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Department of Labor

Occupational Safety and Health Administration

29 CFR Part 1910
Combustible Dust; Proposed Rule

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. OSHA–2009–0023]

RIN 1218–AC41

Combustible Dust

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Advance notice of proposed rulemaking.

SUMMARY: In this advance notice of proposed rulemaking (ANPR), OSHA is requesting comments, including data and other information, on issues related to the hazards of combustible dust in the workplace. For the purposes of this notice, the term ''combustible dust'' includes all combustible particulate solids of any size, shape, or chemical composition that could present a fire or deflagration hazard when suspended in air or other oxidizing medium. OSHA plans to use the information received in response to this notice in developing a proposed standard for combustible dust.

DATES: Submit comments in response to this ANPR by January 19, 2010.

ADDRESSES: Submit comments as follows:

• *Electronic.* Submit comments electronically at *http://www.regulations.gov,* which is the Federal eRulemaking Portal. Follow the instructions online for submitting comments.

• *Facsimile.* Commenters may fax submissions, including attachments, that are no longer than 10 pages in length to the OSHA Docket Office at (202) 693–1648; OSHA does not require hard copies of these documents. Commenters must submit lengthy attachments that supplement these documents (*e.g.,* studies, journal articles), in triplicate hard copy, to the OSHA Docket Office, Technical Data Center, Room N–2625, U.S. Department of Labor, 200 Constitution Ave., NW., Washington, DC 20210. These attachments must clearly identify the commenter's name, date, subject, and docket number (*i.e.,* OSHA–2009–0023) so the Agency can attach them to the appropriate comments.

• *Regular mail, express delivery, hand (courier) delivery, and messenger service.* Submit three copies of comments and any additional material (*e.g.,* studies, journal articles) to the OSHA Docket Office, Docket No. OSHA–2009–0023 (or Regulation Identifier Number (RIN) 1218–AC41), Technical Data Center, Room N–2625, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone (202) 693–2350 (TDY number: (877) 889–5627). Note that security procedures may result in significant delays in receiving comments and other written materials by regular mail. Contact the OSHA Docket Office for information about security procedures concerning delivery of materials by express delivery, hand delivery, and messenger service. The hours of operation for the OSHA Docket Office are 8:15 a.m.–4:45 p.m., e.t.

• *Instructions.* All submissions must include the Agency name and the OSHA docket number or RIN for this rulemaking (*i.e.,* OSHA Docket No. OSHA–2009–0023 or RIN 1218–AC41). Submissions, including any personal information provided, are placed in the public docket without change and will be available online at *http://www.regulations.gov.* Therefore, the Agency cautions commenters about submitting statements they do not want made available to the public, or submitting comments that contain personal information (either about themselves or others) such as Social Security numbers, birth dates, and medical data.

• *Docket:* To read or download submissions or other material in the docket, go to *http://www.regulations.gov* or the OSHA Docket Office at the address above. While all documents in the docket are listed in the *http://www.regulations.gov* index, some information (*e.g.,* copyrighted material) is not publicly available to read or download through this Web site. All submissions, including copyrighted material, are available for inspection and copying at the OSHA Docket Office. Contact the OSHA Docket Office for assistance in locating docket submissions.

FOR FURTHER INFORMATION CONTACT: Information regarding this ANPR is available from the following sources:

• *Press inquiries.* Contact Jennifer Ashley, Director, OSHA Office of Communications, Room N–3647, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone: (202) 693–1999.

• *General and technical information.* Contact Don Pittenger, Director, Office of Safety Systems, OSHA Directorate of Standards and Guidance, Room N–3718, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone: (202) 693–2255; fax: (202) 693–1663.

• *Copies of this* ***Federal Register*** *notice.* Electronic copies are available at *http://www.regulations.gov.* This **Federal Register** notice, as well as news releases and other relevant information, also are available at OSHA's Web page at *http://www.osha.gov.*

SUPPLEMENTARY INFORMATION:

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I. Background

A. Introduction

The hazards of combustible dust encompass a wide array of materials, industries, and processes. Any combustible material can burn rapidly when in a finely divided form. Materials that may form combustible dust include, but are not limited to, wood, coal, plastics, biosolids, candy, sugar, spice, starch, flour, feed, grain, fertilizer, tobacco, paper, soap, rubber, drugs, dried blood, dyes, certain textiles, and metals (such as aluminum and magnesium).

Five elements are needed for a combustible dust explosion to occur. The first three elements are those necessary for a fire: Fuel, heat, and an oxidizer. These three elements form the ''fire triangle,'' in which combustible dust is the fuel, heat is provided by any source of ignition, and oxygen is present in air and in oxidizers.

The fourth element is dispersal of dust into a cloud of the proper concentration. These four conditions are necessary for a deflagration, which is violent combustion accompanied by a pressure wave. The combustion is rapid, but propagates at a speed less than the speed of sound.

A fifth element, confinement, is necessary for an explosion. Confinement can be any enclosure—including, but not limited to, a building, room, duct, or processing and storage equipment. An explosion occurs when the pressure developed by a deflagration bursts or ruptures the enclosure. Together, these five elements (fuel, heat, an oxidizer, dispersion and confinement) are known as the ''dust explosion pentagon.'' The minimum explosible concentration is the lowest concentration of combustible dust suspended in air that will support a deflagration.[1]

Secondary explosions or deflagrations occur when pressure waves from an initial (or primary) deflagration or explosion cause dispersal and ignition of combustible dust that has accumulated on surfaces. Secondary explosions are often more devastating than primary explosions due to the increased amount of fuel and the size of the ignition source (*i.e.,* the initial event). In some cases, explosions continue to cascade throughout an area or facility.

OSHA is developing a standard that will comprehensively address the fire and explosion hazards of combustible dust. The Agency's existing standards address some, but not all, of the elements needed to protect workers from these hazards. For example, OSHA's general industry housekeeping standard (29 CFR 1910.22(a)(1)) addresses accumulations of dust, including dusts that may be combustible, and the general industry electrical standard (29 CFR 1910, subpart S) helps to control electrical ignition hazards. When workers are exposed to hazards not currently addressed in the OSHA standards, employers are cited under the General Duty Clause (GDC) specified by Section 5(a)(1) of the Occupational Safety and Health Act of 1970 (OSH Act; see 29 U.S.C. 654). The information requested in this notice will help the Agency develop a standard that would better protect workers from the hazards of combustible dust.

Industries that may have combustible dust hazards include, among others: Agriculture, animal food manufacturing, grain handling, food manufacturing, wood product manufacturing, chemical manufacturing, textile manufacturing, furniture manufacturing, metal processing, fabricated metal products and machinery manufacturing, pesticide manufacturing, pharmaceutical manufacturing, tire manufacturing, production of rubber and plastics, plastics and rubber products manufacturing, recycling, wastewater treatment, and coal handling and processing. To determine which industries may be affected by an OSHA standard regulating combustible dust hazards, OSHA identified industries that had previous incidents relating to combustible dust. Table 1 summarizes this data. Incidents were identified using data from the U.S. Chemical Safety and Hazard Investigation Board (CSB) involving incidents occurring from 1980 to 2005. For incidents between 2006 and 2008, OSHA used reports gathered by the Web site ''dustexplosions.blogspot.com.'' Using these two data sources, OSHA assigned a North American Industry Classification System (NAICS) code to each incident using the available information. The groups of NAICS codes in this table were determined by combining similar industries together that had explosions in the past. Incidents having insufficient information to assign a NAICS code to the affected establishment were classified as ''unknown.'' OSHA's preliminary analyses show that, in industries for which combustible dust fires or explosions have occurred, there are 426,000 establishments employing 16 million workers (see Table 1). The table does not show that these industries include over 333,000 small businesses with 6.5 million employees. It is possible that some establishments in these industries do not have significant dust hazards.

TABLE 1—INDUSTRIES HAVING AT LEAST ONE RECORDED COMBUSTIBLE DUST INCIDENT REPORTED SINCE 1980, ACCORDING TO OSHA RESEARCH

NAICS group[1]	Name of industry[1]	Incidents (1980–2008)[2]	Firms[3]	Establishments[3]	Employees[3]
115111	Cotton Ginning	1	260	279	2,654
221000	Utilities, Electric Power Gen	28	6,554	17,174	614,427
311000	Food Manufacturing (Except 311100, 311200, 311300, 311800, 311900).	8	5,820	7,786	834,277
311100	Animal Food Mfg. (Except 311119)	2	176	248	16,202
311119	Other Animal Food Mfg	5	1,046	1,549	31,971
311200	Grain and Oilseed Milling (Except 311221 and 311230)	5	392	658	31,439
311221	Wet Corn Milling	21	33	65	8,875
311230	Breakfast Cereal Mfg	6	43	66	13,410
311300	Sugar & Confectionary Product Mfg. (Except 311313)	5	1,581	1,700	66,341
311313	Beet Sugar Manufacturing	6	10	33	6,263
311800	Bakeries	4	9,301	10,072	288,393
311900	Other Food Manufacturing	8	2,768	3,205	161,567
312000	Beverage and Tobacco Product Mfg. (Except 312110)	4	2,193	2,379	83,531
313000	Textile Mills	11	2,770	3,243	187,766
314000	Textile Product Mills	2	6,456	6,726	155,586
321000	Wood Product Mfg. (Except 321113 and 321219)	28	11,192	12,749	449,650
321113	Sawmills	7	3,398	3,731	104,666
321219	Reconstituted Wood Prod. Mfg	14	167	255	22,190
322000	Paper Manufacturing	18	3,269	5,139	441,430
324000	Petroleum & Coal Products Mfg	1	1,166	2,448	102,997
325000	Chemical Mfg. (Except 325188 and 325410)	31	7,737	10,749	514,732
325188	Basic Inorganic Chemical Mfg	11	390	612	40,589
325410	Pharmaceutical & Medicine Mfg	8	1,481	1,886	249,743
326000	Plastics and Rubber Products Mfg. (Except 326211)	17	11,365	11,454	846,857

[1] The terms ''deflagration'', ''explosion'', and ''minimum explosible concentration'' are used in this notice as defined in NFPA 654 (2006 edition) for combustible dust only. This notice does not address the terms ''detonation'' or ''explosion'' as they relate to materials classified as explosives.

TABLE 1—INDUSTRIES HAVING AT LEAST ONE RECORDED COMBUSTIBLE DUST INCIDENT REPORTED SINCE 1980, ACCORDING TO OSHA RESEARCH—Continued

NAICS group [1]	Name of industry [1]	Incidents (1980–2008) [2]	Firms [3]	Establishments [3]	Employees [3]
326211	Tire Manufacturing	5	91	138	53,985
327000	Nonmetallic Mineral Prod. Mfg	4	11,332	17,350	482,459
331000	Primary Metal Manufacturing	32	4,310	5,285	449,914
332000	Fabricated Metal Product Mfg	27	54,969	59,064	1,563,713
333000	Machinery Manufacturing	7	23,842	26,317	1,126,671
334000	Computer, Electronic Equip. Mfg	2	12,733	14,548	1,057,485
336000	Transportation Equipment Mfg	16	10,552	12,707	1,622,527
337000	Furniture & Related Product Mfg. (Except 337100)	2	4,779	5,148	188,908
337100	Household & Institutional Furniture, Cabinet Mfg	16	15,878	16,301	354,341
339000	Miscellaneous Manufacturing	7	29,925	31,239	686,096
423000	Merchant Wholesalers (423110, 423210, 423310, 423930)	4	22,669	27,704	432,265
488000	Support Activities for Transportation	1	29,416	37,083	579,589
493000	Warehousing and Storage	1	7,176	13,849	595,325
511000	Publishing Industries	1	22,874	31,821	1,039,739
561210	Facilities Support Services	1	1,680	4,115	164,637
562000	Waste Management and Remediation Services	3	16,189	19,919	345,334
Other	Unknown Industry Category	42	.....	.....	.....
	Total	422	347,983	426,794	16,018,544

Sources:
[1] North American Industry Classification System, United States, 2008.
[2] Incident data from U.S. Chemical Safety and Hazard Investigation Board and *http://dustexplosions.blogspot.com.*
[3] County Business Patterns 2006—U.S. Census Bureau.

B. Dust Explosions in Grain Handling Facilities

In the 1970s, agriculture and food processing industries experienced several combustible dust explosions. A 1977 grain-dust explosion in Westwago, Louisiana, killed 36 workers. It remains the deadliest grain-dust explosion of the modern era. Five days later, another grain-dust explosion in Galveston, Texas, caused the deaths of 9 workers and injured 34 others.[2] As a result of these and other grain-dust explosions in the 1970s, OSHA issued a document entitled ''Grain Elevator Industry Hazard Alert,'' which provided employers, workers, and other officials with information concerning the hazards and safe handling of grain.

Later in the 1970s, the Agency initiated rulemaking to address the problem of grain-dust explosions. On December 31, 1987, after extensive public comment on its proposed rule and several public hearings, OSHA published its final standard on Grain handling facilities, 29 CFR 1910.272 (52 FR 44592). In its *Combustible Dust Hazard Study* of November 2006 (discussed further in Section 1(D) of this notice), the U.S. Chemical Safety and Hazard Investigation Board stated: ''OSHA's Grain handling facilities standard provides a model for OSHA action that has proven effective in reducing catastrophic dust explosions in the grain industry.'' [3]

During a review of the Grain handling facilities standard in 2003, OSHA received comments from union representatives claiming that, since its promulgation, grain explosions were down 42 percent, and injuries and deaths from grain explosions were reduced by 60 percent and 70 percent respectively.[4] Figure 1 shows the number of grain-dust explosions per year since 1978. For the ten years prior to the standard (1978–1987), the average number of explosions per year was 20.5. This average decreased to 10.3 explosions per year from 1988 to 1997 and further decreased to 6.3 per year from 1998 to 2007. OSHA gathered this data from the *Regulatory Review of OSHA's Grain Handling Standard,*[5] Kansas State University in cooperation with USDA Federal Grain Inspection Service,[6] and USDA Grain Inspection, Packers, and Stockyards Administration.[7]

[2] National Academy of Science, *International Symposium on Grain Elevator Explosions,* July 11–12, 1978, National Materials Advisory Board Committee on Evaluation of Industrial Hazards.

[3] U.S. Chemical Safety and Hazard Investigation Board Investigation Report No. 2006–H–1, *Combustible Dust Hazard Study;* November 2006, page 67.

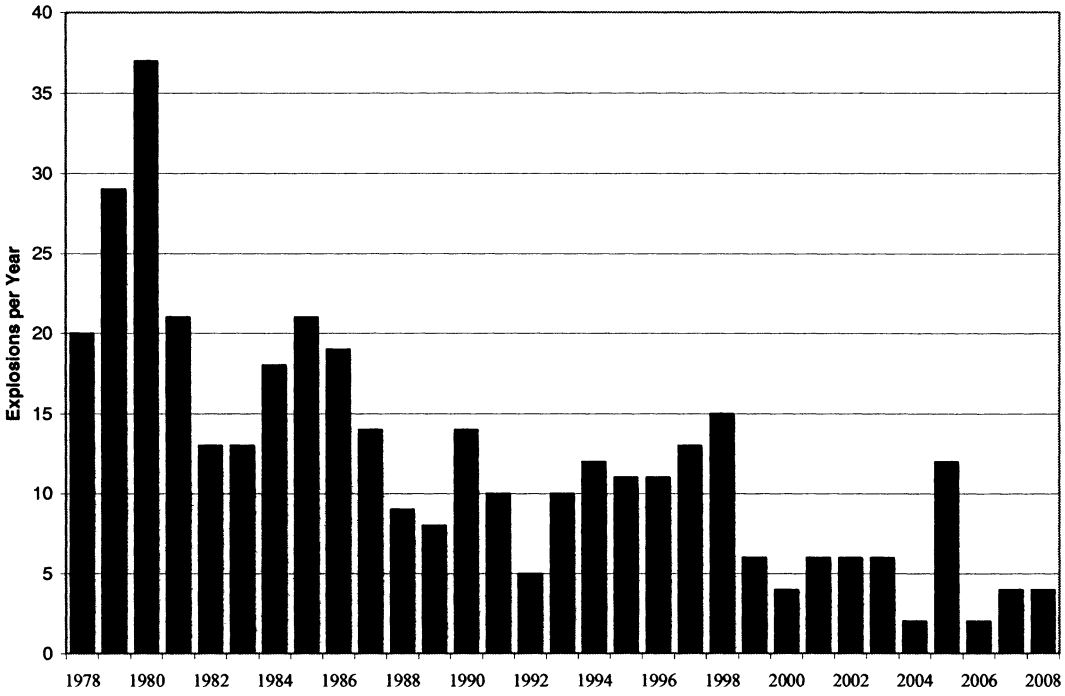
[4] *Regulatory Review of OSHA's Grain Handling Standard [29 CFR 1910.272],* February 2003.

[5] *Regulatory Review of OSHA's Grain Handling Standard [29 CFR 1910.272],* February 2003.

[6] Kansas State University, in cooperation with USDA Federal Grain Inspection Service, available online at: *http://www.oznet.ksu.edu/pr_histpubs/Dust_Exp.htm.*

[7] USDA Grain Inspection, Packers, and Stockyards Administration, personal e-mail communication from USDA to OSHA, Jul 10, 2009, with attachment entitled, ''Explosion Data.''

Figure 1: Number of Grain-Dust Explosions per Year from 1978 – 2008 (Source: USDA FGIS and Kansas State University, and OSHA FRIA, Grain Handling Standard)



C. Dust Explosions in Other Industries

The flammability and explosiveness of various types of organic and inorganic dusts has been recognized for well over a century. The devastating effects of secondary explosions resulting from accumulated dust have also been well documented, particularly since the early years of the 20th century; the hazards of some dusts, particularly coal dust, mineral dusts, and flour, were recognized many years before the 20th century. However, no national organizations focused on the hazards of combustible dusts until the National Fire Protection Association (NFPA) established a committee to do so in 1922. The NFPA's work resulted in a wealth of knowledge about the prevention and control of dust-explosion hazards in material handling and manufacturing processes. In 1923, NFPA published the first national consensus standard to address the prevention of dust explosions in grain terminals and flour mills.[8]

Over the past 15 years, a number of industries have experienced serious dust explosions, causing loss of life and injuries, as well as property damage. The first of these incidents, an explosion and fire in a textile factory in Methuen, Massachusetts in 1995, injured 37 people and destroyed several large buildings.[9] After a detailed investigation of this incident, OSHA issued a Hazard Information Bulletin in 1998 for the textile industry.

In 1999, an automotive plant near Dearborn, Michigan experienced an explosion in one of the boilers in its power plant. Analysis of the explosion indicated that the initial boiler explosion may have caused accumulated coal dust on plant surfaces to become airborne, fueling a secondary explosion that destroyed part of the facility. Six workers were killed and 36 were injured.[10]

In the same year, there was an explosion at a foundry in Springfield, Massachusetts, involving powdered phenolic resin in the iron castings manufacturing process. This explosion killed three workers and injured nine. Investigators found heavy resin deposits in ducts and other surfaces. From this finding, they concluded that a primary explosion in a dust extraction duct had dispersed the settled dust, and that the dispersed dust then fueled secondary explosions in the facility.[11]

A rubber-dust explosion at a rubber recycling plant in Vicksburg, Mississippi in 2002, resulted in five fatalities and seven injuries. Part of the recycling process involved grinding rubber tires; the grinding process produced rubber dust, which accumulated on building surfaces and in a product bagging bin that was not equipped with explosion vents. A fire started on the roof of the plant. When it spread to the bagging bin, it dispersed the layers of dust in the bin and on the surrounding surfaces, fueling an explosion.[12]

A massive explosion in 2003 at a pharmaceuticals device manufacturing facility in Kinston, North Carolina, injured 38 workers and killed 6. In a process in which rubber strips were dipped into a polyethylene slurry, fans were used to help dry the coated rubber, causing fine polyethylene powder to be disbursed. Employees diligently cleaned the visible areas of the process room; however, most of the employees were unaware that combustible polyethylene

[8] Cashdollar, K. L., & Hertzberg, M., eds (1987) *Industrial Dust Explosions,* ASTM International, U.S., p. 345.

[9] U.S. Fire Administration Technical Report #110, *Manufacturing Mill Fire, Methuen, MA,* December 11, 1995.

[10] Michigan Department of Energy, Labor & Economic Growth, *CIS Reaches Historic Settlement Agreement with Ford and UAW,* 1999 available online: *http://www.michigan.gov/dleg/0,1607,7-154-10573_11472–52301-,00.html.*

[11] U.S. Department of Labor (USDOL), 1999. Joint Foundry Explosion Investigation Team Report, Jahn Foundry Corporation, Springfield, MA, February 25, 1999.

[12] OSHA, 2002, *Region 4 Report on Explosion at Rouse Polymerics,* U.S. Department of Labor.

dust was accumulating in the enclosed space above the suspended ceiling, carried there by the building ventilation system. Due to the extensive damage to the facility, and the deaths of potential witnesses, investigators were unable to definitively determine the ignition source or the method of dust dispersal.[13]

That same year, phenolic resin again fueled a fatal dust explosion, this time in an acoustic insulation manufacturing facility in Corbin, Kentucky. As workers were cleaning fugitive dust accumulations with compressed air, a cloud of phenolic resin formed near a malfunctioning appliance, which likely ignited the cloud of dust. The initial deflagration dispersed large quantities of combustible dust that had accumulated on surfaces throughout the facility. The resulting dust clouds fueled several secondary explosions. The building was destroyed, 7 workers were killed, and 37 were injured.[14]

Even finely divided metals can cause dust explosions. Again in 2003, one worker was killed and several injured in an aluminum dust explosion at a wheel manufacturing facility. At the point in the process in which scrap aluminum was reduced to small chips, aluminum particles were drawn into a dust collector. An initial explosion in the dust collector spread through the ventilation system, causing a secondary explosion involving the dust accumulated on overhead beams, ducts, and other structures.[15]

As a result of this series of incidents in 2003, OSHA produced a Safety and Health Information Bulletin (SHIB), *Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions.* This widely disseminated guidance document provided employers and workers with information on combustible dust explosions, including mitigation. It contains references to both the applicable OSHA standards and the related industry consensus standards. However, incidents continued to occur despite the availability of these standards and the guidance in the SHIB.

In early 2008, a catastrophic incident at a sugar refinery in Port Wentworth, Georgia, killed 14 workers and seriously injured 36 others. The CSB investigated[16] and determined that an initial dust explosion occurred in an enclosed steel belt conveyor below three 105-foot-tall silos, most likely ignited by an overheated conveyor bearing. Large quantities of sugar dust that had accumulated on surfaces throughout the plant fueled a series of massive secondary explosions and fires, destroying much of the facility. The plant had a history of previous, smaller initial explosion incidents that did not result in significant damage or secondary explosions. The fine OSHA proposed for this employer is the third-largest fine ever proposed for a single incident.

The sugar plant incident highlighted a lack of hazard awareness and a failure to comply with existing Federal standards and State codes. OSHA took prompt action to further heighten awareness of this hazard by producing additional guidance for employers and workers, including a Web page, a fact sheet, and a poster. The Agency mailed the SHIB directly to 30,000 employers suspected of having combustible dust hazards, and also focused enforcement efforts on sugar plants.

D. CSB Combustible Dust Study

The CSB conducted a study of dust explosion incidents between 1980 and 2005. The 2006 report from that study identified 281 incidents that killed 119 workers and injured 718.[17] From 2006 through 2008, OSHA has found records of an additional 16 deaths and 84 injuries; these records are included in Table 1 above. Among CSB's findings and conclusions were the following:

- Many industry and safety professionals lack awareness of combustible dust hazards.
- The widely recognized standards of good engineering practice in the NFPA's voluntary consensus standards were not being followed in many facilities.
- State and local fire codes were ineffective as a viable mechanism to reduce dust explosion risks in general industry nationwide.
- OSHA's focus has been on enforcement activities in response to combustible dust incidents.
- The only comprehensive OSHA standard that specifically addresses combustible dust hazards (the 1987 Grain handling facilities standard) has effectively reduced the risk and consequences of grain-dust explosions, and incorporates many of the same principles that can be found in the NFPA standards.

The report of CSB's combustible dust study also listed five recommendations for OSHA. This notice addresses the first of these recommendations:

''Issue a standard designed to prevent combustible dust fires and explosions in general industry. Base the standard on current National Fire Protection Association (NFPA) dust explosion standards (including NFPA 654 and NFPA 484), and include at least

- Hazard assessment,
- engineering controls,
- housekeeping,
- building design,
- explosion protection,
- operating procedures, and
- worker training.''

The second CSB recommendation requested that OSHA revise its Hazard Communication Standard (HCS) (29 CFR 1910.1200) to clarify the coverage and requirements related to combustible dust. This recommendation is being addressed in a separate rulemaking.

The third and fourth CSB recommendations suggested that OSHA, respectively, communicate with the United Nations Economic Commission for Europe the need to amend the Globally Harmonized System to address combustible dust hazards, and provide combustible dust-related training through the OSHA Training Institute. Both of these recommendations have been accomplished.

The fifth CSB recommendation suggested that OSHA initiate a Special Emphasis Program for Combustible Dust, to include an outreach program focused on the information in OSHA's Safety and Health Information Bulletin, *Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions.* The Agency went beyond CSB's recommendation and implemented a National Emphasis Program (NEP) to increase OSHA's enforcement activities throughout the country and to focus on specific industry groups that experienced either frequent combustible dust incidents or combustible dust incidents with catastrophic consequences. The NEP was launched on October 17, 2007, and is ongoing. It was revised in 2008 to more closely focus on sugar plants.

E. Congressional Response

Interest intensified in regulatory action during the months after the sugar-plant incident in 2008. Employee unions expressed support for CSB's rulemaking recommendations. On May 1, 2008, the U.S. House of Representatives introduced a bill

[13] *Investigation Report, Dust Explosion, West Pharmaceutical Services, Inc.,* U.S. Chemical Safety and Hazard Investigation Board (CSB), September 2004.

[14] CSB, 2005, *Investigation Report, Combustible Dust Fire and Explosions, CTA Acoustics, Inc.,* February 2005.

[15] CSB, 2003, *Investigation Report, Hayes Lemerz Dust Explosions and Fire,* September 2003.

[16] U.S. Chemical Safety and Hazard Investigation Board Investigation Report No. 2008–05–1–GA, *Sugar Dust Explosion and Fire;* September 2009.

[17] U.S. Chemical Safety and Hazard Investigation Board Investigation Report No. 2006–H–1, *Combustible Dust Hazard Study;* November 2006, p. 31.

entitled H.R. 5522, *Worker Protection Against Combustible Dust Explosions and Fires Act of 2008.* This bill directed OSHA to issue an interim combustible dust rule and an amendment to the HCS in 90 days, and a final rule in 18 months. H.R. 5522 was passed by the House and referred to the Senate.

Two Congressional hearings were held on H.R. 5522. The first hearing was held by the House Committee on Education and Labor on March 12, 2008, and the second hearing was held by the Subcommittee on Employment and Workplace Safety of the Senate Housing, Education, Labor and Pensions Committee on July 29, 2008. Assistant Secretary of Labor Ed Foulke testified for OSHA at these hearings; also testifying were representatives of CSB, NFPA, and the Georgia sugar plant that sustained the 2008 explosion.

On February 4, 2009, H.R. 849, *Worker Protection Against Combustible Dust Explosions and Fires Act of 2009,* was introduced into the current session of Congress. The provisions of this resolution are the same as H.R. 5522.

F. Existing OSHA Standards

The Agency does not have a single, comprehensive standard that addresses combustible dust hazards across all industries. Current OSHA standards provide limited protection from dust hazards in two ways: First, certain standards address some dust hazards for specific industries. Among these standards are the following:

- 29 CFR 1910.261—Pulp, paper, and paperboard mills.
- 29 CFR 1910.263—Bakery equipment.
- 29 CFR 1910.265—Sawmills.
- 29 CFR 1910.269—Electric power generation, transmission, and distribution.
- 29 CFR 1910.272—Grain handling facilities.

Second, some general industry standards address one or more of the elements that can contribute to dust explosions, such as ignition sources and dust accumulations, or the standards require the communication of information that employers and workers need to address dust hazards. *Among these standards are:*

- 29 CFR 1910.22(a)—Housekeeping.
- 29 CFR 1910.178—Powered industrial trucks.
- 29 CFR 1910 Subpart Q—Welding, Cutting, and Brazing.
- 29 CFR 1910. 269—Electric power generation, transmission, and distribution.
- 29 CFR 1910.307—Hazardous (classified) locations.
- 29 CFR 1910.334(d)—Occasional use of flammable or ignitable materials.
- 29 CFR 1910.1200—Hazard Communication.

As noted earlier, OSHA's existing standards for combustible dust do not provide a comprehensive set of requirements to fully address all of the prevention and mitigation methods specific to combustible dust hazards. Accordingly, some ignition sources are specifically covered (*e.g.,* electrical installations, powered industrial trucks), while other ignition sources are not covered (*e.g.,* mechanical sparks, friction, open flames). Additionally, OSHA standards address the accumulation of fugitive dust (*i.e.,* dust that escapes from equipment or areas where it is normally present), but do not include measures that would prevent the escape of dust in the first place. Also, many built-in engineering controls (including the design of facilities, explosion venting, suppression systems, and explosion protection systems) are not addressed in the OSHA standards. OSHA is asking a series of questions about the need to address these areas in a new combustible dust standard to afford adequate and complete protection to workers.

G. Consensus and Industry Standards

NFPA issues a number of national consensus standards that address the hazards of combustible dust. For example, NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids,* addresses the hazards of combustible dust in a general manner. Specific industries are excluded from NFPA 654, but are covered by other NFPA standards, including NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities;* NFPA 484, *Standard for Combustible Metals;* NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions;* and NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities.*

These five NFPA combustible dust standards have mandatory secondary references to a large number of other standards. The 2006 edition of NFPA 654 mandates compliance with 36 other NFPA standards. These 36 secondary references, in turn, reference additional standards. In effect, no one standard comprehensively addresses the hazards of combustible dust, which may pose difficulties for some employers trying to develop programs to mitigate combustible dust hazards. In addition, the provisions of these five NFPA standards differ, which may add to these difficulties. Some elements of protection are addressed in some standards but not in others; other elements are addressed in different ways in the various standards. For example, NFPA 61, 484, and 654 contain provisions for drive belts, while NFPA 655 and 664 have no provisions directly addressing drive belts.

In addition to the NFPA standards listed above, NFPA issues a number of standards that cover the design and installation of protection systems specific to deflagration and explosion hazards, including combustible dust. Two of these standards are NFPA 68, *Standard on Explosions Protection by Deflagration Venting,* and NFPA 69, *Standard on Explosion Prevention Systems.* NFPA also has a series of standards that cover automatic fire suppression and alarm systems for a variety of facilities and hazards, but are not specific to combustible dust, deflagrations, or explosions.

A large majority of State and local jurisdictions in the United States have adopted the NFPA standards because both of the model fire codes used in this country (*i.e.,* International Code Council's *International Fire Code,* and NFPA's *Fire Code*) make these NFPA standards mandatory. However, the 2006 report on CSB's combustible dust study indicates that enforcement of these fire codes at the State and local level is ''inconsistent and largely ineffective.'' For example, the 2008 sugar-plant incident occurred in Georgia, a State having a fire code that mandated compliance with, among other combustible dust-related consensus standards, NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities.*

NFPA standards are updated on a regular basis, usually every three years. In the Agency's experience, consensus standards incorporated by reference into OSHA rules quickly become out of date, making it difficult for employers to comply when the out-of-date consensus standards become difficult to obtain. Furthermore, OSHA cannot legally update NFPA or other consensus standards used in its rules by referring to the ''current'' or ''most recent'' edition of the consensus standards.

Despite the aforementioned challenges with the application and enforcement of NFPA standards, the standards are used to a significant extent throughout industry, particularly by large companies, engineering consultants, and firms designing facilities with combustible dust hazards. Therefore, OSHA is asking for comment

on how best to incorporate the provisions of the consensus standards.

H. National Emphasis Program Analysis

OSHA analyzed the results of its Combustible Dust National Emphasis Program (NEP) to better understand where combustible dust hazards exist and where improvements may be needed to ensure that workers are protected from combustible dust hazards. Between November 1, 2007, and February 24, 2009, OSHA conducted 813 inspections under this NEP—665 in States under Federal OSHA authority, and 148 in States having an OSHA-approved State Plan. OSHA cited employers for 3,662 violations.

Of the 665 Federal NEP inspections, 160 citations were issued under the General Duty Clause (GDC) for hazards related to combustible dust. Therefore, the rate of GDC usage for combustible-dust-related hazards in the NEP inspections was 24 percent during the time period noted above (These statistics were derived from the information available at the time this notice was developed; the numbers may change over time through the informal conference and settlement process.)

The 160 GDC violations referenced 32 different industry or consensus standards developed by 6 different standards-developing organizations. The eleven most frequently referenced consensus standards were as follows, in descending order of frequency:

- NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids.*
- NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities.*
- NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities.*
- NFPA 69, *Standard on Explosion Prevention Systems.*
- NFPA 484, *Standard for Combustible Metals.*
- NFPA 68, *Standard on Explosion Protection by Deflagration Venting.*
- ASME B20.1, *Standard for Conveyors and Related Equipment.*
- ANSI/ITSDF B56.1, *Safety Standard for Low and High Lift Trucks.*
- FM Global Loss Prevention Data Sheet 7–76, *Prevention and Mitigation of Combustible Dust Explosions and Fires.*
- NFPA 505, *Standard on Powered Industrial Trucks.*
- NFPA 86, *Standard on Ovens and Furnaces.*

It has been necessary to cite the GDC extensively to address the various aspects of combustible dust hazards. GDC citations focused on each of the elements that could contribute to a dust fire or explosion, including containment or control of dust, isolation or control of ignition sources, and explosion venting or suppression systems. *The following hazards were the most commonly cited GDC violations:*

- Baghouse dust collectors located inside a building without proper explosion protection systems, such as explosion venting or explosion suppression systems.
- Deflagration isolation systems not provided to prevent deflagration propagation from dust collectors to other parts of the plant.
- Rooms with excessive dust accumulations not equipped with explosion relief venting to the exterior.
- Horizontal surfaces not minimized to prevent accumulation of dust.
- Air from dust collectors recycled through ductwork back into the work area.
- Legs of bucket elevator enclosures not equipped with explosion relief venting.
- Explosion vents on bucket elevator enclosures directed into work areas and not to a safe, outside location away from platforms, means of egress, or other potentially occupied areas.
- Pulverizers not provided with explosion venting or deflagration suppression systems.
- Dust collection system ductwork not constructed of metal.
- Open-flame propane heater used for comfort heating in an area where agricultural products were milled.
- Equipment (such as grinders and shakers) not maintained to minimize the leakage of combustible dust into the surrounding area.
- Electric grinders used in dust hazard areas without a hot-work permit system.

This list provides some indication of the areas in which current standards do not cover combustible dust hazards in general industry. Only the last two items on the list are administrative or operational in nature, involving maintenance, work practices, policies, and procedures. The other ten items involve engineering controls, such as fixed facilities or protection features built into the plant or the processing systems. These specific GDC violations point to areas that may be appropriate to cover in a prospective OSHA standard for combustible dust. Therefore, OSHA arranged the questions it is asking to solicit information separately for engineering controls and administrative controls.

The main finding of this NEP analysis is the unusually high rate of GDC use in combustible dust inspections (24 percent). Ordinarily, the GDC is used on a much more limited basis. For the same time period between November 1, 2007 and February 24, 2009, the 48,969 Federal OSHA inspections that were conducted outside the NEP yielded 1,736 GDC citations (a rate of 3.5 percent). Therefore, the GDC was used almost seven times as often for combustible-dust-related citations than for all other citations. This unusually high proportion suggests the need for a comprehensive OSHA standard.

I. Regulatory Issues

The CSB recommended that OSHA issue a standard to prevent combustible dust fires and explosions. The CSB determined that many tragic accidents in the past decade could have been avoided or minimized if employers had complied with applicable national consensus standards. OSHA recognizes that regulatory action needs to be considered as part of its overall approach to protecting workers from combustible dust hazards. The Agency already has made significant efforts to address the need for additional information and training on combustible dust hazards. Among these efforts are OSHA's SHIB, fact sheet, and poster; additional information provided on the Agency's Web site; outreach to employers; and specialized training for compliance officers. In addition, through the NEP, OSHA also enhanced compliance through strengthened enforcement of existing standards and citations under the General Duty Clause.

The existing regulatory regime is fragmented and incomplete. The Agency's analysis of the combustible dust NEP, above, shows that existing OSHA standards do not regulate important elements of combustible dust hazards. The consensus standards related to combustible dust are large, complex, numerous, and interrelated, which make it difficult for employers to comply with them. In addition, where these consensus standards have been adopted as part of State or local codes, available evidence shows that they are poorly enforced at the local and State levels.[18] Therefore, OSHA has preliminarily concluded that national consensus standards alone, even when

[18] U.S. Chemical Safety and Hazard Investigation Board Investigation Report No. 2006–H–1, *Combustible Dust Hazard Study;* November 2006, page 68.

adopted by State or local governments, are insufficient to adequately protect workers from these hazards.

As noted earlier, combustible dust hazards are present in a wide range of industries. Many different materials, both organic and inorganic, can produce dust capable of fueling explosions. OSHA plans to evaluate affected industries to determine the most effective way to regulate the combustible dust hazards present in these industries. It may be appropriate for OSHA to treat specific industries differently, based at least in part on current national consensus standards.

OSHA must consider many factors in developing a comprehensive standard for combustible dust. Some of these factors relate directly to the characteristics of the hazard and the range of variables encountered in the workplace, which affect the combustibility or explosibility of dusts. For any dust materials having a specific chemical composition, the chance of a combustible dust deflagration depends on many variables, including:

- Size of particles
- Shape of particles
- Particle surface-area-to-volume ratio
- Agglomeration (how well particles stick together)
- Impurities present in the material
- Moisture content of the material
- The predisbursal dust layer depth and location
- The concentration of particles in a dust cloud
- The spatial distribution of particles in a dust cloud (the variation in concentration throughout a dust cloud)
- Oxygen concentration
- Turbulence in the space or area
- Characteristics of the ignition source (including magnitude and level of energy)
- Location of the ignition source in relation to the dust cloud

Many more variables come into play for combustible dust incidents than for scenarios involving flammable gases, flammable liquids, or larger-sized flammable solids. The ignition of vapor-air mixtures, especially at rest, is much more predictable and reproducible than the ignition of combustible dust. Consequently, some mitigation methods used to address combustible dust hazards are not straightforward. Prescriptive requirements may not be reasonable or effective in such a scenario.

Another factor involves whether and how to integrate current and future national consensus standards into a regulatory scheme. One means of doing so may be for OSHA to require compliance with various NFPA standards, rather than to develop a government-unique standard. Some of the issues with this approach are discussed earlier in section I(G) of this notice. Another approach may be to reference NFPA standards as acceptable compliance options.

OSHA must also consider the interrelationship of a combustible dust standard and other OSHA standards that address different features of the hazard, for example, the hazard communication, electrical, grain handling, and other standards noted earlier in section I(F) of this notice.

The information currently available indicates that the risk of combustible dust explosions is considerable and that a single, comprehensive standard addressing all of these hazards will likely provide clarity for employers and increased safety for exposed workers. OSHA is requesting information and comment from the public to evaluate what regulatory action it should take to further address combustible dust hazards within the general industry standards.

II. Request for Data, Information, and Comments

OSHA is providing the following questions to facilitate the collection of needed information and to facilitate public comment on relevant issues. OSHA invites commenters to respond to any questions for which they have specific knowledge, data, or information, regardless of their involvement with combustible dust, *e.g.,* employer, employee, consultant, researcher, fire or building code enforcement official. Commenters also are encouraged to address any aspect of combustible dust safety that they believe would assist the Agency in considering appropriate regulatory action on the matter. OSHA requests that commenters provide a detailed response to questions, including a rationale or reasoning for the position taken, rather than simply replying ''yes'' or ''no.'' Also, relevant data that may be useful to OSHA's deliberations, or that may assist it in conducting an analysis of the impacts of future Agency actions, should be submitted. To assess the costs, benefits, or feasibility of any possible regulatory intervention, the Agency needs specific quantitative information on various safety measures. Therefore, for those recommendations involving specific interventions, any data in terms of costs and benefits associated with the recommendation would be helpful. To assist it in analyzing comments, OSHA requests that commenters reference the question number to which they are responding.

A. Industry Background

OSHA is interested in determining the extent of combustible dust hazards. The following questions address the extent of the hazards, and provide a context in which to understand your answers to subsequent questions.

1. What business are you in? What NAICS industry or industries are you in?

2. How many employees do you have? How many are production employees? How many employees work in areas where combustible dusts are present? What types of jobs do they perform?

3. What is the area of your facility? What percentage of this area has combustible dusts normally present? What percentage is subject to possible fugitive dust accumulations?

4. What type or types of combustible dusts are present?

5. Would you expect other firms in your industry to have similar combustible dusts hazards or are the products or processes that generate combustible dust in your facility unusual for your industry? Why?

B. Definition of Combustible Dust

No single, universally accepted definition of combustible dust is available. Even among standards promulgated by the same standards-developing organization, the definitions vary significantly. NFPA 654 and 655 define combustible dust in general terms without regard for particle size. This approach recognizes that factors such as particle shape, agglomeration, and other characteristics listed earlier in this notice, can affect explosibility. Other standards (such as NFPA 61, 484, and 664) define combustible dust in terms of a minimum particle size. The definition in previous editions of NFPA 654 (which may still be used in some areas of the country) was also size-based.[19] Furthermore, OSHA's grain standard uses a size-based definition for ''fugitive grain dust.''

Many different materials may form combustible dust, and several laboratory tests are available to characterize them. Some of these tests help determine a dust's basic explosibility. Other tests yield results on the degree of

[19] The 2006 edition of NFPA 654 explains in Annex section A.3.3.4 the reason that the previous size-based definition is no longer used: ''Dusts traditionally have been defined as a material 420 µm or smaller (capable of passing through a U.S. No. 40 standard sieve). Combustible particulates with an effective diameter of less than 420 µm should be deemed to fulfill the criterion of the definition. However, flat platelet-shaped particles, flakes, or particles of fibers with lengths that are large compared to their diameter usually do not pass through a 420 µm sieve yet still pose a deflagration hazard.''

explosibility; these tests are useful for designers of built-in protective features or systems. In some cases, the hazards of certain dusts are widely known (for example, wood dust). In these cases, basic testing to determine whether the dust is explosive may not be necessary. OSHA is interested in data on the extent to which different materials are, or may form, combustible dust.

6. Do you determine whether a dust is considered a combustible dust by reference to data, testing, or some other means? Please explain.

7. What additional tests do you conduct to determine the level of combustibility of a particular dust?

8. Do you have any dusts that you assume to be combustible, and, thus, preclude the need or expense of testing? If so, please indicate what type of dust.

9. Certain definitions, in particular those definitions based on particle size alone, would not cover some materials that can present an explosion hazard in certain situations. Accordingly, identify any dusts that can explode that would not be included in your definition. Would your definition include some dusts for which explosions are very rare or unknown? If so, which ones?

C. Hazard Recognition

The CSB report on its combustible dust hazard study, as well as the investigative reports of specific combustible dust incidents discussed above, show a pattern of employers and workers being either unaware of the hazards posed by combustible dust, or of the seriousness of the hazards. As a result, many workers were not adequately protected from these hazards. Employers who have recognized the hazards were made aware of them in a variety of ways. OSHA is interested in data on the contributions of in-house experts, outside consultants, insurance representatives, and local or State code authorities in improving awareness of the hazard.

10. How did you become aware that you had combustible dust present in your facility?

11. Who is responsible for determining if a dust is combustible? What expertise do they have?

12. How do you determine if dust is combustible? Do you use published data, and if so, from what source? Do you sample dust for laboratory testing, and if so, how often? Do you rely on labels or data sheets, including MSDSs, developed by others? Do suppliers provide you with information related to combustible dust? Please explain.

13. To what extent do the local code authorities, insurance representatives, or other outside experts determine the presence of combustible dust in your facility?

D. Hazard Assessment

Hazard assessments are systematic approaches to evaluating a hazard and selecting control or mitigation methods. CSB's report on its combustible dust hazard study recommends hazard assessments as necessary for the mitigation of combustible dust hazards. It should be noted that NFPA 654 refers to a hazard assessment as a ''Process Hazard Analysis.'' In addition to information about how employers perform hazard assessments, OSHA is also interested in the extent to which experts (both external and on-staff) are involved in hazard assessments.

14. Do you conduct assessments of combustible dust hazards? How often? What assessment method do you use? Describe the information you use in performing the assessment, as well as the information the assessment yields and how you use this information.

15. On whom do you rely for technical assistance when performing the assessment? In-house staff, local/State authorities, insurance representatives, or consultants?

16. How do you decide when outside expertise or assistance is necessary? How do you assess the capability of outside experts?

17. Are your employees involved in the hazard assessment? Does their involvement improve the assessment? Does their involvement improve their understanding of the hazard and its mitigation?

E. Hazard Communication and Training

OSHA's Hazard Communication Standard (HCS), 29 CFR 1910.1200, comprehensively addresses the evaluation of the potential hazards of chemicals and the communication of hazard information to workers. Regarding dusts and other particulates, as with all chemicals covered by the HCS, a hazard evaluation must be conducted, taking into consideration all discernible hazards, including explosibility. It is incumbent upon manufacturers and importers to provide information on the potential for, and control of, combustible dusts.

The HCS standard has three main components that are essential to the effective functioning of a program. First, chemical manufacturers and importers must review available scientific evidence concerning the physical and health hazards of the chemicals they produce or import to determine if they are hazardous. This procedure is called a hazard determination or hazard evaluation. Second, for every chemical found to be hazardous, the chemical manufacturer or importer must develop Material Safety Data Sheets (MSDSs) and container labels to be transmitted to downstream users of the chemicals. Employers are required to maintain an MSDS in the workplace for each hazardous chemical that they use. Third, all employers must develop a written hazard communication program and provide information and training to employees about the hazardous chemicals in their workplace.

Regarding combustible dusts, anticipated operations, uses, and downstream material processing that generate dusts should be considered normal conditions when using a substance. These conditions include operations and uses such as abrasive blasting, cutting, grinding, polishing, or crushing materials; conveying, mixing, sifting, or screening dry materials; and the build-up of dried residue from processing wet materials.

The HCS requires chemical manufacturers and importers to develop an MSDS for each hazardous chemical they produce or import. The following MSDS requirements are applicable to combustible dust hazards: Chemical and common names of the hazardous chemical and all ingredients determined to present a physical hazard, physical and chemical characteristics of the hazardous chemical, any generally applicable precautions for safe handling and use, any generally applicable control measures, date of MSDS preparation or last revision, and the name, address, and telephone number of the responsible party preparing the MSDS.

During its combustible dust study, CSB reviewed MSDSs of 140 known substances that produce combustible dusts, and found that information regarding potential combustible dust hazards was poorly or inadequately transmitted to employers and workers; according to this report, 41 percent of the MSDSs reviewed in the CSB study did not warn users about potential explosion hazards. Of the remaining 59 percent of MSDSs sampled, most of the information was not stated in a place or manner clearly recognized by employees, or not specific to hazards related to combustible dusts. The CSB concluded that many of the MSDSs did not identify the potential for combustible dust explosions that could reasonably have been anticipated during downstream material processing.

Training is also a critical component of any program to control combustible dust and prevent fires and explosions. Employees need to understand the

hazards, how to prevent the hazards, and what to do in the event of a fire or explosion.

The following questions address MSDSs and training related to combustible dust hazards.

18. Do the MSDSs you develop or use identify the risks associated with combustible dust hazards? Do they list mitigation measures? Are you aware of MSDSs that should identify combustible dust as a hazard and do not? If so, please explain.

19. Do you communicate information on the risks of, and controls for, combustible dust hazards to your employees as a part of your hazard communication program?

20. Do you train your employees on the hazards of combustible dust and its mitigation? Do you also provide refresher training? What is covered in each type of training that you provide? How many of your employees receive each type of training that you provide? How many hours of training is provided and at what frequency (on hire, annually, as needed)? Who provides the training? What are their qualifications? Do you use standardized training materials (such as films, books, and computer classes)?

21. Do you have any means of determining if employees understand the training? Do you have any means of determining if employees are applying the training? If so, describe these means.

F. Consensus, Industry, and Insurance Standards

Under the OSH Act, OSHA must consider the provisions of national consensus standards, such as those promulgated by NFPA, in its rulemaking efforts. In addition to this mandate, OSHA may consider standards that are not developed using the consensus-standards process when determining appropriate protective measures for employees. The following questions refer to these standards.

22. Do you follow the provisions in NFPA standards for combustible dust? If so, which standards? Is this use voluntary, or based on mandates by local authorities, insurance carriers, or other entities? Do you have any difficulty in using the NFPA standards because of conflicting definitions, varying requirements, secondary references to other standards, or any other reason? If so, describe these difficulties.

23. Do you use FM Global Property Loss Prevention Data Sheet 7–76, *Prevention and Mitigation of Combustible Dust Explosions and Fires,* as an aid in determining how to mitigate the hazards of combustible dust? Is this use voluntary or mandated by your insurance carrier?

24. Are there any other standards or guides you use to address the hazards of combustible dust? If so, please indicate which ones, or describe them.

G. State and Local Codes

NFPA standards carry the force of law when adopted by a jurisdiction (Federal, State, county, or municipal); these standards also can be mandated by an insurance company or other entity. In some cases, even when not mandated, employers comply with these standards (or portions of them) as a matter of policy. Many State fire codes contain mandatory references to NFPA's combustible dust-related standards either directly, or by the adoption of a model fire code. The two model fire codes used in this country (*i.e.,* International Code Council's *International Fire Code* and NFPA's *Fire Code*) both mandate compliance with NFPA's combustible-dust-related standards. Despite the existence of consensus and insurance standards, and State fire codes, major incidents continue to occur, as described earlier in this notice.

The CSB's 2006 report on its combustible dust hazard study concluded that State and local enforcement of NFPA standards was inadequate to protect workers. The reasons found include limited resources, insufficient training, and enforcement efforts that concentrate on facilities other than industrial facilities.

OSHA's National Emphasis Program for combustible dust has resulted in many employers abating combustible dust hazards in their facilities. Some employers voluntarily upgraded their facilities, procedures, and policies based on outreach and guidance material made available by a variety of organizations (including OSHA) or in response to the publicity surrounding major dust explosions. These efforts increased worker and employer awareness of the benefits of complying with NFPA standards. Nevertheless, it is difficult to project trends for hazards that result in infrequent, major incidents such as combustible dust explosions. Because of the variability of the many components required for a significant combustible dust explosion, facilities can operate for decades without an incident, yet suffer a catastrophic event after a slight change in conditions. The following questions address enforcement issues involving combustible dust.

25. Does the fire or building code (State, local, or other) in your area specifically address the hazards of combustible dust? If so, how?

26. Has your facility been inspected by State or local authorities? Is this a regular occurrence? If so, at what frequency? Were these inspections initiated by the authorities, or did you take the initiative to contact them? Did the inspections include combustible dust hazards? Did the inspection officials have expertise on combustible dust hazards? What action did you take as a result of State or local inspections?

27. Do you know if State or local enforcement efforts have been effective in controlling combustible dust hazards? If you have information on any studies of this issue other than the CSB's study (for example, studies conducted by insurance organizations, code authorities, trade associations, consultants, or unions), please provide information on them.

H. Engineering Controls

Various methods of controlling occupational hazards fall into a hierarchy in order of their effectiveness. A typical hierarchy (beginning with the most effective method) is:

- Elimination.
- Substitution.
- Engineering controls.
- Administrative controls.
- Personal protective equipment.

Administrative controls include work practices, personnel scheduling, operational procedures, and equipment maintenance. Engineering controls are fixed measures that are built into a facility or processing equipment to either remove a hazard (*i.e.,* preventing it from occurring) or to minimize the effects of an incident (after a fire or explosion has begun). OSHA believes that, for combustible dust hazards, these two types of engineering controls may belong at different levels in the hierarchy. Those engineering controls that prevent the occurrence of an incident, hereinafter referred to as ''primary engineering controls,'' belong where they are normally seen in the hierarchy; ahead of administrative controls. Those engineering controls that minimize deaths, injuries, or damage after a fire or explosion has begun, hereinafter referred to as ''secondary engineering controls,'' may be more appropriately placed in the hierarchy after administrative controls. Therefore, OSHA has grouped the questions in this section into two categories: (a) Primary engineering controls, and (b) secondary engineering controls.

Collectively, primary and secondary engineering controls often include features of building design, processing

systems, ventilation systems, protective systems, and alarm systems. In NFPA 654, these provisions are not retroactive; that is, facilities, equipment, structures, or installations that existed or were approved prior to the standard becoming effective may remain as is. While retrofitting of most equipment is not mandated under this standard, it allows the authority having jurisdiction to require retrofitting of equipment or features in situations presenting an unacceptable degree of risk.

If OSHA were to incorporate provisions for engineering controls in a combustible dust standard, it would need to address whether any of these controls should be (1) retrofitted for all existing facilities immediately, (2) mandated after a specified date or period (*i.e.,* a delayed effective date), or (3) required only for facilities built after a specified date or period *(i.e.,* a ''grandfather'' clause). The Agency is, therefore, asking the following questions regarding engineering controls.

28. Do your facilities or equipment have any of the following primary engineering controls to mitigate combustible dust hazards? If so, describe in detail where they are installed and how they function to mitigate combustible dust hazards.

a. Features to prevent escape of dust into unwanted areas.

b. Features to prevent the accumulation of dust on surfaces.

c. Oxygen concentration reduction.

d. Dilution with noncombustible dust.

e. Foreign material (such as tramp metal) separation devices.

f. Monitoring and alarms for abnormal conditions.

g. Automatic interlocks, shutoffs, or overflow systems.

h. Manual emergency controls.

i. Lightning protection systems.

j. Features to mitigate the hazards of process heating systems.

k. Features to mitigate the hazards of comfort heating systems.

l. Features to mitigate the hazards of hot surfaces.

m. Class II electrical equipment and wiring.

n. Other mitigation features or engineering controls designed or built into your facility or processing equipment to prevent the occurrence of fires or explosions.

29. Do your facilities or equipment have any of the following secondary engineering controls to mitigate combustible dust hazards? If so, please describe in detail where they are installed and how they function to help mitigate combustible dust hazards.

a. Air-material separators (dust collection systems)

b. Segregation with physical barriers.

c. Separation by distance.

d. Fire-resistant construction.

e. Deflagration pressure containment.

f. Deflagration suppression systems.

g. Automatic fire suppression systems.

h. Manual fire suppression equipment.

i. Deflagration venting.

j. Dust retention and flame arresting devices.

k. Relief valves or devices.

l. Abort gates or dampers.

m. Isolation devices to preclude deflagration propagation.

n. Evacuation alarm systems.

o. Fire, heat, smoke, flame, or spark/ember detection systems.

p. Other mitigation features or engineering controls designed or built into your facility or processing equipment to limit deaths, injuries, or damage after a fire or explosion has occurred.

30. Do you feel that secondary engineering controls should be in the preferred hierarchy of controls after administrative controls? Why or why not? Please describe incidents where secondary engineering controls were effective or ineffective.

31. How much did each fixed feature cost to install? Are there any special maintenance or operating costs associated with these features (such as energy costs, waste disposal costs, maintenance activities such as clean up)? Are there any other routine costs associated with these measures?

32. How did you decide which of these features to provide in your facility? Were these features installed during the initial construction of the facility, or retrofitted at a later time?

I. Administrative Controls

Typically, an OSHA standard includes provisions for administrative methods and work practices to control or mitigate a hazard. These provisions include operational procedures, portable equipment, equipment maintenance, or personal protective equipment. In NFPA 654, these types of provisions are retroactive, which means they apply to all facilities, both new and existing. The following questions address the use of administrative and work practice controls in your facility.

33. Does your facility have any methods that prevent or limit the escape of dust? Please describe these methods.

34. Do you have a program or policy specifically for cleaning surfaces to remove accumulated fugitive dust? What surfaces does this program cover? What is the frequency with which you remove dust from surfaces? Do you inspect hidden and non-work areas, such as ventilation systems, product or input storage areas, concealed spaces, areas above suspended ceilings, beams, and ledges, for fugitive dust accumulation?

35. Do you have criteria or measures for what amount or level of fugitive dust accumulation is tolerable (such as a specific depth over a given area, inability to discern underlying color)? Please describe these criteria and measures.

36. Do you use cleaning methods that preclude dust disbursal? Which methods do you use, and under what conditions? What methods do you prohibit, and why?

37. Do workers' assignments, in whole or in part, involve cleaning dust from surfaces? How many workers perform this task, and how many hours per week do they spend on dust removal? Can the cleaning be done with minimal interruption of the facilities' operations?

38. Do you implement ignition controls for any of the following ignition sources for areas where combustible dust may be present? If so, indicate which sources and provide details. Did you consult with your operational employees in developing these programs or policies? How do you assure that your programs or policies are followed by all relevant parties?

a. Control of static electricity.

b. Use of cartridge-actuated tools.

c. Control of open flames and sparks (including cutting, welding, grinding, chipping).

d. Control of smoking.

e. Restrictions for hot surfaces.

f. Use of powered industrial trucks (EX or DX designation).

39. Do you have a program in place for the maintenance and testing of fixed facilities, equipment, structures, or systems? If so, please describe the program.

40. Do you have or use any personal protective equipment specific to combustible dust hazards? If so, please describe the equipment, and the reasons for its use.

41. Are any of your administrative or work practice programs or policies written? If so, please provide a copy of these written documents.

J. Emergency Response

Fighting combustible dust fires, or fires near combustible dust hazards, presents unique hazards. If done incorrectly, risk of death and injury may rise for both employees and firefighters. For example, opening a containment system or using straight-stream nozzles can cause dispersion of dust, which can then become the fuel for an initial or

secondary fire or deflagration. The following questions address emergency-response procedures in your facility.

42. Do you provide facility information to industrial fire brigades or other emergency responders for the purpose of assisting their efforts to respond to fires or explosions? If so, please describe the information you provide to them.

43. Do you provide training to employees, industrial fire brigades, or other emergency responders on the hazards of fighting fires in combustible dust-producing facilities? If so, respond to the following questions, and provide details and explanation. Do you train these groups on combustible dust hazards and their mitigation? Do you also provide refresher training? What is covered in this training? How many people receive this training? How many hours of training is provided and at what frequency (on hire, annually, as needed)? Who provides the training? What are their qualifications? Do you use standardized training materials (such as films, books, and computer classes)? Do you have any means of determining if attendees understand the training? Do you have any means of determining if attendees apply the training after they receive it? Please describe any instances where the training provided affected the outcome of an incident.

K. Investigation of Incidents

Much can be learned from combustible dust fires and explosions. In some cases, frequent minor incidents failed to garner the attention of employers, leading to complacency in the workplace. In other cases, minor incidents shielded the catastrophic potential of combustible dust hazards.

Many of the provisions included in the consensus standards addressing combustible dust have been refined over the years based on loss experience. Potentially, even more can be learned by studying incidents in which protective features effectively prevented death or injury, or incidents considered near misses. Some possible characterizations of near misses are situations under which a combustible dust cloud nearly ignited, a fire caused no deflagration or explosion, or a deflagration or explosion resulted in no injury or death. The following questions address your facility's responses to combustible dust fires, explosions, and near misses.

44. Have you had any combustible-dust-related fires, explosions, or near misses? Is so, describe these incidents in detail, and indicate what changes were implemented to prevent a reoccurrence. How do you define or characterize a near miss?

45. Are combustible-dust-related fires, explosions, or near misses investigated? If so, indicate how thoroughly, who performs them, and what professional qualifications they have. Do you document investigation results? If so, please provide examples of such documentation.

46. Does such a fire, explosion, or near miss cause a new hazard assessment to be conducted? Do these incidents cause you to review your engineering or administrative controls?

L. Regulatory Approach

OSHA is considering a variety of regulatory approaches to eliminate or mitigate combustible dust hazards. Your comments on the following issues will help OSHA decide how best to protect workers effectively from combustible dust hazards.

47. OSHA recognizes that the risk from combustible dust hazards varies with the type of material involved and the conditions present, the particular processes used at a facility, and the number of workers exposed. These hazards exist in facilities ranging from a woodworking shop with one employee to a large manufacturing plant with thousands of workers. Should OSHA scale its requirements to be more or less restrictive depending on either the size of, or type of dust present in, the facility? How should this scaling be done (*i.e.,* how should the provisions of a standard be applied to different facilities)? Are there situations or conditions that should limit the provisions that apply? If so, please explain.

48. Given the various definitions in the consensus standards, how should OSHA define combustible dust—by minimum particle size, without regard for particle size, or should the definition vary for the type of dust? Provide the technical basis for your response.

49. Data indicates that mineral dusts (such as silicates, sulphates, nitrates, carbonates, phosphates, cement, salt, gypsum, sand, and limestone) are not explosible. Should OSHA exclude mineral dusts or any other dust from coverage? If so, which dusts? Please provide the technical data substantiating the lack of explosibility.

50. Some dusts (such as wood dust) are widely understood to be combustible, and are explosible under a wide range of conditions. Should OSHA consider certain dusts explosible under any conditions, thereby precluding the need for testing? Alternatively, should OSHA permit employers to make this determination? If so, for which types of dust? Please explain your responses.

51. The NFPA combustible-dust-related standards have some similar provisions, but also have some provisions that vary for different types of dusts. Other NFPA standards have provisions that apply only to specific dusts. Should an OSHA standard cover different types of dusts separately, together, or in some other manner? Please explain your response.

52. The approach suggested by the CSB and others contains many of the elements in OSHA's Process Safety Management (PSM) Standard. Should an OSHA standard take an approach similar to the PSM Standard, *e.g.,* by requiring the development and implementation of a site-specific plan tailored to the facility and hazards in question? Please provide a rationale for your response.

53. NFPA 654 contains a provision for combustible dust hazard assessment, which helps refine the actions required for adequate safety under the specific conditions present in a facility. OSHA recognizes that this approach may not be necessary for all types and sizes of facilities. For example, a small furniture shop may be able to safely operate under a fixed set of requirements for the well-understood hazards of wood dust. Should every provision of an OSHA combustible dust standard be addressed in a hazard assessment, or just provisions involving engineering controls? Should the hazard assessment vary according to the size or type of facility? Please explain your response.

54. It has been suggested that OSHA incorporate NFPA standards by reference to address combustible dust hazards. The Agency is concerned with a number of issues regarding this approach. These concerns include, but are not limited to:

a. The scope of NFPA standards exceeding OSHA's mandate to protect only employees.

b. The multitude of mandatory primary references, secondary references, and other subordinate references in each NFPA standard that could result in an unnecessary burden on employers.

c. The differences between the various NFPA combustible-dust-related standards.

d. The frequent updating of standards by NFPA, making the OSHA standard outdated.

e. The limited availability of older editions of NFPA standards.

f. The difficulty involved in readily updating the consensus standards referenced in an OSHA combustible dust standard to the current or most

recent edition of the consensus standards.

g. The fact that OSHA cannot legally update NFPA or other consensus standards used in its rules by referring to the ''current'' or ''most recent'' edition of the consensus standards.

How do you think the Agency should make use of NFPA standards in a prospective OSHA standard? If the NFPA standards are not directly incorporated by reference into the OSHA standard, would it be appropriate for the OSHA standard to reference NFPA standards as compliance alternatives (*e.g.,* if an employer complies with the referenced NFPA standard applicable to an operation, OSHA would deem the employer to be in compliance with the applicable provision of the OSHA standard)?

55. Outreach efforts (both public and private), employer awareness, and OSHA's enforcement have increased in response to various combustible dust incidents over the last decade. As a result, many employers continue to upgrade their facilities and update their operating procedures to prevent and control combustible dust hazards. Would an OSHA combustible dust standard increase employee safety beyond the level already attained through current Federal efforts, State and local requirements, and voluntary standards? What approach would most effectively increase the safety of employees? Please provide a rationale for your response.

56. In 2003, OSHA concluded in its regulatory review that no significant changes were needed to OSHA's standard on Grain handling facilities at that time. Are any revisions needed to the portions of this standard that address fires and explosions? Are revisions to this standard necessary to harmonize it with the treatment of other dusts? Should the existing provisions of the standard that address fires and explosions be covered under a combustible dust rule? If OSHA retained the standard and issued a combustible dust standard that applied to other facilities and processes, would portions of your plant be covered by both standards? If so, would this present a problem? Please explain your response.

57. OSHA anticipates that administrative and work practice controls would be included in a combustible dust standard. For instance, several OSHA standards already address the accumulation of fugitive combustible dust, but do not address the escape of dust. Some ignition sources are covered under current OSHA standards (such as electrical and powered industrial trucks), but other, easily controlled ignition sources, would likely be addressed in a prospective OSHA combustible dust standard (such as open flames, sparks, hot surfaces, static electricity, tools, and smoking). Engineering controls can be more costly and take longer to implement than administrative controls. Should an OSHA combustible dust standard have requirements for engineering controls to control fugitive combustible dust? Which engineering controls should or should not be required, and under what circumstances? Should OSHA require retrofitting of engineering controls, and if so, which controls? What time period should OSHA allow for retrofitting? What are the costs associated with retrofitting these controls?

58. Workers are often in the best position to understand how processes work and the characteristics of the materials involved. Workers also may be in the best position to see how variations in procedures or equipment can affect their safety. Should operational employees participate in the development of engineering and administrative controls? Will this participation improve their safety? Please explain your response.

59. Facilities, processes, and materials are subject to change over time. These changes can affect potential hazards, and, thereby, the means used to mitigate those hazards. If these changes are not examined to determine if corresponding changes in protection or prevention are necessary, worker safety could be decreased. Should change management be a component of an OSHA standard? Why or why not?

60. A fire, explosion, or near-miss, could indicate that improvements are necessary to provide an adequate level of employee safety. Improvements may depend on the incident's severity or consequences. Should investigations of fires or explosions be a part of an OSHA combustible dust standard? Should a fire or explosion be classified for reporting purposes in terms of its severity, effect, size, or duration? If so, provide details. Should investigations and reporting of near-misses be a part of an OSHA standard? Please explain your response.

61. Should an OSHA combustible dust standard address the hazards of fighting fires in combustible-dust-producing facilities? If so, should the standard address fire fighting by designated employees, an employer's industrial fire brigade, or other emergency responders? In your response, provide details on hazards specific to fighting fires in or near combustible dust.

M. Economic Impacts and Benefits

As part of the process of developing a standard, OSHA must estimate the costs, economic impacts, and benefits of the standard. OSHA also analyzes the benefits of its standards in terms of reduced deaths, injuries, and property loss. The following questions will provide OSHA with needed economic impact and benefits information.

62. What are the potential economic impacts associated with the promulgation of a standard specific to the hazards of combustible dust? Describe these impacts in terms of benefits from the reduction of incidents and injuries; effects on revenue and profit; and any other relevant impact measure. If you have any examples of estimates of the costs of controlling combustible dust hazards, please provide them.

63. What changes, if any, in market conditions would reasonably be expected to result from issuing a standard on combustible dust? Describe any changes in market structure or concentration, and any effects on services, that would reasonably be expected from issuing such a standard.

64. Would a comprehensive OSHA standard on combustible dust reduce fire and explosion hazards? How would an OSHA standard address any noncompliance problem (such as, noncompliance with the housekeeping standard or the GDC)?

N. Impacts on Small Entities

In developing a standard, OSHA must determine whether it will have a significant impact on a substantial number of small businesses. If the standard has such impacts, OSHA is required to develop a regulatory flexibility analysis and assemble a Small Business Regulatory Enforcement Fairness Act (SBREFA) Panel prior to publishing a proposal. Regardless of the significance of the impacts, OSHA seeks ways of minimizing the burdens on small businesses consistent with OSHA's statutory and regulatory requirements and objectives. OSHA has preliminarily determined that 330,000 small firms owning 351,000 establishments and employing 6.5 million employees are in industries that experienced combustible dusts fires or explosions in the past.

65. How many, and what type of small firms, or other small entities, have combustible dust hazards, and what percentage of their industry (NAICS code) do these entities comprise?

66. How, and to what extent, would small entities in your industry be affected by an OSHA standard

regulating combustible dust? Do special circumstances exist that make controlling combustible dust more difficult or more costly for small entities than for large entities? Describe these circumstances.

O. Compliance Assistance

As indicated above, OSHA has provided outreach and guidance documents, and training, related to combustible dust hazards. Through the following questions, the Agency seeks information on the effectiveness and benefits of its outreach, guidance, and training efforts, as well as suggestions for future products.

67. Are you familiar with any of the following guidance and outreach products OSHA has produced? Which of these products have you used as an aid in determining what to do about combustible dust in your facility?

a. Safety and Health Information Bulletin—*Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions.*

b. Web site Safety and Health Topics Page—*Combustible Dust.*

c. Hazard Alert Fact Sheet—*Combustible Dust Explosions.*

d. Poster—*Combustible Dust—Does your company or firm process any of these products or materials in powdered form?*

68. What types of materials, products, or outreach would assist you and employees in addressing combustible dust hazards? Do small businesses have special needs with respect to the form or content of such materials? Would dust-specific or industry-specific materials be useful?

69. Do you prefer paper publications such as booklets, fact sheets, and quick cards, or electronic tools such as OSHA safety and health topics pages and eTools?

III. Public Participation

Submit comments in response to this document by (1) hard copy, (2) fax transmission (facsimile), or (3) electronically through the Federal Rulemaking Portal. Because of security-related procedures, a significant delay may occur in receiving comments by regular mail. Contact the OSHA Docket Office at (202) 693–2350 for information about security procedures concerning the delivery of materials by express delivery, hand delivery, and messenger service.

All comments and submissions are available for inspection and copying at the OSHA Docket Office at the Technical Data Center, Room N–2625, U.S. Department of Labor, 200 Constitution Ave., NW., Washington, DC 20210. Comments and submissions are also available at *http://www.regulations.gov.* OSHA cautions commenters about submitting personal information such as Social Security numbers and birth dates. Contact the OSHA Docket Office at (202) 693–2350 for information about accessing materials in the docket.

Electronic copies of this **Federal Register** notice, as well as news releases and other relevant documents, are available at OSHA's Web page: *http://www.osha.gov/index.html.*

IV. Authority and Signature

This document was prepared under the direction of Jordan Barab, Acting Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, pursuant to sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657), 29 CFR part 1911, and Secretary's Order 5–2007 (72 FR 31160).

Jordan Barab,

Acting Assistant Secretary of Labor for Occupational Safety and Health.

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