

How Much Dust is Too Much Dust?

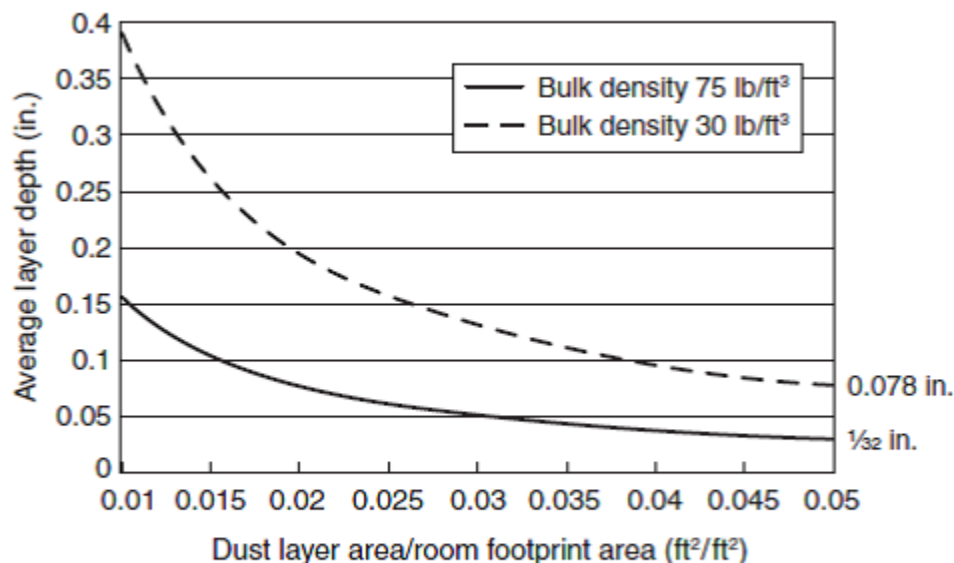


FIGURE D.2 Layer Depth Producing Dust Deflagration Hazard

Used with Permission: NFPA 654 2013 Edition

If dust is a by-product of your manufacturing process, keeping that dust under control needs to be a priority. How much dust is enough to create an explosion hazard? This article explains.

If your insurance carrier or OSHA inspector starts a discussion about how much dust you have in a room, there is a new way to quantify whether that amount is enough to pose a deflagration hazard. Deflagration is combustion that spreads through heat transfer. Hot burning material heats the next layer of cold material and ignites it. Most fire found in daily life, from flames to explosions, is deflagration.

You can calculate whether the amount of dust meets National Fire Protection Association (NFPA) regulation amounts for a hazard by using actual measurements of the depth and area that has dust on/in it and the mass density of your dust in pounds per cubic foot.

The NFPA recently added a section in Standard 654 which is the Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids. The equations are part of what is called the “Dust Layer Criterion.” In a nutshell, it takes into account the amount of energy per cubic foot that is stored in the type of dust you have in your specific location and gives guidelines on if what you have accumulated is enough to pose a hazard. The energy is calculated by figuring in the total volume and the mass density of the dust. Mass Density is related to a

material's explosive energy potential. Dust has a very large surface area for a given weight (mass). That's why it burns so quickly.

One of the best ways to understand dust's large surface to weight ratio is to compare it to a baseball. A baseball has a weight of 5 ounces and a surface area of just 28 square inches.

By comparison, 5 ounces of fine paper dust has a surface area of about 7.2 square FEET, or 1,037 square inches which is about 37 times the amount of surface area of a baseball with the same amount of weight. The large surface area combined with small particle size is what makes dust ignite easily and burn fast enough to cause an explosion or to pressurize and burst a steel filter.

The dust layer criterion is a calculation that can be completed by your staff engineer or with the help of a qualified engineer from your pneumatic conveyed trim and dust collection system provider.

The following key points in the Dust Layer Criterion may be useful when your insurance carrier or OSHA inspector wants to discuss the amount of dust in your baler room or production area.

- The dust accumulation is either separated or non-separated (combined) depending on the layout of your building. Having a baler room "separated" from production is in most cases an advantage for purposes of insurance, cleaning costs or when citations are being considered.
- Dust accumulations where the surface color (of the underlying surface) is discernable do not count for purposes of calculating the dust accumulation. In other words, if you can see the color of the floor through the dust coating, the dust in that specific area is not considered for the calculation.
- Knowing the accumulation depth and area in your baler room will help you determine the total volume of dust accumulated in the room and also may point you to where there may be leaks in the duct, cyclone or filter. If there is a small area where the dust is thick, it is typically caused by a small pinhole in the equipment. A small leak can make a lot of dust show up in a small area. Fix the leaks and you will be money ahead when the dust layer criterion is applied. Mapping out the dust thickness and drawing it on paper will help lead you to where the leaks are.
- Know what your baler room dust accumulation is over a set period of time. When speaking with the insurance carrier or the inspector (fire Marshall, OSHA inspector etc.), sometimes what an inspector cites as too much dust (lack of housekeeping) is actually below the threshold set by the NFPA. And knowing the statistics on the dust accumulation rate may help you negotiate a plan to avoid a citation and fine.

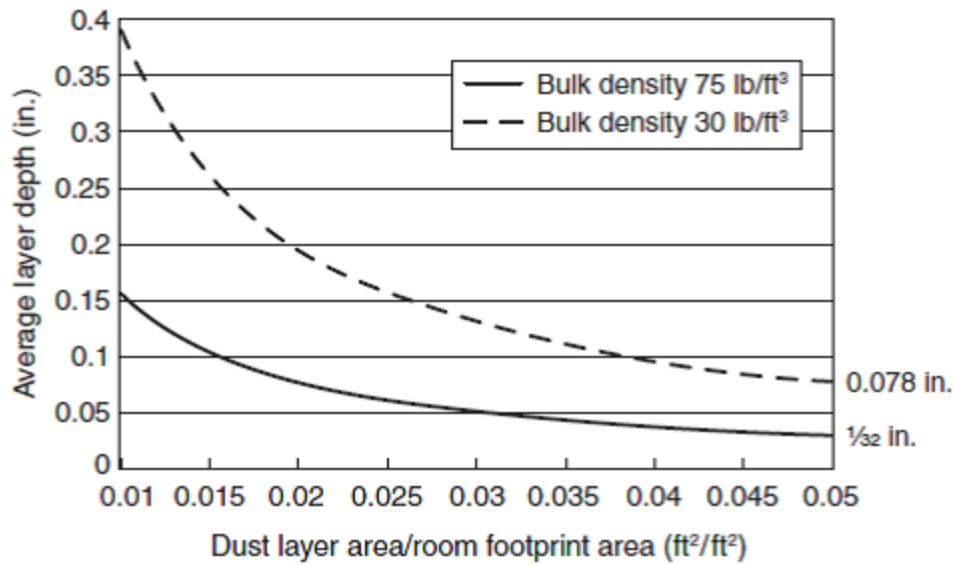


FIGURE D.2 Layer Depth Producing Dust Deflagration Hazard

Used with Permission: NFPA 654 2013 Edition

$$Ratio = \frac{20 \text{ ft}^2 \cdot \frac{1}{16} \text{ in.}}{0.05 \cdot 1000 \text{ ft}^2 \cdot \frac{1}{32} \text{ in.}} = \frac{1.3 \text{ ft}^2 \cdot \text{in.}}{1.6 \text{ ft}^2 \cdot \text{in.}} \leq 1$$

Used with Permission: NFPA 654 2013 Edition. Page 50

Questions? For more information, give G.F. Puhl a call at 615.230.9500 or email us at sales@gfpuhl.com.