by actual visual observation. The employer should also have this as a part of training and the preventive maintenance program and it should be properly documented.

22. 16.0101(p)(5). The employer will have to certify that concentrations are, in fact, below 25 percent of 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.

J. Effective Dates of Requirements. Most requirements of the standard had an effective date of September 1, 1988; that is, the employer was required to be in compliance as of that date.

1. There are several requirements, however, for which later effective dates apply:

   a. March 30, 1989, for 16.0101(k), Filter collectors;

   b. April 1, 1991, for 16.0101(o), Continuous-flow bulk raw grain dryers; and

   c. April 1, 1991, for 16.0101(p)(3)(A)(B)(C)(D), Inside bucket elevators.

2. Where an inspection is conducted in the interim, and an employer is found not yet to have complied with a requirement that will be effective at a later date, the Chief shall send a letter to the employer:

   a. Advising of the requirement, the effective date, and the hazard(s) the requirement addresses;

   b. Encouraging prompt compliance with the requirement; and

   c. Offering any appropriate advice or assistance toward achieving compliance.

F. Additional Documentation to Support Violations--Construction and Functional Details. The CO or IH 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 basement to 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. Dust removal plan, method of housekeeping, and type of dust removal (collection) system, together

with location and type of dust collection bins or tanks;

f. Type of fumigation systems; and any other significant factors.

3. Plant size and capacity; type and volume of grains handled; product description including, a process flow chart.

4. 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.

G. Minimum Documentation Necessary for Electrical Hazards. Electrical installations and equipment in grain handling facilities are covered under 03.006 EC.

1. 03.006 EC 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 either 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 an design that will provide protection from Class II hazards; i.e., that it is at least as safe ad equipment following the guidelines contained in the National Electrical Code (NEC).

b. Acceptable evidence might be test data, approved equipment markings, or prooof of conformity with the requiremetns of the edition of the NEC in effect at the time that the quipment was installed together with proof that the equipment has not been subsequently changed.

2. Classificaiton of an area as Class II, Division 1, 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, and in the upper garner. They may occur at both ends of a horizontal conveyor or at any

point between the two ends, and where specific dust collection or control methods are not used.

3. Classificaiton of a grain handling facility or any area within it will normally, at the very least, be Class II, Division 2, as defined at 03.099(a)(24)(B)EC.

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, could be considered as nonhazardous locations.

5. Any electrical citation issued must be adequately documented in the case file. Such documentation must address the following matters to the degree possible:

   a. 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 accumlating 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 possiblity that dust deposits or suspensions could be ignited. (See also H.3. of this program directive regarding laboratory support.)

   b. Location and type of potential electrical ignitionsources; type and condition of electrical equipment located in the area; evidence that electrical equipment is not safe for the location.

   c. Likelihood of mechanical failure or electrical malfunctions or abnormal operation of machinery or equipment; combinations of factors which could result in explosive conditions.

   d. Degree of confinement at the location.

H. <u>Laboratory Support--Dust Sample Collection</u>.

1. The OSHA Salt Lake City Analytical Laboratory and the Alaska OSH contract 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. Collect approximately one-half (0.25 liter) of dust in a wide-mouth plastic container with a tight-fitting screw cap. Do not use plastic bags.

b. Seal the containers with an Alaska OSH sample seal. Package the containers securely, using packing materials to cushion them during shipment.

c. Follow normal OSH chain-of-custody procedures for all aspects of sample handling.

d. Indicate on Form OSHA 91A, Item 30, that grain dust tests (the analysis described in H.1. above) are being requested.

3. If it is necessary to have grain dust analyzed for minimum explosive concentration, then a 1.0 liter sample will be necessary. The smaller sample (0.25 liter or one-half pint) noted above is sufficient to determine particle size, combustibility, and moisture content, but not for the tests needed to find the minimum explosive concentration.

Reviewed and Approved.

Tom Stuart, Director

Appendix A

References

The primary list of references relating to grain handling facilities is contained in Appendix C of 16.0101. The following sources, some of which have been mentioned in this PD, 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 the 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 Heatlh Center--Training Series," published under USDOL Grant No. E9F5B271. Grain Elevator and Processing Society, P.O. 15026, Commerce Station, Minneapolis, Minnesota 55415-0026.