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COMMISSIONER

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ASSISTANT DEPUTY COMMISSIONER
OCCUPATIONAL SAFETY AND HEALTH DIVISION

MEMO

To: OSH Division

From: Kevin Beauregard, Assistant Deputy Commissioner

Date: January 26, 2015

Re: Evaluating Hazardous Levels of Accumulation Depth for Combustible Dusts

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This memorandum supplements the information provided in several sections of CPL 03-00-008, *Combustible Dust National Emphasis Program (Reissued)*. Specifically, it provides guidance in calculating dust accumulation levels for dusts having a bulk density less than 75 pounds per cubic foot (75 lb/ft^3).

Several sections of CPL 03-00-008 reference 1/32 inch dust accumulation levels. This accumulation thickness is based on certain assumptions, including uniformity of the dust layer covering the surfaces and a bulk density of 75 lb/ft^3. NFPA 654 (2013) allows the dust accumulation level to exceed a layer depth of 1/32 inch for materials with a bulk density less than 75 lb/ft^3 when the bulk density of the material has been determined.

As previously stated in the cover sheet to CPL 03-00-008, the submission of dust samples to the SLTC lab requires Bureau Chief approval due to the cost of analysis.

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April 21, 2015

MEMORANDUM FOR:	REGIONAL ADMINISTRATORS
THROUGH:	DOROTHY DOUGHERTY Deputy Assistant Secretary
FROM:	THOMAS GALASSI, Director Directorate of Enforcement Programs
SUBJECT:	Evaluating Hazardous Levels of Accumulation Depth for Combustible Dusts

The purpose of this memorandum is to provide guidance in calculating the levels of dust accumulations that may be allowed at workplaces for combustible dusts with bulk densities less than 75 lb/ft^3. The guidance provided in this memorandum supplements the dust accumulation guidance provided in several sections of CPL 03-00-008, *Combustible Dust National Emphasis Program (Reissued)*, including IX.E.3.c and d; IX.E.8; and IX.E.9.c and d.

Several sections of CPL 03-00-008, *Combustible Dust National Emphasis Program (Reissued)*, reference 1/32 inch dust accumulation levels. This accumulation thickness is based on certain assumptions, including uniformity of the dust layer covering the surfaces and a bulk density of 75 lb/ ft^3 of the material. NFPA 654 (2013) allows the dust accumulation level to exceed the layer depth criteria of 1/32 inch according to the following equation for materials with bulk density less than 75 lb/ft^3:

$$LD\ (\text{in}) = \frac{\left(\frac{1}{32}\ in\right)\left(75\frac{lb}{ft^3}\right)}{BD}$$

where,

LD = layer depth (inch), i.e., adjusted dust accumulations depth based on the bulk density of the material.
BD = Bulk density (lb/ft^3) of the combustible dust in question

Additionally, according to section 6.1.3.2[1] of NFPA 654 (2013 edition), a dust explosion hazard and dust flash fire hazard are deemed to exist in any building or room where any of the following conditions exists:

1. The total area of nonseparated dust accumulations exceeding the layer depth (LD) criterion is greater than five percent of the footprint area.
2. The area of any single nonseparated dust accumulation exceeding the layer depth (LD) criterion is greater than 1000 ft^2.
3. The total volume of nonseparated dust accumulations is greater than the layer depth (LD) criterion multiplied by five percent of the footprint area.

4. The total volume of any single nonseparated dust accumulation is greater than the layer depth (LD) criterion multiplied by 1000 ft^2.

Bulk densities of combustible dusts depend on many factors including the type of material (e.g. wood, paper, plastic, metal, etc.), the dust particle size, and the dust particle shape. Compliance Safety and Health Officers (CSHOs) should take into consideration the bulk density of the dust in question prior to determining if a violation of 1910.22(a)(1), 1910.22(a)(2), or 1910.176(c) exists. CSHOs should use the guidance and example calculations (examples 1-5) provided in Appendix D.2., *Layer Depth Criterion Method* of NFPA 654 (2013 edition) to determine if a deflagration or an explosion hazard exists at that facility from dust accumulations, and citations under 1910.22(a)(1), 1910.22(a)(2), or 1910.176(c) can be issued.

Very low bulk density materials, such as tissue paper dust, may not create a deflagration hazard even at an accumulation level of ¼ inch, covering over five percent of the floor area or 1000 ft2, whichever is less. In cases involving low bulk density materials, CSHOs should take the sample as follows[2]:

1. Locate a horizontal surface area where dust is present and evenly distributed across a flat surface. This is an important criterion.

2. Mark off a 1 ft^2 area. (It is easier if one of the four sides is the horizontal surface ledge.) If an area 1 ft x 1 ft is not available due to the size of the surface use, then mark off

1/2 ft. x 2 ft (0.15 m x 0.6 m) or ¼ ft x 4 ft (0.076 m x 1.2 m).

3. Using a ruler as a guide, carefully scrape the other dust surrounding the marked 1 ft2 away from the dust square (or rectangle) at least 8-12 in. Use the brush if needed to clean dust away from the 1 ft^2 selected for bulk density measurement, ensuring that the 1 ft2 area does not receive any of the dust being brushed away.

4. Measure and record the height (to the nearest 1/32 in.) of the horizontal dust layer. Take a minimum of four measurements along the edge of the dust layer to establish an average height to the nearest 1/32 inch.

5. Collect the 1 ft^2 sample in a small plastic bottle using a clean brush. These bottles may be obtained from the Salt Lake Technical Center (SLTC) or locally purchased.

6. Affix an official sample identification seal (OSHA 21) on the container. To seal the bottle correctly apply one end of the seal to the center of the lid. Then run the seal to the edge of the lid and as far down the side of the bottle as it will reach.

7. Send the above sample of the dust to the SLTC for weighing purposes and for bulk density determination.

8. Indicate on block 30 of OSHA 91A (*Air Sampling Worksheet*) that the bulk density of the sample should be determined. Include the average thickness of the 1ft^2 sample.

After receiving the sample, SLTC will dry the sample for 24 hours in a drying oven set at 167° F before weighing the sample. SLTC will then determine the bulk density (lb/ft^3) of the submitted sample based on the volume and weight of the sample.

CSHOs should send samples to SLTC for bulk density determination only if the material is light (such as paper dust or fabric fibers) and the levels of accumulations are greater than ¼ inch extending over 5% of the floor area of a room or a building, or 1000 ft^2, whichever is less.

However, during the course of an inspection if dust accumulations are documented to exceed one inch in depth (extending over five percent of the floor area of a room or a building, or 1000 ft^2, whichever is less), samples of the dust do not need to be submitted to SLTC for bulk density determination. In these situations, information on the approximate bulk densities of the combustible dust may be obtained from various sources, including the employer or the internet, for example: http://www.hapman.com/resources/bulk-material-density-guide, http://bulksolidsflow.com.au/free_programs/bulk_density/bulk_density.html, or other similar sources. The bulk density numbers from these sources may be used as guidance to calculate the approximate values for the dust accumulations (for samples that are not sent to SLTC for bulk density determination) that can present explosion or deflagration hazards, and citations under 1910.22(a)(1), 1910.22(a)(2), or 1910.176(c) can be issued without the bulk density determination.

For any questions, Sanji Kanth of my staff should be contacted at 202-693-2135 or at kanth.sanji@dol.gov.

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1 This section of NFPA 654 (2013 Edition) outlines the Layer Depth Criterion Method. This memorandum does not discuss Mass Methods A and B or the Risk Evaluation Method outlined in sections 6.1.4 through 6.1.6 of NFPA 654 (2013 Edition).

2 The recommended procedure in section A.6.1.1.5 of Annex A of NFPA 654 (2013 Edition) has been modified to meet OSHA's needs.