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NFPA 660: New Scheme to Manage Combustible Dust

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The National Fire Protection Association (NFPA) has changed the way industries manage combustible dust and particulate solid hazards by replacing six separate combustible dust standards with one consolidated and streamlined scheme. Effective December 6, 2024, NFPA 660: Standard for Combustible Dusts and Particulate Solids is intended to eliminate variability across previous standards, providing industries with clearer and more consistent guidelines to managing combustible dust hazards. Below we provide an overview of combustible dusts, a description of the new standard, a summary of the ways in which combustible dust hazards are managed by regulators like OSHA and the CSB, as well as employer takeaways.

Overview of Combustible Dusts

As we explained in our webinar, broadly, combustible dusts are finely divided combustible particulate solid that presents a flash fire hazard or explosion hazard when suspended in air under certain conditions. Combustible dusts can include dusts of grains, sugar, corn starch, cotton, metals, pharmaceuticals, plastics, carbon, and wood, among others. Given the wide range of dusts that might be combustible, it is not surprising that numerous industries are affected by combustible dust hazards, including, but not limited to, chemical manufacturing, food products, metal industries, rubber and plastic products, equipment manufacturing, lumber and wood products, etc.

Although combustible dust incidents may not be as common as more obvious hazards, like slips/trips/falls, tragically, when combustible dust incidents do occur, they can have extremely high consequences, often resulting in numerous fatalities. Indeed, from 1980 to 2005, the CSB identified 281 combustible dust incidents that killed 119 workers, injured 718, and extensively damaged industrial facilities. And, since 2006, the CSB has conducted at least five additional investigations into combustible dust-related incidents, taking the lives of 27 workers and injuring 61 others. This underscores the need to properly manage combustible dust hazards.

To that end, in part for purposes of mitigation, the necessary elements of a combustible dust explosion are often depicted in the "combustible dust pentagon" – fuel, ignition source, oxygen, confinement, and dispersion. (The

first three elements make up the “fire triangle.”)

Combustible dust hazards are thus often mitigated by eliminating at least one side of the pentagon. Critical to any combustible dust hazard mitigation program is housekeeping. Indeed, combustible dust accumulations of even 1/32 inches – the thickness of a paper clip – can present a hazard. Good housekeeping helps control the fuel (i.e., combustible dust) side of the pentagon. While the list goes on, other mitigation measures include ignition control (e.g., spark arrestors), building/equipment design, oxygen control (e.g., nitrogen inerting – but beware of nitrogen asphyxiation hazards that may be inadvertently created), inspection and maintenance, PPE, training/education, etc. NFPA provides leading guidelines for purposes of identifying and mitigating combustible dust hazards.

The Standard

Prior to the issuance of NFPA 660, NFPA set forth guidelines about combustible dust primarily in six separate standards, some of which were industry-specific. These were: NFPA 652 (fundamentals of combustible dust), NFPA 61 (agricultural and food processing), NFPA 484 (combustible metals), NFPA 655 (sulfur), NFPA 664 (woodworking) and NFPA 654 (all other combustible dust types). Although NFPA 660 introduced some changes, it was not a complete overhaul of past standards. Rather, although some substantive changes were made, NFPA essentially consolidated the previously separate standards and converted them into chapters in the new NFPA 660 standard. The result is that NFPA 660 provides more consistent terms, definitions, and best practices to simplify compliance and enhance employee safety across all industries.

Other highlights include:

- Requirements considered fundamental have been removed from industry-specific chapters and moved to the fundamentals chapters
- Requirements included in the fundamentals chapters have been removed from the industry-specific chapters
- Information has been added to document who is qualified to perform a Dust Hazard Analysis (DHA)
- Elements of general safety training and job-specific training and refresher training frequencies have been included
- Guidance on responding to silo fires has been added

As with the previous standards, central to NFPA 660 is risk assessment and hazard identification, including, importantly, methodologies for conducting a thorough DHA. A DHA is a process that helps facilities identify areas where combustible dust presents risks of fire, deflagration, or explosion. This step is critical for developing effective mitigation strategies. It must be completed for all new and existing processes and facility compartments and revalidated every five years.

Given the importance of the DHA in the combustible dust management system, NFPA 660 establishes requirements for the members of the DHA team. The DHA must be performed by or led by a qualified person who possesses documented experience and education regarding methods for performing a DHA and the assessment and identification of mitigation or elimination options for the fire, flash fire, explosion, and related

hazards of the specific type or types of combustible dust involved in the facility.

In addition, NFPA 660 provides guidance on:

- Preventive Measures and Controls: The standard outlines preventive measures and engineering controls, suggesting measures such as dust collection systems to mitigate the risk of dust accumulation, and providing direction in the identification of potential ignition sources.
- Housekeeping and Maintenance Practices: NFPA 660 emphasizes the importance of regular housekeeping and maintenance practices to minimize the accumulation of dust and ensure the proper functioning of safety systems.
- Training and Education: The standard underscores the importance of comprehensive training and refresher training for personnel involved in handling, processing, and managing combustible materials, and in identifying ignition sources, such as static electricity.
- Emergency Response and Preparedness: NFPA 660 provides guidelines for developing emergency response plans and procedures to effectively mitigate the impact of fires and explosions caused by dust incidents.

Regulatory Oversight

Although OSHA does not have a combustible dust standard for general industry (it does for grain-handling facilities at 29 CFR 1910.272), that does not mean that OSHA does not enforce in this area. In addition to unprogrammed inspections (e.g., in response to a combustible dust incident reported by an employer), OSHA can also conduct programmed inspections through its combustible dust National Emphasis Program (NEP). OSHA's combustible dust NEP was issued on October 18, 2007, reissued on March 11, 2008, and revised on January 30, 2023. Since 2007, the agency has conducted about 600 inspections annually under this emphasis program.

OSHA uses the NEP regularly to inspect certain facilities, which are listed in an appendix based on NAICS codes, and issue citations under the General Duty Clause and/or other specific standards, such as provisions in standards related to: walking working surfaces, including requirements for housekeeping; materials handling and storage, for issues with housekeeping in storage areas; ventilation; PPE; electrical hazards; power industrial trucks; safety signage; HAZCOM; egress; and fire prevention.

While issuing citations under specific standards is a little more straightforward, issuing citations under the General Duty Clause for purposes of combustible dust hazards nearly always involves references to applicable NFPA standards. As background, for OSHA to prove a violation of the General Duty Clause, it must show four elements: (1) the employer failed to keep the workplace free of a hazard to which employees of that employer were exposed; (2) the hazard was recognized; (3) the hazard was causing or was likely to cause death or serious physical harm; and (4) there was a feasible and useful method to correct the hazard. In the NEP, OSHA states that a citation under the General Duty Clause may be issued for fire, flash fire, deflagration, and explosion hazards that may be caused by combustible dust within a dust collection system or other equipment, such but not limited to, mixers, dryers, silos (material storage), bucket elevators (material transport), or mills. And, it states, "The NFPA standards, which represent the opinions of experts familiar with combustible dust hazards, are useful in providing evidence of industry recognition of the hazard and potential feasible means of abatement." Thus, OSHA tends to prove at least two of the four General Dusty Clause violation elements – recognized hazard, and feasible means of abatement – by referencing applicable NFPA standards. Although it is still too soon to see

since NFPA 660 has only been in effect for a few months, NFPA 660 will undoubtedly be one of those standards. (Indeed, the previously separate standards that NFPA 660 consolidated were heavily relied on by OSHA.)

Additionally, as described and depicted above, although the CSB is a non-enforcement agency, it has investigated numerous combustible dust-related incidents. As part of these investigations, the CSB recommended to OSHA that it promulgate a combustible dust standard for general industry. Although OSHA opened a rulemaking in response, that effort was withdrawn on March 30, 2017. The timeline below summarizes much activity by the CSB and OSHA in this space from January 2003 to May 2017. While the CSB has developed numerous investigation reports on combustible dust-related incidents, it is also developing incident reports, a newer CSB work product, on such events.

Employer Takeaways

Combustible dust is not always obvious – materials that seem benign in solid form can become hazardous when turned into fine particles. The only definitive way to know if your dust is combustible is to have it tested by a certified laboratory. Testing can reveal properties such as ignition sensitivity, combustibility, and explosion potential, enabling you to design effective safety and mitigation strategies tailored to your operations.

Mindful of these risks, if you learn that there is a combustible dust hazard in your facility, you should consider putting a NFPA 660-compliant system in place to assure compliance, and more importantly, to ensure that your employees are safe.

Need help developing a combustible dust or industrial hygiene (IH) plan for your safety team? Reach out to us for resources from your friendly neighborhood workplace safety counsel.

Graphics and Data courtesy of CSB.gov.