SSPC-Guide 6
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SSPC: The Society for Protective Coatings

SSPC-GUIDE 6

Guide for Containing Debris Generated During Paint Removal Operations

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 to be used by facility owners, specifiers, designers, and contractors. It may also be used by other interested parties.

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.

2. Description and Definitions

2.1 GENERAL: During surface preparation, airborne particulate 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, and by containing and collecting the debris. Controlling airborne particulate 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 Projects (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)
- Method for Assessing Efficiency of Debris Collection and Bulk Abrasive Recovery (Section 5.6)

2.3 DEFINITIONS

2.3.1 **Action Level for Lead:** Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 $\mu g/m^3$) calculated as an eight-hour TWA per OSHA General Industry Standard 29 CFR 1910.1025 and OSHA Construction Industry Standard 29 CFR 1926.62.

2.3.2 **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 into 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.

2.3.3 **Ventilation System:** 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.

2.3.4 **PM-10:** Particulate matter (dust) less than 10 micrometers (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.)

2.3.5 **Permissible Exposure Limit (PEL) for Lead:** Maximum allowable employee average exposure per OSHA General Industry Standard 29 CFR 1910.1025 and OSHA Construction Industry Standard 29 CFR 1926.62.

2.3.6 **Time Weighted Average (TWA):** Concentrations of airborne toxic materials which have been weighted for a certain time duration, usually 8 hours.

2.3.7 **Impenetrable:** Impervious to dust and wind.

2.3.8 **Impermeable:** Impervious to water.

3. Referenced Documents

3.1 The standards and references in this guide are listed in Sections 3.2 through 3.9 and form a part of this guide.

3.2 The latest issue, revision, or amendment of the reference standards in effect on the date of invitation to bid shall govern unless otherwise stated.

Note: New governmental regulations or amendments to existing ones become effective as scheduled by the governmental agency, independent of the date of bid.

3.3 SSPC: THE SOCIETY FOR PROTECTIVE COATINGS:

PA Guide 5	Guide to Maintenance Painting Programs
Guide 7	Guide for the Disposal of Lead Contaminated Surface Preparation Debris

3.4 U.S. GOVERNMENT CODE OF FEDERAL REGULATIONS:

29 CFR 1926.62	Interim Final Rule on Lead Exposure in Construction
29 CFR 1910.1025	Occupational Safety and Health Standards (Lead)
40 CFR, Part 50, Appendix G	National Ambient Air Quality Standard for Lead

3.5 U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH:

Method 7082	Lead

3.6 U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

OSHA 3142	Lead in Construction

3.7 U.S. ENVIRONMENTAL PROTECTION AGENCY:

Method 3050	Acid Digestion of Sediments, Sludges, and Soils

3.8 AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS:

Industrial Ventilation Manual of Recommended Practices

3.9 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

ANSI/ASC Z9.4	For Exhaust Systems Abrasive Blasting Operations – Ventilation and Safe Practice

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:

i. Abrasive blasting (e.g. open blasting with expendable abrasives, open blasting with re-usable abrasives, vacuum [closed] blasting with re-usable abrasives, non-recirculating closed blast systems).

ii. Water blasting and pressurized water jetting (with or without abrasives).

iii. Chemical stripping.

iv. 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 which 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 may contain toxic components.

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.

4.2 SPECIFYING CONTAINMENT SYSTEMS

4.2.1 The facility owner or representative should specify the class of containment required and/or the environmental monitoring criteria that will be used to verify its suitability. The specified containment must be maintained in accordance with the approved design throughout the course of surface preparation. Because of uncertainties in the measurement and significance of containment efficiencies, it is not a good practice to simply specify a level or percent of containment. Methods for specifying containment systems and items that must be considered are found in Sections 4.2.2, 4.2.3, and 4.2.4. Containment for paint application is outside of the scope of this Guide.

4.2.2 Containment System Classes: The classifications described below vary in the degree to which the containment design can be effective in controlling emissions of dust and debris into the environment. The degree of emissions control is greatest for Class 1 and least for Class 4. Selection of a containment system with greater emission control capability is required for surface preparation methods which produce the greatest quantity of dust and debris. Containments with lesser emissions control capability are required for surface preparation methods which produce the least quantity of dust and debris. For example, a Class 1 containment for abrasive blast cleaning (designated 1A) involves the use of more elaborate containment components than Class 1 for power tool cleaning (designated 1P). For this reason, individual tables have been prepared to identify the containment components for each of the classes according to the type of removal method.

When vacuum shrouding is employed around the removal tool, controls equivalent to Class 1 may be achieved through the use of ground covers or free-hanging tarpaulins.

4.2.2.1 Class 1: This system provides the highest level of emissions control.

For abrasive blast cleaning, Class 1A normally requires air impenetrable walls with rigid or flexible framing, fully sealed joints, airlock or resealable entryways, and negative air achieved by forced or natural air flow (verified by instrument or visual monitoring) and exhaust air filtration. [Note: Class 2 from the original 1992 Guide 6I(CON) was combined with Class 1 in 1994 and designated as Class 1A.]

For wet methods of preparation, Class 1W normally requires water impermeable walls and floors with rigid or flexible framing, fully sealed joints, resealable entryways, and negative air achieved by forced or natural air flow (verified visually) and exhaust air filtration.

For chemical stripping, Class 1C normally requires water impermeable and chemical resistant walls and floors with rigid or flexible framing, fully sealed joints and overlapping entryways, and forced or natural air flow with exhaust air filtration.

For hand or power tool cleaning, Class 1P normally requires air impenetrable walls with rigid or flexible framing, fully sealed joints, resealable entryways, and negative air achieved through forced or natural air flow (verified visually) and exhaust air filtration.

4.2.2.2 Class 2: This system provides a high level of emissions control.

For abrasive blast cleaning, Class 2A normally utilizes air impenetrable walls with rigid or flexible framing, fully sealed joints, partially sealed entryways, forced or natural air flow (verified visually) and exhaust air filtration. [Note: Class 3 in the original 1992 Guide 6I(CON) was redesignated as Class 2A in 1994.]

For wet methods of preparation, Class 2W normally requires water impermeable walls and floors, rigid or flexible framing, fully sealed joints, overlapping entryways, and natural air flow.

For chemical stripping, Class 2C normally requires water impermeable and chemical resistant walls and floors with rigid or flexible framing, fully sealed joints, overlapping entryways, and natural air flow.

For hand or power tool cleaning, Class 2P normally requires air penetrable or impenetrable walls, rigid or flexible framing, fully sealed joints, overlapping or open seam entryways, and natural air flow.

4.2.2.3 Class 3: This system provides a moderate level of emissions control.

For abrasive blast cleaning, Class 3A normally utilizes air penetrable walls with rigid or flexible framing, partially sealed joints and entryways and exhaust air filtration. [Note: Class 4 in the original 1992 Guide 6I(CON) was redesignated as Class 3A in 1994.]

For wet methods of preparation, Class 3W normally requires water impermeable walls and floors, minimal framing, partially sealed joints, open seam entryways, and natural air flow.

For chemical stripping, Class 3C normally requires water impermeable and chemical resistant walls and floors, minimal framing, partially sealed joints, open seam entryways and natural air flow.

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For hand or power tool cleaning, Class 3P normally requires air penetrable walls, minimal framing, partially sealed joints, open seam entryways, and natural air flow.

4.2.2.4 Class 4: This system provides a minimal level of emissions control.

For abrasive blast cleaning, Class 4A normally utilizes air penetrable walls with flexible framing, open seams and entryways, and natural air flow. [Note: Class 5 in the original 1992 Guide 6I(CON) was redesignated as Class 4A in 1994.]

For wet methods of preparation, this class is not applicable.

For chemical stripping, this class is not applicable.

For hand or power tool cleaning, this class is not applicable.

4.2.2.5 **Containment Class Tables:** Tables A, W, C, and P list various containment and ventilation components which can be utilized to achieve these different classes. Table A is used for abrasive blast cleaning, Table W for water blasting/water jetting, Table C for chemical stripping, and Table P for hand or power tool cleaning. The components are described in Sections 5.3 and 5.4. Note that other combinations of containment and ventilation components may provide dust and debris control similar to those suggested in the tables.

4.2.3 Other Considerations in Specifying and Selecting Containment Systems:

a. Type of structure (e.g., simple flat plate or beams versus complex trusses and joists).

b. Load bearing capacity and integrity of the containment system and of the structure. Note: Containment systems may need to be reviewed by a registered professional engineer prior to erection and use to confirm the structural adequacy of the containment and the effect of various loads imposed.

c. Size and elevation of structure (e.g., elevated water tank, small secondary bridge, etc.)

d. Location of structure (e.g., rural, urban, over water, etc.)

e. Proximity to other buildings, structures, operating equipment, and traffic. Tight confines may not permit the construction of certain containment devices.

f. Local climate (e.g., heavy winds, rain, snow, etc.)

g. Permitting. The construction of containment devices may be regulated by codes.

h. Construction of structure such as riveted or welded. On certain structures, the welding of containment system brackets adjacent to riveted seams should be avoided.

i. Additional work to be performed inside containment (e.g., the control of paint overspray).

4.3 SELECTING METHODS FOR ASSESSING THE QUANTITY OF EMISSIONS

4.3.1 The specifier should select one or more of the following methods for monitoring the amount of dust or debris that escapes the work area.

Method A: Visible Emissions

Method B: Ambient Air Monitoring for PM-10
Method C: Occupational Monitoring of Area Emissions for Lead
Method D: Ambient Air Monitoring for Toxic Metals (TSP Lead)
Method E: Soil Analysis for Toxic Metals
Method F: Water and Sediment Analysis for Toxic Metals

These methods are described in Section 5.5. A method for assessing the efficiency of debris collection and bulk abrasive recovery is also addressed (see Section 5.6).

4.3.2 If one or more of the methods is specified, the specification should identify the method selected, the frequency and duration of the tests that will be employed, the location of the monitors (in the case of instrument monitoring), and the acceptance criteria.

4.4 IMPLEMENTING CONTAINMENT PROJECTS

4.4.1 Preparation of Written Specification: The specifier should incorporate the information derived in 4.1 through 4.3 in a written document that clearly defines what is required of the contractor, what is to be furnished by the owner, and how the work will be evaluated. It is also recommended that the specifier identify applicable regulations, codes, ordinances, etc., and the associated enforcement agencies. In addition, the document should include names of key contacts and provisions for resolving disputes.

4.4.2 Implementation of Containment and Monitoring: The owner should assure that the work is monitored as described above (see also Sections 9 and 10 of SSPC-PA Guide 5). A high level of involvement by the owner either directly or through knowledgeable designates should be maintained throughout the course of the project. Because of the newness of much of this technology, there is often a need to modify the specific terms of the specification, such as the paint removal methods employed, the design and construction of the containment, and the methods for monitoring the emissions.

4.4.3 Project Documentation: It is vital that the facility owner be provided with accurate and complete records of all the documents and activities including specifications, inspection and work reports, change orders, weather conditions, various mitigating factors, contractor suppliers, activities by regulatory agencies in monitoring or guiding the work, disposal records and test results and data derived from containment, ventilation, air, soil, and other monitoring. These records and data are invaluable in evaluating the quality of the work and in determining conformance with the specifications. In addition, they can be added to the database being developed by the protective coatings industry on the most cost-effective and efficient means of debris containment.

4.4.4 Disposal of Debris: Surface preparation debris (e.g., spent abrasives and containment materials that cannot be reused), must be disposed of in accordance with Federal and state regulations on solid and hazardous waste. For more information, see SSPC-Guide 7.

4.4.5 Cleaning of Reusable Equipment and Materials: Loose surface lead dust shall be removed from equipment, containment materials, and other reusable items prior to transportation off-site.

5. Descriptions of Methods and Systems

5.1 METHODS OF COATING REMOVAL: The following is a list of methods that can be used successfully to remove coatings and to collect the debris. Mists, dusts, and debris created may or may not contain toxic metals. All waste discharges should be tested for toxic metals. The list is not considered to be all-inclusive, as new and innovative methods are continually being developed.

5.1.1 Hand Tool Cleaning: Includes chipping hammers, scrapers, wire brushes, and sand paper.

5.1.2 Power Tool Cleaning: Includes power operated wire brushes, sanders, scrapers, grinders, descalers, needle guns, and rotary peening equipment.

5.1.3 Power Tool Cleaning with Localized Exhaust: Includes power tools which contain integral vacuum-equipped shrouding. A brush or rubber sleeve on the shrouding conforms to the surface to enhance the control of dust and debris collection.

5.1.4 Water Jetting Without Abrasive: Includes all types of pressurized water jetting systems. The action of the water with or without cleaning solutions or rust inhibitors provides the cleaning. Pressures are as stated by the manufacturer of the equipment. Note that when removing hazardous paints, high pressures and certain cleaning solutions may cause the hazardous substances to be carried with the water. This water must be recycled or collected and disposed of properly. Water jetting at pressures from 10,000 to 25,000 psi is often called high pressure water jetting, and, at pressures over 25,000 psi, ultra high pressure water jetting.

5.1.5 Water Jetting With Abrasives: Includes pressurized water jetting systems with abrasive injection. Variations may mix abrasive and water in a separate tank or at the nozzle, or inject abrasive into the water stream. Pressures required as stated by the manufacturer of the equipment. Note that when removing hazardous paints, high pressures and certain cleaning solutions or rust inhibitors may cause the hazardous substances to be carried with the water. This water must be recycled or collected and disposed of properly. Water jetting at pressures from 10,000 to 25,000 psi is often called high pressure water jetting, and, at pressures over 25,000 psi, ultra high pressure water jetting.

5.1.6 Wet Abrasive Blast Cleaning: Includes compressed air blasting systems that incorporate water into the blast stream. Variations may mix abrasive and water in a separate tank or at the nozzle, or apply the water to the abrasive as it exits the nozzle. Pressures are required as stated by the manufacturer of the equipment. Note that when removing hazardous paints, high pressures and certain cleaning solutions or rust inhibitors may cause the hazardous substances to be carried with the water. This water must be collected and disposed of properly.

5.1.7 Open Abrasive Blast Cleaning with Expendable Abrasives: Blast cleaning using compressed air to propel abrasives through nozzles. The spent abrasives, paint, debris, trash, etc. are collected for disposal. Expendable abrasives are those which are not normally reused after the initial blast. For the purposes of this guide, expendable abrasives include natural minerals (e.g., quartz sand, flint, garnet, staurolite, olivine, etc.), and mineral slags formed in electric power generation or in smelting metals such as copper or nickel. Manufactured abrasives, such as aluminum oxide, and vegetable abrasives (e.g., walnut shell, corn cob, etc.) might also be included. Caution: Some expendable abrasives may contain heavy metals.

5.1.8 Open Abrasive Blast Cleaning with Reusable Abrasives: Blast cleaning using compressed air to propel abrasives through nozzles, except that the abrasives are collected, cleaned of paint and debris, and reused. Cast steel, malleable iron, chilled cast iron, garnet, and aluminum oxide abrasives are typically used. An abrasive's ability to be re-used depends on its type, durability, and hardness. The abrasive reclaimer (collection and cleaning equipment) may be an integral part of the blast machine or it may be housed in a separate machine. Blasting and abrasive reclamation may operate simultaneously or independently. The use of re-usable abrasives may reduce the volume of waste by a factor of 50 or more compared to expendable abrasives.

5.1.9 Closed Abrasive Blast Cleaning with Re-Usable Abrasives: Blast cleaning using compressed air or centrifugal wheels within a vacuum assembly to propel abrasives toward a surface and simultaneously remove the abrasive and debris. Once the collected abrasives are cleaned of paint and debris, they are reused. Reusable abrasives may reduce the volume of waste by a factor of 50 or more compared to expendable abrasives. Systems can be recirculating or non-recirculating.

5.1.9.1 Vacuum Blasting: Blast cleaning using compressed air to propel abrasives toward a surface. A special vacuum assembly equipped with a brush or rubber sleeve surrounds the blast nozzle, sealing it to the surface. The seal must be maintained between the assembly and the surface to create a completely closed blasting cycle. The abrasive is recirculated automatically, cleaned of paint and debris, and returned for reuse. Cast steel, malleable iron, chilled cast iron, and aluminum oxide abrasives are typically used.

5.1.9.2 Wheel Blast Cleaning: Blast cleaning wheel assemblies that propel abrasive to the surface using centrifugal force. A special vacuum assembly with a mask that seals the centrifugal wheel assembly to the surface is required. The seal must be maintained between the assembly and the surface to create a completely closed blasting cycle. The abrasive is recirculated automatically, cleaned of paint and debris, and returned for reuse. Cast steel, malleable iron, or chilled cast iron abrasives are typically used.

5.1.9.3 Mechanical Non-Recirculating Blast System: Equipment that shrouds the blast nozzle to contain and remove the debris. The abrasive may or may not be reused. If it is reused, cleaning the debris from the abrasive is accomplished as a separate operation.

5.1.10 Chemical Stripping: Use of chemical stripping solutions or slurries applied to the paint surface. Effectiveness of the chemicals may be enhanced by applying a cover such as cloth or paper to the surface after application to prevent evaporation. The softened paint is removed by peeling the cover or by hand scraping. Washing, flushing, and neutralization of the surface may be required, as well as collection of the rinsings for proper disposal. Note: Chemical stripping solutions themselves can be hazardous and may require special handling and disposal.

5.2 METHODS OF COLLECTING DEBRIS: Methods of collection include, but are not limited to, the following:

5.2.1 Localized Collection at Point of Cleaning: This method involves surrounding the coating removal equipment with a localized containment enclosure equipped with a vacuum (i.e. localized exhaust) to permit the collection of the debris as it is being generated. The localized containment or chamber must conform to the surface (e.g., to irregularities such as welds, angles, and appurtenances as well as flat surfaces) through the use of masks, brushes, or other suitable means that will minimize the escape of abrasive, dust, paint, or debris. This method may be more effective in controlling emissions when used on large open structures such as tank shells as compared with complex structures such as joists or trusses. The vacuum machine may be an integral part of the coating removal equipment or abrasive reclaimer, or may be a separate machine, but coating removal and vacuuming must be accomplished simultaneously.

5.2.2 General Area Collection: This method of collection involves the removal of spent abrasive and paint debris from a containment structure that encloses the work area, workers, and tools, rather than only enclosing the removal tool itself. Collection methods include, but are not limited to:

5.2.2.1 **Bulk Collection:** Collection of debris from ground covers, floor, deck, or structure components, either during or after surface preparation. Collection may include the use of brooms, magnetic brooms, brushes, shovels, wheelbarrows, buckets, bucket loaders, vacuums, vacuum trucks, conveyors, or other suitable means. Note that in the case of hazardous paint removal, OSHA regulations place restrictions on the use of some of these methods.

5.2.2.2 **Channelling:** Controlling the flow of debris in the direction of a central removal location is accomplished by the use of tarps, rigid panels, augers, funnels, or other suitable materials. The materials must be selected with consideration of the nature of the debris being channelled (e.g. water, chemical stripper, dry particulate, etc.). At the removal location, further collection may be accomplished using mechanical conveyors, vacuums, or other means. The channelling materials and equipment may be a part of, or independent of, the containment structure.

5.3 **CONTAINMENT ENCLOSURE COMPONENTS:** The components of containment enclosures are identified below. Consideration should be given to the use of flame retardant materials when applicable. Tables A, W, C, and P provide guidance on combining each of the components to design a containment system.

5.3.1 Containment Materials

5.3.1.1 **Type A1 - Rigid:** Containment materials consist of singular panels, interlocking panels, or modular fabrications constructed of plywood, aluminum, rigid metal, plastic, or similar materials.

5.3.1.2 **Type A2 - Flexible:** Containment materials are comprised of screens, tarps, drapes, plastic sheeting, or similar materials.

5.3.2 Penetrability of Containment Materials

5.3.2.1 **Type B1 - Air Impenetrable:** Materials that are impervious to dust or wind, including, but not limited to:

a. **Tarps or Drapes:** Formed or coated woven material free of holes or openings.

b. **Plastic Sheeting:** Single or double ply, heavy wall construction plastic. Reinforced plastic may be necessary for some applications.

c. **Panels:** Panels of plywood, aluminum, corrugated plastic, metal, or similar rigid materials.

Note: Openings in materials reduce recovery efficiencies.

5.3.2.2 **Type B2 - Air Penetrable:** Material that is formed or woven to allow air flow but that can retain some airborne particles. Note: The design wind loads of air penetrable materials such as screens are the same as air impenetrable materials such as tarps. Openings in materials reduce recovery efficiencies.

5.3.2.3 **Type B3 - Water Impermeable:** Material that is impermeable to water.

5.3.2.4 **Type B4 - Chemical Resistant:** Material that is resistant to chemical stripping solutions and impermeable to the water used for rinsing.

5.3.3 Support Structure

5.3.3.1 Type C1 - Rigid Support Structures: These structures allow no movement and are comprised of scaffolding and framing to which the containment materials are affixed.

5.3.3.2. Type C2 - Flexible Support Structures: These structures allow minor movement and are comprised of cables, chains, or similar systems to which the containment materials are affixed.

5.3.3.3 Type C3 - Minimal Support Structures: These structures involve little to no supporting structure beyond cables or chains required to affix the containment materials to the structure itself and perhaps to the floor or ground.

5.3.4 Treatment of Joints

5.3.4.1 Type D1 - Fully Sealed Joints: All mating joints between the containment materials and the structure and floor or ground are sealed. Sealing includes overlapping of seams when using flexible materials and the use of stitching, taping, caulking, or other sealing measures. Consideration should be given to the chemical or water resistance of the sealing materials as appropriate.

5.3.4.2 Type D2 - Partially Sealed Joints: The containment materials are mated together. The use of overlapping seams is recommended, but complete sealing of all joints is not required.

5.3.5 Entryways

5.3.5.1 Type E1 - Entryway through Airlocks with Resealable Doors: This entry system includes access doors that are capable of being repeatedly resealed. Air locks are used in addition, in order to minimize air exchanges and air losses through the entryways.

5.3.5.2 Type E2 - Entryway Through Resealable Doors: The use of doorways that are capable of being repeatedly resealed.

5.3.5.3 Type E3 - Entryway Through Overlapping Door Tarps: The use of multiple flap overlapping door tarps to minimize dust escape through the entryway.

5.3.5.4 Type E4 - Entryway Through Open Seams: Special doors are not employed. Entry into the work area is made through unsealed seams in the containment materials.

5.4 VENTILATION SYSTEM COMPONENTS: Items to be considered when assessing the requirements of ventilation systems are addressed below. Tables A, W, P, and C provide guidance on combining the containment and ventilation requirements. Note that when designing a ventilation system, it is necessary to balance the static pressure with the input air flow to avoid collapsing ductwork or the containment due to high negative pressures. Additional information on ventilation and exhaust design is found in References 3.8 and 3.9.

Note: The selection of the ventilation system from the information in this guide is to assist in the control of emissions released through the atmosphere, but does not assure worker safety. Representative air sampling in the worker's breathing zone for air contaminants should always be conducted when employees may be exposed in excess of the specified OSHA limits, and depending upon the results, changes to the ventilation system may be necessary. Air sample collection and analysis methods must conform to OSHA standards and NIOSH methods.

5.4.1 Air Supply (Intake) Points

5.4.1.1 Type F1 - Controlled Air Supply (Intake): The use of baffles, louvers, flap seals, filters, and ducts on supply air points to preclude inadvertent escape of abrasive and debris. They may or may not be used in combination with fans (see 5.4.2.1).

5.4.1.2 Type F2 - Open Air Supply (Intake): Open air entry points without the use of ducts, valves, or baffles.

5.4.2 Input Air Flow

5.4.2.1 Type G1 - Forced Input Air Flow: Fans or blowers are used at the supply air points or other locations within containment to assist air flow through the containment structure. When used with a negative pressure system, the input air flow must be properly balanced with the exhaust capacity throughout the range of operations.

5.4.2.2 Type G2 - Natural Input Air Flow: Fans or blowers are not used at supply air entry points.

5.4.3 Air Pressure Inside Containment

5.4.3.1 Type H1 - Instrument Verification: An average negative pressure throughout the enclosure of at least 0.03"(0.08 cm) water column (W.C.) relative to ambient conditions shall be maintained during the surface preparation and clean-up operations. Manometers or magnehelic gages can be used to verify negative pressure.

5.4.3.2 Type H2 - Visual Verification: Negative pressure shall be employed as verified through the concave nature of the wall, ceiling, or floor materials while taking into account wind effects. Smoke or other visible means inside or outside the containment can be used to observe air flow patterns.

5.4.3.3 Type H3 - Not Required: Specified degree of negative pressure not required.

5.4.4 Air Movement Inside Containment: Air movement is utilized inside contain-ment for several reasons:

- to reduce the exposure of workers to airborne dusts (e.g., in 29 CFR 1926.62, OSHA stipulates that engineering controls must be instituted to the extent feasible to control worker exposure to lead dust.)
- to improve visibility
- to remove dust laden air
- to aid in preventing contaminants from escaping into the environment (e.g., in 40 CFR 260-268 EPA stipulates that no hazardous debris is permitted to be deposited on the ground, but no specific criteria have been established to achieve these goals.)

5.4.4.1 Type I1 - Minimum Air Movement is Specified: Achieving air movement through the containment requires the use of mechanical ventilation (see Note 7.1). Air movement may be specified by several methods, such as the following:

- Establishing a minimum velocity of air (fpm) in cross draft or down draft (see Note 7.2)
- Establishing a minimum volume of air (cfm) to ventilate a given volume of containment.

The selection of methods and criteria for specifying or producing air movement should be based on an analysis of project-specific conditions, including the blasting pressure, number and size of blast nozzles, type, size and friability of abrasive, flow rate of abrasive, the lead or toxic metal content, thickness and age of the paint being removed, the type and size of structure being prepared, and the configuration of the containment system being installed.

While there are generally accepted criteria for specifying air movement, air velocity past the worker is often a primary consideration when designing ventilation systems, because of worker protection issues.

5.4.4.2 **Type I2 - Minimum Air Movement is Not Specified:** Under this approach, the specifier does not establish any criteria for minimum air movement in containment. Note that when removing lead-containing paints, it may still be necessary to utilize feasible engineering controls to reduce airborne lead exposure in accordance with the provisions of 29 CFR 1926.62 and to prevent the escape of airborne lead particulates from the containment.

5.4.5 Exhaust Air Flow/Dust Collection

5.4.5.1 **Type J1 - Air Filtration Required:** Forced exhaust air flow into dust collectors (wet or dry) or bag houses sized appropriately for the type and size of particulate matter and for the volume and velocity of air moved through the containment.

5.4.5.2 **Type J2 - Air Filtration Not Required:** Natural exhaust air flow is employed without the use of forced air or dust filtration. Little control over the debris being emitted into the environment is possible when using dust producing methods of preparation such as abrasive blasting.

5.5 **METHODS FOR ASSESSING QUANTITY OF EMISSIONS:** Surface preparation and paint removal operations produce dust and debris which may be emitted into the environment. Methods for quantifying the amount of dust and debris escaping the work area are described below. Method A provides immediate feedback on the emissions created. Methods B, C, and D require days to receive results. Methods E and F provide results upon project completion. Users must contact the appropriate state and local authorities to ascertain which of the methods are accepted for monitoring emissions, and to establish the appropriate acceptance criteria.

Note: Testing for PM-10 or monitoring of visible emissions may be of limited applicability or relevance to a hazardous paint removal project. Monitoring for the toxic metal (e.g., lead as in 5.5.4) may provide more useful and meaningful data.

5.5.1 **Method A - Visible Emissions:** Observations of visible emissions from the work area provide immediate feedback on the performance of the containment system. Two methods can be used:

5.5.5.1 **General Surveillance:** Visible emissions are permitted at given frequencies or durations provided they do not extend beyond an established boundary line (e.g., property line). Possible frequencies include:

Level 0 Emissions - No visible emissions. Note: This level is typically not achievable during abrasive blasting.

Level 1 Emissions - Random emissions of a cumulative duration of no more than 1% of the work day (e.g., five minutes in an eight hour work day).

Level 2 Emissions - Random emissions of a cumulative duration of no more than 5% of the work day (e.g., 24 minutes in an eight hour work day).

Level 3 Emissions - Random emissions of a cumulative duration of no more than 10% of the work day (e.g., 48 minutes in an eight hour work day).

Level 4 Emissions - Emissions are unrestricted and may occur at any time.

Note: The workday activities for timing emissions encompass surface preparation and clean-up only.

5.5.5.2 **Opacity Scale:** Opacity measurements are made by trained, certified observers. A scale from 0% to 100%, in 5% increments, is used. Measurements are typically made at 15 second intervals for given periods of time (e.g., 30 minutes). The acceptance criteria must be established by the specifier. For example, a criteria might restrict the opacity to no more than 20% for any three minute period in 60 minutes. Local regulations may provide guidance as to the level of opacity that should be required.

5.5.2 **Method B - Ambient Air Monitoring for PM-10:** High volume air samplers equipped with PM-10 heads are used to assess the total amount of particulate matter 10 micrometers (0.39 mils) or less in size that escape the contained work area. The number of monitors to be used is based on wind direction and proximity to homes, playgrounds, businesses, bodies of water, etc. The National Ambient Air Quality Standard for PM-10 according to 40 CFR Part 50 is 150 $\mu g/m^3$ over a 24 hour period. 450 $\mu g/m^3$ over an eight hour period may provide a rational method for applying the EPA criteria, provided no emissions occur from the worksite during the remaining 16 hours. Monitoring should be conducted for a few days prior to beginning the work (for 8 hours to 24 hours per day, as appropriate) in order to establish background levels. Depending upon the variability of the results, full-time background monitoring throughout the project may be necessary.

5.5.3 **Method C - Occupational Monitoring of Area Emissions for Lead:** When lead paint is being removed, air quality measurements for lead can be determined in accordance with NIOSH Method 7082 using personal monitors outside of areas or equipment that may potentially emit lead. Action Level lead limits are 30 $\mu g/m^3$ (0.03 mg/m^3) per OSHA General Industry Standard 29 CFR 1910.1025 and OSHA Construction Industry Standard 29 CFR 1926.62. The perimeter of the work area should be isolated using signs, barriers, and ribbons in all locations where the Action Level is exceeded. Areas and equipment that should be monitored and isolated include, but are not limited to, the containment, dust collector, and abrasive recycling equipment.

5.5.4 **Method D - EPA Ambient Air Monitoring for Toxic Metals:** When removing paints containing toxic metals, air quality measurements for the toxic metals can be made by instrument monitoring in accordance with EPA criteria. The selection of monitoring locations should be based on factors including wind direction, surface or terrain irregularities, and proximity to homes, playgrounds, businesses, bodies of water, etc. Depending upon the variability of the results, full-time background monitoring throughout the project may be necessary.

High volume air samplers equipped for the collection of total suspended particulate (TSP) are used. When removing paints containing lead, the filters are analyzed for lead in accordance with the EPA 40 CFR Part 50, Appendix G. The National Ambient Air Quality Standard for Lead according to 40 CFR Part 50 is 1.5 $\mu g/m^3$ as a 90-day average.

Note: Since paint removal operations are not normally conducted continuously over a 90 day period, it may be necessary to establish a daily criteria for monitoring. Note that the suggested modification of the procedure shown below may not be acceptable to state or local environment officials. The appropriate officials should be contacted prior to its implementation.

$$DA = (90 \div PD) \times 1.5\ \mu g/m^3$$

DA = Daily Allowance ($\mu g/m^3$)
PD = Number of preparation days anticipated in a 90 day period

The above calculation provides an allowance criteria for a 24 hour period. In order to convert this value to an allowance corresponding to the hours worked, do the following:

$$ADA = DA\ (24 \div H)$$

ADA = Adjusted Daily Allowance ($\mu g/m^3$)
DA = Daily Allowance ($\mu g/m^3$)
H = Hours worked in 24 hours

5.5.5 Method E - Soil Analysis for Toxic Metals: A pre-job and post-job soil analysis for toxic metals (e.g. lead) is useful for determining if adequate ground protection was employed.

Prior to project start-up, select test sites beneath the structure if applicable and a minimum of one to two from 10 to 100 feet (3 to 30 m) away from the structure in each of four directions. Long structures such as bridges may require additional sampling locations. Document the specific location of each site. At each test site, center and align a 1 sq. ft. (30.5 cm^2) template parallel or tangential to the structure. Remove a sample of soil 3/4 in. (1.9 cm) in diameter and 1/2 in. (1.3 cm) in depth at the center of the square and at each of the four corners. Combine the five soil plugs in a single bag to represent the sample at the given location. At project completion, return to the same locations and remove a similar sample. Analyze the pre-job and post-job soil samples for the appropriate toxic metals in accordance with EPA Method 3050. The specifier must establish the increase allowable, if any.

Note: It must be recognized that the preexisting levels of toxic metals in the soil (e.g., lead) can vary considerably from one location to the next (even within one or two feet) due to prior land use, past paint removal projects, previous paint spills, leaded gasoline, and other factors. This must be taken into consideration when specifying the use of soils tests and when interpreting the results.

5.5.6 Method F - Water and Sediment Analysis for Toxic Metals: Pre-job and post-job assessment of toxic metals (e.g., lead) in sediment can be useful in determining if proper protection of a water body has been achieved. Pre-job sampling should be accomplished in discrete locations around and beneath the project site to a sediment depth of no more than 6 in (15.6 cm). Samples should be removed at the same locations upon project completion.

Sampling of water may or may not provide valuable information due to the transient nature of the toxic metal (e.g. lead) in fast moving water bodies (sediment analysis may be a more reliable indicator). However, for sedentary bodies of water or if a drinking water intake is located nearby, pre-job and post-job water sampling and analysis may be beneficial.

5.6 Method for Assessing Efficiency of Debris Collection and Bulk Abrasive Recovery

5.6.1 Weight In/Weight Out Method: This method is suitable for estimating the efficiency of debris collection and bulk abrasive recovery. It is not suitable for estimating air emissions.

Determine the dry weight of abrasive (Wa) used in blast cleaning an entire structure or portions of a structure and the weight of paint debris (Wp) for the same area. Determine the dry weight of abrasive and paint debris removed from blast cleaning the entire structure or portions of structure (Wd). Compute the recovery efficiency (RE) as follows:

$$RE = \frac{Wd}{Wa + Wp} \times 100$$

6. Disclaimer

While every precaution is taken to ensure that all information furnished in SSPC guides, standards, and specifications is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials or methods specified therein, or of the guide itself.

7. Notes*

7.1 In the preamble to 29 CFR 1926.62, OSHA states (pg 26614) that it believes an exposure reduction factor of 50% will be achievable for mechanical ventilation systems. If feasible engineering controls do not reduce the exposure below the PEL, administrative controls, good work practices, and effective use of respiratory protective equipment are needed in addition to feasible engineering controls to help control worker exposures to lead and other toxic metals.

7.2 The OSHA Interim Final Rule on Lead in Construction (29 CFR 1926.62) does not specify air velocities moving through containment, but it states that engineering and work practice controls must be utilized as necessary to reduce airborne exposures.

7.3 The construction industry ventilation standard (29 CFR 1926.57) refers to ANSI Z9.2-1979 with regard to abrasive blast cleaning. ANSI Z9.2-1979 in Table A2 suggests a downdraft velocity in abrasive blasting rooms of 60 to 100 feet per minute. Another ANSI reference regarding ventilation in abrasive blasting rooms is ANSI Z9.4-1985,which suggests provision of a downdraft ranging from 60 to 90 feet per minute (the larger the floor area, the lower the air flow recommendation), or a cross-draft of 100 feet per minute when removing coatings containing toxic metals by dry abrasive blasting.

SSPC recognizes that fixed abrasive blast rooms are not the same as field containment structures, and is making no representations regarding the suitability of the velocities (whether too much or too little). For example, Federal Highway Administration research involving air movement inside containment when removing lead paint by abrasive blast cleaning (research Report Number RD-94-100) found no significant differences in worker lead exposures at cross-draft velocities of 70 to 300 feet per minute. The abrasives involved in the study were steel grit and mineral sand. The blast room information is presented in these Notes due to the link to ANSI Z9.2 that is provided through 29 CFR 1926.57, and because it may provide information that could be beneficial to some users of the Guide.

It should also be noted that although this type of ventilation will reduce exposure, it will not completely eliminate the exposure hazard to the blast operator due to the turbulence caused by the blasting process and the proximity of the operator to the generation source of the particles.

7.4 ANSI Z9.2-1979 indicates that large solid particles usually cannot be captured by conventional air flow patterns, but that air flow patterns should ensure that hygienically significant particle sizes are captured. Hygienically significant particle sizes are defined as those which are less than 10 micrometers in size. It suggests that the larger particle sizes should be allowed to fall to the floor to be removed by housekeeping practices. As a result, when designing ventilation systems for containment, primary consideration should be given to the movement of the hygienically significant particle sizes through the enclosure to the exhaust hood in combination with good housekeeping practices to remove the heavier particles.

7.5 ANSI Z9.2-1979 states in paragraph 4.8.1(1) that if data on control velocity and volume are not available in reliable published information, control velocity and volume can be determined by measurement of actual air-flow velocities for projects on which control has been attained. Little information has been published regarding control velocities in field containments. As a result, the specifier may consider allowing the contractor to demonstrate that the proposed air velocity inside containment will provide the necessary and desired controls (i.e., reduced worker exposures, controlled blood lead levels, controlled emissions and so forth) to comply with the OSHA mandate for engineering controls.

* Notes are not requirements of this guide.

TABLE A - ABRASIVE BLAST CLEANING*
COMBINATIONS OF CONTAINMENT AND VENTILATION SYSTEM COMPONENTS

Containment Classification	Containment System (5.3 of Guide)					Ventilation (5.4 of Guide)				
	5.3.1 Containment Materials	5.3.2 Penetrability	5.3.3 Support Structure	5.3.4 Joints	5.3.5 Entryway	5.4.1 Air Make-Up	5.4.2 Input Air Flow	5.4.3 Air Pressure	5.4.4 Air Movement	5.4.5 Exhaust Dust Filtration
Class 1A	A1 - Rigid A2 - Flexible	B1 - Air Impen.	C1 - Rigid C2 - Flexible	D1-Full Seal	E1 - Airlock E2-Resealable	F1-Controlled	G1 - Forced G2 - Natural	H1-Inst. Ver. H2-Visual	I1 - Minimum Specified	J1 - Air Filtration
Class 2A	A1 - Rigid A2 - Flexible	B1 - Air Impen.	C1 - Rigid C2 - Flexible	D1-Full Seal	E2-Resealable E3 - Overlap	F1-Controlled F2-Open	G1 - Forced G2 - Natural	H2-Visual	I1-Minimum Specified	J1 - Air Filtration
Class 3A	A1 - Rigid A2 - Flexible	B1 - Air Impen. B2- Air Pen.	C1 - Rigid C2 - Flexible	D1-Full Seal D2 - Partial Seal	E4 - Open Seam	F1-Controlled F2-Open	G1-Forced G2-Natural	H3-Not Required	I2-Not Specified	J1 - Air Filtration
Class 4A	A1 - Rigid A2 - Flexible	B1 - Air Impen. B2 - Air Pen.	C3-Minimal	D2-Partial Seal	E4-Open Seam	F2-Open	G2-Natural	H3-Not Required	I2 - Not Specified	J2 - No Controls on Exhaust

Note 1: The information in this table is provided for guidance only and does not guarantee that any specific levels of containment will be achieved by following the suggestions. The type of structure, wind conditions, soundness of the materials of construction, and many other factors play a role in containing dust and debris.

Note 2: The table occasionally identifies two options for a given component. For example, containment materials (5.3.1) are shown as being either rigid or flexible. If the specifier requires the use of rigid materials only, this restriction must be specified separately.

Note 3: The design suggestions made in this table are based on the use of open abrasive blast cleaning inside containment. The classifications are ordered from the greatest degree of dust and debris containment (Class 1A) to the least (Class 4A). Normally, the higher the degree of containment, the higher the costs.

Note 4: Many other combinations of the components beyond those suggested above can be used to provide similar results. The method of preparation can also be adjusted to reduce or eliminate dust emissions.

Note 5: Certain combinations of components within each class may not be suitable when removing hazardous paints (e.g., forced air input in combination with penetrable containment materials in Class 3A).

Note 6: When designing a ventilation system, care must be taken to balance the static pressure with the input air flow to avoid collapsing the containment due to high negative pressure.

* When vacuum shrouded blast cleaning is employed, ground covers or free hanging tarpaulins may provide controls equivalent to Class 1A.

TABLE P - POWER TOOL CLEANING*

COMBINATIONS OF CONTAINMENT AND VENTILATION SYSTEM COMPONENTS

Containment Classification	Containment System (5.3 of Guide) 5.3.1 Containment Materials	5.3.2 Penetrability	5.3.3 Support Structure	5.3.4 Joints	5.3.5 Entryway	Ventilation (5.4 of Guide) 5.4.1 Air Make-Up	5.4.2 Input Air Flow	5.4.3 Air Pressure	5.4.4 Air Movement	5.4.5 Exhaust Dust Filtration
Class 1P	A1-Rigid A2-Flexible	B1-Air Impen. B2-Air Pen.	C1-Rigid C2-Flexible	D1-Full Seal	E2-Resealable	F1-Controlled	G1-Forced G2-Natural	H2-Visual	I1-Min. Specified	J1-Air Filtration
Class 2P	A1-Rigid A2-Flexible	B1-Air Impen. B2-Air Pen.	C1-Rigid C2-Flexible	D1-Full Seal	E3-Overlap E4-Open Seam	F2-Open	G2-Natural	H3-Not Required	I2-Not Specified	J2-Not Required
Class 3P	A1-Rigid A2-Flexible	B2-Air Pen.	C3-Minimal	D2-Partial Seal	E4-Open Seam	F2-Open	G2-Natural	H3-Not Required	I2-Not Specified	J2-Not Required

Note 1: When designing a ventilation system, care must be taken to balance the static pressure with the input air flow to maintain adequate air flow through the containment and to avoid collapsing the containment or ductwork due to high negative pressure.

Note 2: The table occasionally identifies two options for a given component. For example, containment materials (5.3.1) are shown as being either rigid or flexible. If the specifier requires the use of rigid materials only, this restriction must be specified separately.

* For hand tool cleaning or vacuum-shrouded power tool cleaning, ground covers or free hanging tarpaulins may provide controls equivalent to Class 1P.

TABLE C - CHEMICAL STRIPPING
COMBINATIONS OF CONTAINMENT AND VENTILATION SYSTEM COMPONENTS

Containment Classification	Containment System (5.3 of Guide)					Ventilation (5.4 of Guide)				
	5.3.1 Containment Materials	5.3.2 Penetrability	5.3.3 Support Structure	5.3.4 Joints	5.3.5 Entryway	5.4.1 Air Make-Up	5.4.2 Input Air Flow	5.4.3 Air Pressure	5.4.4 Air Movement	5.4.5 Exhaust Dust Filtration
Class 1C	A1-Rigid A2-Flexible	B1-Air Imperm. and B4-Chemical Resistant	C1-Rigid C2-Flexible	D1-Full Seal	E3-Overlap	F2-Open	G1-Forced G2-Natural	H3-Not Required	I2-Not Specified	J1-Filtration
Class 2C	A1-Rigid A2-Flexible	B4-Chemical Resistant	C1-Rigid C2-Flexible	D1-Full Seal	E3-Overlap	F2-Open	G2-Natural	H3-Not Required	I2-Not Specified	J2-Not Required
Class 3C	A1-Rigid A2-Flexible	B4-Chemical Resistant	C3-Minimal	D2-Partial Seal	E4-Open Seam	F2-Open	G2-Natural	H3-Not Required	I2-Not Specified	J2-Not Required

Note 1: When designing a ventilation system, care must be taken to balance the static pressure with the input air flow to maintain adequate air flow through the containment and to avoid collapsing the containment or ductwork due to high negative pressure.

Note 2: The table occasionally identifies two options for a given component. For example, containment materials (5.3.1) are shown as being either rigid or flexible. If the specifier requires the use of rigid materials only, this restriction must be specified separately.

TABLE W - WATER BLASTING/WATER JETTING*
COMBINATIONS OF CONTAINMENT AND VENTILATION SYSTEM COMPONENTS

Containment Classification	Containment System (5.3 of Guide)					Ventilation (5.4 of Guide)				
	5.3.1 Containment Materials	5.3.2 Penetrability	5.3.3 Support Structure	5.3.4 Joints	5.3.5 Entryway	5.4.1 Air Make-Up	5.4.2 Input Air Flow	5.4.3 Air Pressure	5.4.4 Air Movement	5.4.5 Exhaust Dust Filtration
Class 1W	A1-Rigid A2-Flexible	B1-Air Impen. B3-Water Imperm.	C1-Rigid C2-Flexible	D1-Full Seal	E2-Resealable	F2-Open	G1-Forced G2-Natural	H2-Visual	I1-Minimum	J1-Filtration
Class 2W	A1-Rigid A2-Flexible	B3-Water Imperm.	C1-Rigid C2-Flexible	D1-Full Seal	E3-Overlap	F2-Open	G2-Natural	H3-Not Required	I2-Not Specified	J2-Not Required
Class 3W	A1-Rigid A2-Flexible	B3-Water Imperm.	C3-Minimal	D2-Partial Seal	E4-Open Seam	F2-Open	G2-Natural	H3-Not Required	I2-Not Specified	J2-Not Specified

Note 1: When designing a ventilation system, care must be taken to balance the static pressure with the input air flow to maintain adequate air flow through the containment and to avoid collapsing the containment or ductwork due to high negative pressure.

Note 2: The table occasionally identifies two options for a given component. For example, containment materials (5.3.1) are shown as being either rigid or flexible. If the specifier requires the use of rigid materials only, this restriction must be specified separately.

* When vacuum-shrouded water jetting is employed, ground covers or free hanging tarpaulins may provide controls equivalent to Class 1W.