

Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations

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1: Scope

- 1.1 This guide describes methods of paint removal, containment systems, and procedures for minimizing or preventing emissions from escaping the work area, and procedures for assessing the adequacy of the controls over emissions.
- 1.2 The containment systems are categorized in up to four classes per type of paint removal method, based on the extent to which emissions are controlled.
- 1.3 This guide is primarily intended for use with steel structures; however, some of the methods and materials may be suited for use on concrete, aluminum, wood, or other materials of construction.
- 1.4 This guide is intended for use by facility owners, specifiers, designers, and contractors. It may also be used by other interested parties. National and local regulations may apply when this guide is used outside the U.S.
- 1.5 A discussion of ventilation is included in the guide to assist users in both controlling emissions to the environment, and in enhancing worker protection and visibility within the containment. It is important to recognize that ventilation systems alone may or may not be sufficient to fully protect workers when the paint being removed contains lead or other toxic metals, and additional work practice and/or administrative controls and respiratory protection may be required to control worker exposures. Requirements or evaluation methods for worker health and safety are outside the scope of this guide.

NOTE: When toxic metals are referenced in the guide, lead is often used as the example. This should not be construed to imply that lead is the only toxic metal contained in paints or abrasives, or that lead is the only toxic metal addressed in regulations. A number of toxic metals may be present in paint and abrasives, and regulations are available to address many of them.

2: Description and Definitions

- 2.1 **General:** During surface preparation, airborne particulate matter and debris from the removal of paint (particularly paints containing lead, cadmium, and chromate pigments) can contaminate the air, soil, and water surrounding work sites. The potential environmental hazards are reduced by minimizing or eliminating the airborne particulate matter, and by containing and collecting the debris. Controlling airborne particulate matter and other emissions may be necessary to comply with federal, state, and local regulations.
- 2.2 **Outline of Guide**
 - 2.2.1 Procedures included in this guide:
 - Selecting Methods of Surface Preparation and Debris Collection (Section 4.1)
 - Specifying Containment Systems (Section 4.2)
 - Selecting Methods for Assessing the Quantity of Emissions (Section 4.3)
 - Implementing Containment Project (Section 4.4)
 - 2.2.2 The guide also includes descriptions and commentaries on:
 - Methods of Coating Removal (Section 5.1)
 - Methods of Collecting Debris (Section 5.2)
 - Containment Enclosure Components (Section 5.3)
 - Ventilation System Components (Section 5.4)
 - Methods for Assessing Quantity of Emissions (Section 5.5)

2.3 Definitions

Action Level: Employee exposure, without regard to the use of respirators, to an airborne concentration of a contaminant in milligrams per cubic meter (mg/m^3) or micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) calculated as an eight-hour Time Weighted Average (TWA). Unless otherwise specified by regulation, the Action Level of a material will be equivalent to one-half of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for that substance.

Air Flow: In this guide, “air flow” refers to the rate or movement of air (i.e., foot per minute [ft/min]) in a given direction such as cross- or down-draft. Also referred to as “air velocity” or “air movement.”

Containment System: A containment system includes the cover panels, screens, tarps, scaffolds, supports, and shrouds used to enclose an entire work area or a paint removal tool. The purpose is to minimize or prevent the debris generated during surface preparation from entering the environment, and to facilitate the controlled collection of the debris for disposal. Containment systems may also employ the use of ground covers or water booms.

Emissions: When used in this guide, emissions from the containment that require control include airborne plumes of material, as well as spills or leaks of water, abrasive, paint chips, and debris.

Engineering Controls: A device or system designed and implemented to restrict or abate occupational health and safety hazards at their source (e.g., ventilation to remove air contaminants, acoustical enclosure of noisy equipment). *Discussion:* Engineering controls protect workers by removing hazardous conditions or by placing a barrier between the worker and the hazard. Examples include general dilution ventilation or local ventilation (e.g., vacuum shrouds). OSHA Comprehensive Health Standards for lead, cadmium, beryllium, hexavalent chromium, arsenic, and silica (see CFR 1926 parts listed in [Section 3.6](#)) require the employer to implement engineering controls to reduce and maintain employee exposure below the permissible exposure limit to the extent that such controls are feasible.

Hazardous and Toxic Substances: Substances defined by OSHA as chemicals present in the workplace that are capable of causing harm. In this definition, the term “chemicals” includes dusts, mixtures, and common materials such as paints, fuels, and solvents.

Impenetrable: Impervious to dust and wind.

Impermeable: Impervious to water.

Negative Air Pressure: Air pressure inside a structure (e.g., containment) that is less than the air pressure outside the structure.

Discussion: Air is to be drawn into the enclosure under all anticipated conditions and exhausted, resulting in air pressure inside the enclosure (e.g., containment) that is less than the air pressure outside the enclosure, helping to prevent releases of contaminants.

PM-10: Particulate matter (dust) less than $10\ \mu\text{m}$ (0.39 mils) in aerodynamic equivalent diameter. (Aerodynamic equivalent diameter is defined as the diameter of a unit density sphere having the same settling velocity as the particle in question, regardless of its shape and density.)

Permissible Exposure Limit (PEL): In this guide, PEL refers to employee exposure, without regard to the use of respirators, to an airborne concentration of a contaminant in micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) calculated as an eight-hour TWA. A formula is used to calculate the PEL if an employee is exposed to lead or any other contaminant for more than eight hours in any workday.

Static Pressure: The pressure exerted by a liquid or gas, especially water or air, on a body at rest. In this guide, “static pressure” refers to the amount of pressure measured in inches of water when air moves through an object, such as duct work. *Discussion:* Typical static pressure losses include loss through air inlets, duct work and the dust collector itself. For example, a dust collector rated at 40,000 cfm may only provide 30,000 cfm exhaust capacity at 14 inches of static pressure loss. Air resistance in a ventilation system is mainly determined by air speed in the system. Air resistance grows directly proportional to air flow. This phenomenon is known as pressure loss. Static pressure produced by a fan causes air motion in the ventilation system with a certain resistance. The higher the ventilation resistance in the system, the less air flow the fan has. Total pressure loss is equal to all pressure loss values in a ventilation system.

Time Weighted Average (TWA): Concentrations of airborne toxic materials that have been weighted for a certain time duration, usually eight hours.

Ventilation System: A method of providing air movement across a work area by either natural or mechanical means. Ventilation systems include both natural ventilation and mechanical ventilation (fans, hoods, and duct work) to provide air movement across the work area, and dust collectors to clean the discharged air.

3: Referenced Documents

3.1 The latest edition, revision, or amendment of the referenced documents in effect shall govern unless otherwise dated.

3.2 **SSPC: The Society for Protective Coatings,** www.ampp.org

- SSPC-Guide 7 Guide for the Disposal of Lead-Contaminated Surface Preparation Debris
- SSPC-Guide 16 Guide to Selection of Dust Collectors
- SSPC-Guide 18 Specifier's Guide for Determining Containment Class and Environmental Monitoring Strategies for Lead-Paint Removal Projects
- SSPC-TU 7 Conducting Ambient Air, Soil, and Water Sampling During Surface Preparation and Paint Disturbance Activities

3.3 **American Conference of Governmental Industrial Hygienists,** www.acgih.org

Industrial Ventilation – A Manual of Recommended Practice

3.4 **American Industrial Hygiene Association,** www.aiha.org
American Society of Safety Professionals, www.assp.org

- ANSI/AIHA/ASSP Z9.2-2012 Fundamentals Governing the Design & Operation of Local Exhaust Ventilation Systems
- ANSI/AIHA/ASSP Z9.4-2011 (R2021) Abrasive-Blasting Operations – Ventilation and Safe Practices for Fixed Location Enclosures
- ANSI/ASSP Z9.9-2021 Portable Ventilation Systems
- ANSI/ASSP Z9.10-2017 Fundamentals Governing the Design and Operation of Dilution Ventilation Systems in Industrial Occupancies

3.5 **National Fire Protection Association,** www.nfpa.org

NFPA 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

3.6 **U. S. Government Code of Federal Regulations,** www.ecfr.gov

Listed below are some of the regulations that may be required when performing cleaning and painting of hazardous coatings inside a containment: New governmental regulations or amendments to existing ones become effective as scheduled by the governmental agency, independent of the date of bid.

- 29 CFR 1910.1025 Occupational Safety and Health Standards Subpart Z – Toxic and Hazardous Substances (Lead)
- 29 CFR 1915 Occupational Safety and Health Standards for Shipyard Employment
- 29 CFR 1915.13 Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
- 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
- 29 CFR 1926.57 Safety and Health Regulations for Construction, Subpart D – Occupational Health and Environmental Controls (Ventilation)

29 CFR 1926.62	Safety and Health Regulations for Construction, Subpart D – Occupational Health and Environmental Controls (Lead)
29 CFR 1926.1118	Arsenic
29 CFR 1926.1124	Beryllium
29 CFR 1926.1126	Hexavalent Chromium
29 CFR 1926.1127	Cadmium
29 CFR 1926.1153	Respirable Crystalline Silica

4: Procedures

4.1 Selecting Methods of Surface Preparation and Debris Collection

4.1.1 Surface Preparation Method: Prior to selecting and specifying a containment system, it is necessary to determine the method to be used for surface preparation of the steel. Considerations for selecting surface preparation follow.

4.1.1.1 Coatings can be removed from the surface by a variety of techniques. These include:

- Abrasive blasting (e.g., open blasting with expendable abrasives, open blasting with reusable abrasives, vacuum [closed] blasting with reusable abrasives, nonrecirculating closed blast systems).
- Water blasting and pressurized waterjetting (with or without abrasives).
- Chemical stripping.
- Hand and power tool cleaning (with and without localized exhaust).

4.1.1.2 Methods vary significantly in their productivity, degree of cleanliness and surface profile achieved, utility and support requirements, dust and waste produced, clean-up required, and costs. For example, open abrasive blasting with expendable abrasives requires the greatest quantity of abrasive and produces the greatest quantity of dust and debris. Methods that do not utilize abrasive generally produce the least amount of dust and debris.

NOTE: The toxicity characteristic of the waste is independent of the volume of the waste generated (e.g., paint chips alone or paint chips combined with abrasive). It should also be noted that the abrasive used for abrasive blast cleaning might contain other hazardous materials such as cadmium, arsenic, chromium, and beryllium.

4.1.1.3 Before specifying a method of surface preparation, the manufacturer of the coating to be applied should be consulted to assure that the degree of cleaning and surface profile produced will be satisfactory for coating system performance.

4.1.2 Methods for Collecting Debris: Debris may be collected from the surface at the point of cleaning (e.g., with vacuum) or from the general work area. The collection method should be selected in conjunction with the paint removal method and the containment system design to assure a completely integrated operation. The debris should be collected on a regular basis and not left to accumulate over the course of a job. Methods of collecting debris are described in [Section 5.2](#).

In addition to collecting debris within containment, debris that escapes the contained area should be removed on a routine basis (e.g., end of work day, or as specified) to prevent winds or rain from carrying it onto surrounding property, into soil, ground, or storm sewers, or into bodies of water.