

Office of Environmental, Health & Safety Compliance
Guidelines for Dry Grinding Operations

Effective January 13, 2004

Introduction

These guidelines have been prepared to assist DEP Bureaus in performing facility operations, maintenance and/or other routine activities involving grinding operations. This includes stationary or bench grinders as well as handheld/portable grinders.

Applicable Regulations

OSHA standard 1910.94(b)(2) states:

“Wherever dry grinding, dry polishing or buffing is performed, and employee exposure, without regard to the use of respirators, exceeds the permissible exposure limits prescribed in §1910.1000 or other sections of this part, a local exhaust ventilation system shall be provided and used to maintain employee exposures within the prescribed limits.”

OSHA standard 1910.1000 specifies PELs (Permissible Exposure Limits) for various materials based on the health effects of the material. These PELs are 8-hour TWAs (time-weighted averages) unless otherwise noted in the standard. Some substances also have limits preceded by "C" which denotes a ceiling value which shall at no time be exceeded for that substance or which shall not be exceeded for longer than the duration specified in the standard. All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name in 1910.1000 are covered by the Particulates Not Otherwise Regulated (PNOR) PEL which is 15 mg/m³ (total) and 5 mg/m³ (respirable).

Basis for the Guidelines

The guidelines provided here are based on initial grinding dust exposure assessments and conservative assumptions. The guidelines may be broadened in the future if there are additional follow-up assessments of additional grinding activities. See Attachment A to these guidelines for more discussion on their basis.

Dry Grinding Guidelines

Applicability to Routine Grinding of Common Materials

- Intermittant use of bench or portable grinders on common uncoated materials (e.g. carbon steel, cast iron, stainless steel, aluminum) for short durations of 15 minutes or less per day without local exhaust ventilation is unlikely to result in exposure to particulates above the PEL and is acceptable as long as the Safe Work Practices below are followed.
- Do not grind on drums, barrels, tanks, or other used containers without thoroughly cleaning to remove all residues and vapors.

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- If the following are true, the work is NOT considered routine grinding subject to these guidelines and Bureau EHS must be consulted prior to starting work to determine if assessment, ventilation, PPE or special procedures will be necessary:
 - Grinding longer than 15 minutes per day.
 - Grinders produce an unusual amount of dust visible in the breathing zone.
 - Grinding in a confined space.
 - Grinding other metal alloy materials that may contain toxics (e.g., cadmium, cobalt, beryllium, etc.)
 - Grinding coated materials, unless they are known to be non-toxic. In accordance with other DEP guidelines, it is to be assumed that all painted surfaces meet the definition of lead paint unless there is information indicating it is not contaminated. **DO NOT GRIND ON MATERIALS WITH TOXIC OR UNKNOWN COMPOSITION COATING WITHOUT CONSULTING BUREAU EHS BEFORE STARTING WORK.**

Safe Work Practice

These safe work practices should be followed when conducting the above routine dry grinding operations:

- Conduct all grinding in accordance with the DEP Hot Work procedure.
- Potential hazards associated with grinding activities may also warrant eye/face and possible hand protection. Refer to the PPE hazard assessment for the workgroup or activity for the PPE required.
- Where a grinding activity involves non-toxic materials and the grinding activity occurs only occasionally, there is minimal risk to health when following these procedures. A filtering face piece (dust mask) may be worn voluntarily as long as it is in compliance with the NYC DEP Respiratory Protection Policies and Procedures. Consult Bureau EHS for guidance.
- Where coatings, other metal alloys or coolants are used, review the Material Safety Data Sheet (MSDS) for the grinding wheel, work material, coolant, or any other product used in the grinding process before grinding begins. Precautions noted on the MSDS must be followed. If you have questions regarding toxics on an MSDS or there is no MSDS available, contact Bureau EHS for assistance before proceeding.
- All surface coatings near the point of operation should be removed by other means (e.g. non-methylene chloride stripping, manufacturer recommended procedures, etc.) as practical before grinding.
- The area around the grinder should be clean and free from dust and other material that could be dispersed into the air by the grinding operation.
- When using portable grinder, move the work to a well ventilated area, if possible.
- When grinding, direct the discharge of sparks and particulate away from your breathing zone and face as well as away from other workers in the area.
- If a visible cloud of dust or smoke is present in the breathing zone then the operation should be stopped and workers should exit the work area.

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Attachment A – Basis for the Dry Grinding Guidelines

The information in this attachment forms the basis for the guidance provided.

Hazards of Grinding and Particulate Exposure

In dry grinding operations such as those conducted by DEP, one of the primary hazards is exposure to particles (including dust from solid substances) given off by the grinding operation. The critical exposure factors associated with exposure to particulates include:

- the type of particulates;
- the length of exposure time;
- the concentration of particulates in a workers breathing zone; and
- the size of the particles present in the breathing zone.

The type of particulates, concentration and size are in turn dependent on the properties of the material being grinded, the grinding process, the room size and ventilation.

The presence of toxics in the material being grinded is important to know as some materials, such as lead or chromium have lower exposure limits than PNOR (Particulates Not Otherwise Regulated). If the material being grinded is non-toxic, then the PNOR standards apply based on their being an irritant.

Duration of exposure encompasses both chronic exposures over years to the same or to synergistic particulates, as well as acute exposure above an established exposure limit. Generally, the 8-hour Time Weighted Average PELs are the basis for evaluation unless there are Short-Term Exposure Limits (e.g., 15 minute) or Ceiling Limits (value not to be exceeded at any time).

The concentration of the particulate in the workers breathing zone is impacted by type of work, configuration of the work area and ventilation. Dust concentrations at or above the PNOR limit is generally readily visible and the absence of visible dust is a good indicator that there is little risk of exceeding the PNOR limit. Where there is potential for exceeding any PEL, area monitoring with real-time instrumentation is often used (where instruments are available for the parameter measured) for obtaining upper bound work zone and breathing zone concentrations to determine if personal sampling is warranted. Where warranted, personal sampling of a representative or worst-case employee is most often used to represent breathing zone exposure.

Particulates that are of respirable size, less than 5 microns diameter, can reach deep portions of the lungs and may cause a biological reaction in the lungs such as fibrosis or pneumoconiosis. Larger particles tend to be captured in the nose, throat and upper airways and are mostly expelled. Inhalation of particulates may also cause other biological reactions depending on the type of particulate. The particles from grinding with bench or portable grinders are

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characteristically large, settle quickly and are predominantly above the respirable range. Based on this, the total particulate data can be used to evaluate exposure against the PNOR PEL of 15 mg/m³. These results should be comparable to measuring respirable dust and comparing it to the Respirable Dust PEL of 5 mg/m³. Comparing total dust data to the lower standard would be more conservative in the absence of respirable dust data, but it is unlikely that more than 1/3 of the dust measured in the breathing zone, by weight, is respirable. .

Basis for Assessment that Following the Guidelines Will Meet the PNOR Exposure Limits

The PEL for PNOR is an 8-hour Time Weighted Average of 15 mg/m³ and applies if no other toxic metals with PEL's are in the alloy. Dust concentrations at or above the PNOR limit is generally readily visible and the absence of visible dust in the breathing zone is a good indicator that there is little risk of exceeding the PNOR limit.

An additional safety factor exists due to the short-term nature of the exposure. Therefore, we can apply other relevant short-term exposure benchmarks and consider the contribution of this short-term exposure to the TWA exposure (note: although there is no guarantee that DEP employees will not work in a dusty environment for the balance of their work day, it is not common to be approaching the PEL in routine activities).

The TLV booklet (from ACGIH-American Conference of Governmental Industrial Hygienists) indicates that a 30 minute Short Term Exposure Limit (STEL) may be assumed to be 3 times the TWA if a ceiling or STEL is not listed. Therefore, for the the exposure window of 15 minutes in the guidance, the equivalent short term exposure limit would be 45 mg/m³. If there is no visible dust in the breathing zone, this provides a safety factor of at least 3.

The contribution of a 30 minute exposure (twice the guideline) of even 3 times the PNOR concentration of 45 mg/m³ yields an 8-hr TWA contribution of 2.8125 mg/m³ which is well below the 15 mg/m³ PEL. This approach gives a safety factor of at least 5.

Based on the above analysis, we can have reasonable assurance that following the guidelines outlined would maintain exposure under the PEL.

This information assumes that the conditions of the guidelines are followed as supported by current exposure assessment information. This analysis addresses activities which would be expected to only produce a PNOR exposure, however, and other materials and alloys may contain listed inorganic toxics in sufficient quantity to warrant further analysis to ensure that grinding would not result in exceeding a substance specific PEL.