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## FENWAL® Protection Systems White Paper

### ARE YOU IN COMPLIANCE WITH THE OSHA COMBUSTIBLE DUST DIRECTIVE?

**Revised March 18, 2009**

The U.S. Occupational Safety and Health Administration (OSHA) has released a directive effective 10/18/2007 initiating a National Emphasis Program (NEP) to address deflagration, fire and explosion hazards that may exist at facilities handling combustible dusts. Following a recent catastrophic accident involving combustible dust at a sugar refinery plant, OSHA has reissued this NEP effective March 12, 2008, intensifying its enforcement activities at facilities where combustible dust hazards are known to exist.

Under the revised NEP, OSHA will focus its efforts to inspect facilities that generate or handle combustible dusts that are likely to cause dust explosions and fires. Each area OSHA office is expected to inspect at least four facilities each fiscal year. OSHA will issue citations to the inspected facilities, which are noncompliant with this directive.

The OSHA directive (No. CPL-03-00-008) includes detailed information on inspection scheduling, resource allocation, inspection resources, and procedures for the national emphasis program on combustible dusts. This directive does not replace the grain handling facility directive. Additionally, the directive does not cover inspections of explosives and pyrotechnics manufacturing facilities covered by the OSHA process safety management standard. It does, however, cover facilities that manufacture or handle other types of combustible dusts covered under the process safety management standard.

During their inspections, OSHA inspectors will use applicable guidelines from the National Fire Protection Association, NFPA (*NFPA 68, 69, 85, 484, 499, 654 and 664*), FM Global data (data sheet No. *FM 7-76*) and applicable OSHA standards.

The directive is available electronically on OSHA's web site at  
[http://www.osha.gov/OshDoc/Directive\\_pdf/CPL\\_03-00-008.pdf](http://www.osha.gov/OshDoc/Directive_pdf/CPL_03-00-008.pdf).

#### **Which industries does OSHA target?**

The OSHA directive targets facilities that handle or process combustible dusts. Some of the processing equipment covered by the OSHA directive include; dust collection systems, mixers, blenders, pulverizers, mills, dryers, ovens, filters, pneumatic conveyors, and screw conveyors. Some of the combustible dusts listed in the OSHA directive are: metal dust, wood dust, coal dust and other biosolid dusts, plastics dust and additives, other organic dusts such as sugar, paper, and certain textile materials.

A partial list of the industries that are covered by the revised OSHA directive is as follows; agriculture, chemicals, food, textile, forest and furniture products, metal processing, plastics, tire and rubber manufacturing plants, paper products, pharmaceuticals, recycling operations, coal dust and biosolids handling and processing facilities.

A detailed list of the industries and corresponding SIC codes covered by this directive is given in Appendix D of the directive.

### **OSHA Inspection & Citation Procedures**

OSHA's inspection procedures include a detailed review and analysis of the following areas:

#### **1. Material & process specific explosion hazards**

- **Material ignitability and explosibility properties.** OSHA will review test data such as dust explosibility indices ( $K_{ST}$ ,  $dP/dt$ ), minimum explosive dust cloud concentration (MEC), minimum ignition temperatures, minimum ignition energy of a dust cloud in air (MIE).
- **Potential ignition sources.** OSHA will inspect facility for ignition sources such as electrostatic discharge, spark, glowing ember, hot surfaces, frictional heat or open flames that can ignite the dispersed combustible dust mixture. Additionally OSHA will review hazardous area classifications and equipment used in these locations.

As a part of this assessment, OSHA may collect samples and send it to the OSHA test laboratory for further analysis.

#### **2. Procedural controls & process safety management practices**

- **Plant history of fires and explosions.** OSHA inspectors will review plant history of fires and explosions involving combustible dusts.
- **Material Safety Data Sheets (MSDS).** OSHA will review MSDS information for their indication of dust explosion hazards.
- **Dust Accumulations.** OSHA inspectors will inspect facility for accumulation of dusts on the plant floors, overhead beams, joists and other horizontal surfaces. Inspectors will use guidelines such as NFPA 654 or FM Data Sheet 7-76 for determination of the dust accumulation hazards.
- **Permits & Signage.** OSHA will gather information on the hot work permit procedures being implemented at the facility. Additionally OSHA will inspect facility for adequate warning signs in place to warn employees of the potential combustible dust hazards.

#### **3. Engineering controls**

- **Dust collection, conveying, storage and other processing equipment.** OSHA will review and gather design information on the dust collection and other dust handling equipment, including model/serial number, volume, potential ignition sources within the equipment, and determine whether the electrical equipment in the area is designed for use in hazardous locations.
- **Explosion Prevention and Protection Systems.** OSHA inspectors will review and gather information on the adequacy of the existing explosion prevention and protection measures, which includes explosion resistant construction, spark detection systems, explosion isolation & suppression systems (per NFPA 69) and explosion relief venting (per NFPA 68). OSHA's main focus will be to determine if the inspected facility meets the explosion protection and prevention requirements for process vessels as listed in NFPA 654, which covers facilities handling combustible particulate solids.

Citation of facilities is based on inspectors' observations, combustible dust test results and using applicable OSHA standards/regulations. A partial list of the OSHA regulations is given below.

- Grain handling standard violations per 29 CFR 1910.272
- Ventilation standard violations per 29 CFR 1910.94
- House keeping standard violations: for non-grain applications 29 CFR 1910.22 and for storage areas 29 CFR 1910.176.
- General Duty Clause Section 5(a)(1) of OSH Act of 1970 violations (for deflagration and explosion hazards)
- For coal handling operations; 29 CFR 1910.269(v)(11)(vii)
- PPE standard 29 CFR 1910.132(a)
- OSHA Process Safety Management standard, 29 CFR 1910.119
- Electrical area classification violations for Class II (dust) or Class III (fibrous material) areas, 29 CFR 1910.307 or .399.
- Hazard communication standard violations per 29 CFR 1910.1200

See OSHA directive CPL 03-00-008 for a comprehensive list of citations.

### **What can you do to comply with the new OSHA directive?**

The first step is to understand the requirements of the OSHA Directive and National Emphasis Program on combustible dusts. Additionally, it is crucial for employers to understand and implement the applicable NFPA standards at their facilities that address combustible dust hazards.

One of the most critical NFPA documents is **NFPA 654**, which provides the necessary guidance to meet this OSHA directive. A detailed list of applicable NFPA guidelines is given in Appendix A of the OSHA directive and NEP. You can get a copy of NFPA documents from NFPA's web site at [www.nfpa.org](http://www.nfpa.org) or view these standards at [http://www.nfpa.org/aboutthecodes/list\\_of\\_codes\\_and\\_standards.asp](http://www.nfpa.org/aboutthecodes/list_of_codes_and_standards.asp).

Below are some of the steps you can take to ensure you comply with the OSHA Directive CPL 03-00-008 (see OSHA directive for details):

1. Gather data on explosibility and ignitability properties of the materials that you process or handle. You can ask your suppliers to provide this information, or collect and send out samples to a combustible material testing laboratory for testing per ASTM standards. Update this data whenever you change a supplier or change process / material specifications. Include explosibility and ignitability test data in the MSDS you generate. You can contact your local OSHA office for a list of 3<sup>rd</sup> party combustible dust testing laboratories that perform tests according to ASTM standards (e.g. E1226, E1515, E2019, E1491, etc...). Refer to OSHA NEP Appendix E for a description of combustible dust tests.
2. Ensure that all ignition sources within your facility are identified and all electrical locations are classified per the applicable NFPA guidelines (499, NEC) and OSHA regulations. Additionally implement safety programs to control these ignition sources, such as hot work permits, grounding and bonding, separator devices to remove foreign material, etc...
3. Implement a robust & written housekeeping program to control dust accumulations in the processing areas, including floors, structural members, conduits, pipe racks and cable trays, above ceiling locations and on and around equipment. **NFPA 654** provides guidelines on dust layer characterization and precautions.
4. Initiate a formal training program to educate your workers about combustible dust hazards.

5. Ensure that you have adequate preventative and protective measures to control dust explosion hazards at your facility per *NFPA 654*. These may include; building-damage limiting construction, inherently safer design, explosion relief venting per NFPA 68, explosion isolation per *NFPA 69* and explosion suppression per *NFPA 69*.

Refer to Appendix B of OSHA Directive 03-00-008 for a list of questions that OSHA inspectors may ask during their inspections.

#### **How can Fenwal Protection Systems help?**

At Fenwal Protection Systems, we can help you to meet the testing and explosion protection requirements of the OSHA directive. Our expertise in explosion protection, our innovative explosion protection solutions, and our combustible material testing facility, Combustion Research Center, will provide you the necessary support to help you comply with the OSHA directive and NEP with minimum disruptions to your operations.

The list given below shows some of the key OSHA directive requirements and how we can help you to meet its requirements:

<b>OSHA Directive Section No.</b>	<b>OSHA Inspection / Citation Criteria</b>	<b>How can Fenwal Protection Systems help?</b>
<b>E.1</b>	OSHA inspections include if; <ul style="list-style-type: none"> <li>• Dust is combustible</li> <li>• Minimum Explosible Concentration (MEC) of the dust is known</li> <li>• Dust can be ignited via various energy sources such as; electrostatic discharge, hot surface, friction heat, or flames</li> </ul>	The Combustion Research Center (CRC) can perform combustible dust tests including; screening test for explosibility (Go/No Go), ASTM E1515 Minimum Explosible Dust Cloud Concentration (MEC), ASTM E1226 Dust Explosibility Indices (Kst, Pmax, dP/dt), ASTM E2019 Minimum Spark Ignition Energy (MIE), ASTM E1491 Dust Cloud Ignition Temperature (T <sub>c</sub> ), ASTM E2021 Dust Layer Ignition Temperature (T <sub>s</sub> ). These tests may be required to meet the requirements of the OSHA Directive 03-00-006.  Visit <a href="http://www.kidde-crc.com">www.kidde-crc.com</a> for further information on combustible dust testing services.
<b>E.3 (b) &amp; E.6</b>	OSHA to review MSDS and other sources of information indicating dust cloud combustibility.	
<b>E.8</b>	OSHA inspections to include dust collectors, ductwork, associated equipment and containers like mixers or bins for explosion prevention and protection controls. As a part of their inspections they will also collect necessary information on the equipment physical dimensions (as described in <i>NFPA 654</i> )	Fenwal Protection Systems provides explosion protection solutions such as: <ul style="list-style-type: none"> <li>• Explosion relief venting per <i>NFPA 68</i></li> <li>• Chemical / mechanical explosion Isolation per <i>NFPA 69</i></li> <li>• Explosion suppression per <i>NFPA 69</i></li> </ul> As a part of our design, we calculate protected equipment volumes, which is required by the OSHA inspectors. Contact Fenwal Protection Systems for further information at 508-881-2000 x2501 or x2503.
<b>E.8</b>	OSHA will review information on whether the electrical equipment in the area is designed for use in hazardous (classified) locations	In order to classify the location for Class II or no classification, a series of combustible dust tests have to be performed per <i>NFPA 499</i> and <i>NEC</i> . CRC can provide "Hazardous Area Classification" testing package to help you with this

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OSHA Directive Section No.	OSHA Inspection / Citation Criteria	How can Fenwal Protection Systems help?
		assessment. Visit <a href="http://www.kidde-crc.com">www.kidde-crc.com</a> for further information.
E.9 (e)	<p>Section 5(a)(1) (general duty clause) violation citations may be issued due to:</p> <ul style="list-style-type: none"> <li>• Problems related to dust collectors</li> <li>• Improperly designed deflagration venting</li> <li>• Processing and material handling equipment (e.g. mixers, blenders, pulverizers, mills, dryers, ovens, filters, dust collectors, pneumatic conveyors, screw conveyors) not protected by deflagration suppression systems (<i>NFPA 654</i> guidelines not followed)</li> <li>• Equipment connected by pipes and ducts not protected by deflagration isolation systems</li> </ul>	<p>Problems with dust collectors:</p> <ul style="list-style-type: none"> <li>• Provide explosion isolation on the return air duct, if dust collectors returning air back to building.</li> <li>• Provide explosion suppression to dust collectors located inside a building.</li> </ul> <p>Improperly designed deflagration venting:</p> <ul style="list-style-type: none"> <li>• Fenwal vents are designed per <i>NFPA 68</i> (or <i>NFPA 61</i> for grain applications). We can design and provide vents that will comply with the requirements of the OSHA directive.</li> </ul> <p>Dust handling equipment currently not protected by deflagration suppression:</p> <ul style="list-style-type: none"> <li>• Provide explosion suppression and isolation to equipment that handle, process combustible dusts.</li> </ul> <p>Equipment connected by pipes or ducts not protected by deflagration isolation:</p> <ul style="list-style-type: none"> <li>• Fenwal provides chemical or mechanical deflagration isolation systems that comply with <i>NFPA 69</i></li> <li>• Fenwal provides infrared flame detection to activate explosion protection system upon detecting flames.</li> </ul>

If you would like to receive further information on "how Fenwal can provide assistance with the OSHA combustible dust national emphases program", please contact Emre Ergun, Product Manager-Fenwal Protection Systems, at 508-881-2000 x2501, or email [emre.ergun@fs.utc.com](mailto:emre.ergun@fs.utc.com). For information on combustible dust testing services, please contact Dr. Joseph Senecal, Director of Combustion Research Center, at 508-429-3190, or email [joseph.senecal@fs.utc.com](mailto:joseph.senecal@fs.utc.com).

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