



Abrasive Blasting

Abrasive blasting operations applies abrasive material forcibly to a surface using pneumatic pressure, hydraulic pressure or centrifugal force. In addition to exposure to the impact of rebounding material, hazards related to abrasive blasting include the toxicity of the abrasive material and the surface being abraded.

This guide will review the OSHA code OAR Division 2 Subdivision G Occupational Health & Environmental Control 1910.94 (a) Abrasive blasting, as well as provide additional safety information to guide you in safe abrasive blasting operations.

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General Safety

Dust Hazards

Abrasives and the surface coatings on materials blasted are shattered and pulverized during blasting operations. The dust formed will contain particles that could result in the following hazards:

- Respiratory
- Fire
- Explosion

Wet blasting methods minimize dust exposure, but dispersed droplets, mists and dried residues may become airborne and create potential exposures

1. You must evaluate the potential health hazards from abrasive blasting operations by considering the composition and toxicity of the abrasive material and the surface being abraded.
2. You must keep dust concentrations below the permissible exposure limits found in Oregon OSHA code OAR 437, Division 2 Subdivision Z – Toxic and Hazardous Substances.

Examples of the Types of Abrasives Used in Blasting Operations

Type of Abrasive	Examples of Abrasives	Other Information
Synthetic or natural mineral grains	Crystalline Silica Garnet	Silica sand is the most hazardous. Limit the use of silica sand wherever possible. For types of abrasive used in place of silica go to the Occupational Safety and Health Administration's (OSHA) homepage at : http://www.osha.gov/ Select 'S' for Silica
Slag abrasive	Copper slag Nickel slag Mixed metal slag	May contain heavy metals
Metallic shot or grit	Steel Chilled cast iron	The potential hazard is considered minimal
Organic	Ground corncobs Ground walnut shells	Readily combustible organic abrasives can form explosive mixtures with air. <ul style="list-style-type: none">• Prohibit the use of combustible organic abrasives, except in automatic blast cleaning systems• Bond and ground the blast nozzle to prevent the buildup of static charges

Examples of Coatings Removed in Blasting Operations

Types of Coatings	Examples of Coatings	Other Information
Surface <ul style="list-style-type: none">• Formed during the fabrication of a part	Those containing toxic metals: <ul style="list-style-type: none">• Paints containing mercury• Cadmium plating• Lead paints on structural steel• Lead deposits on pistons of internal combustible engines	The type of coating should be known to evaluate potential hazards
Protective <ul style="list-style-type: none">• Applied after fabrication	Protective <ul style="list-style-type: none">• Applied after fabrication	

Personal Protective Equipment

Respiratory Equipment (See Atlas Polymers, Corp Respiratory Protection Guidelines)

The respirator worn should be certified by the National Institute of Occupational Safety and Health (NIOSH) 42 CFR Part 84 for protecting employees from dusts and other hazards produced during abrasive blasting operations. It must be worn by all personnel exposed to concentrations of particulate matter which is above the Oregon OSHA Permissible Exposure limits found in Oregon OSHA code OAR 437, Division 2 Subdivision Z – Toxic and Hazardous Substances. Atlas Polymers, Corp strongly recommends that they be worn when the American Conference of Governmental Industrial Hygienists (ACGIH) established Threshold Limit Values are exceeded. Below is a guide on the type of PPE to be provided during blasting operations.

Type	When
<p>Abrasive Blasting Respirators - A supplied air or a continuous flow respirator constructed to cover and protect the operator's head, neck and shoulders from rebounding abrasive</p>	<p>Operators work in any of the following situations:</p> <ul style="list-style-type: none"> • Inside blast cleaning rooms • Where silica sand is used in manual blasting operations • Where concentrations of toxic dust exceed the permissible exposure limits <p>An abrasive respirator doesn't need to be worn if the operator is physically separated from the nozzle and blast by an exhaust ventilated enclosure</p>
<p>Filtering face piece</p>	<p>Short, intermittent or occasional dust exposures during the following tasks:</p> <ul style="list-style-type: none"> • To protect the operator during abrasive blasting operations performed outside the enclosure or outdoors where nonsilica abrasives are used on materials with low toxicity • Clean-up • Dumping dust collectors • Unloading shipments of sand at receiving areas when the following controls are not feasible – enclosures, exhaust ventilation or other means
<p>Eye and face protection to both of the following</p> <ul style="list-style-type: none"> • Blasting operators • Personnel working near blasting operations 	<p>Respirators worn during blasting operations don't provide eye and face protection</p>
<p>Gloves and aprons made of heavy canvas or leather; or equivalent protection</p>	<p>Operators are exposed to the impact of rebounding abrasives</p>
<p>Safety shoes – steel-toed</p>	<p>Heavy pieces of material are handled</p>

Housekeeping

Abrasive blasting operations can create conditions that result in injuries related to slip, trips and falls. Housekeeping procedures should include:

- Keeping aisles and walkways clear of steel shot or similar abrasives that may create a slipping hazard
- Prohibiting the accumulation of dust on the floors or ledges outside blasting enclosures
- Cleaning up dust spills promptly
- Use of high-efficiency particulate air filter (HEPA), vacuum cleaner when the plant isn't in operation and by a person wearing a respirator approved for the existing conditions

Blast Cleaning Enclosures

There two basic types of enclosures in abrasive blasting:

1. **Blasting Cabinet:** An enclosure where the operator stands outside, operating necessary controls or blasting nozzle from outside of the enclosure.



2. **Blast Cleaning Room:** A complete enclosure in which abrasive blasting is performed with the operator working inside the room.



Blast Cleaning Enclosures

If you have	Then make sure
Air inlets and access openings	They are either baffled or arranged so the combination of inward airflow and baffles minimizes both of the following: <ul style="list-style-type: none">• The escape of abrasive or dust particles into adjacent work areas.• Visible spurts of dust
Small access opening s where dust might escape	Slit resistant baffles are installed in multiple sets of all small access openings, and do both of the following: <ul style="list-style-type: none">• Regularly inspect them• Replace them when needed
An observation window in enclosures where hard, deep cutting abrasives are used	The window is made of safety glass protected by screening Caution: <ul style="list-style-type: none">• Hard, deep cutting abrasives may shatter normal glass• If the safety glass shatters, the protective screening will help contain the glass and protect employees from cuts and lacerations
Small operator access doors	They are flanged and tight when closed, and open from both inside and outside the enclosure Caution: If you have a small operator access door and a large work access door, the large work access door may open or close from the outside only.

Blast Cleaning Enclosures and Recommended Air Velocities

Examples of Blast Cleaning Enclosures	Recommended Air Velocities in Feet per Minute (fpm)
Abrasive blasting cabinets	At least 500 fpm at the hand openings
Blast cleaning rooms	At least 300 fpm with well baffled air inlets
Rotary blast cleaning tables	200-250 fpm at the access opening
Abrasive separators	200-250 fpm at all openings
Bucket elevators	
Other accessory abrasive handling equipment including blast cleaning drums and barrels	

The exhaust systems should be constructed, installed, inspected, and maintained to meet both of the following:

- The American National Standards Institute (ANSI), Z9.2-2001 for – Fundamentals Governing the Design and Operation of Local Exhaust Systems
- The National Fire Protection Association (NFPA) 91-2004 for – Exhaust Systems for Air Conveying of Vapors, Gases and Noncombustible Particulate Solids.

Also refer to the ANSI Z9.4-1997 for information on – Exhaust Systems for Abrasive-blasting Operations, Ventilation, and Safe Practices for Fixed Location Enclosures.

If you have flammable or explosive dust mixtures that may be present:

- Make sure the construction of equipment, including the exhaust system and all electrical wiring, meets both of the following:
 1. The American National Standard Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, NFPA 91.2004
 2. The electrical requirements for Class II locations
- Make sure blast cleaning enclosures, the ducts and the dust collector are constructed with either loose panels or explosion venting areas that meet all of the following:

1. Provide pressure relief in case of an explosion
2. Are located away from occupied areas
3. The Guide for Deflagrations, NFPA 68.2002

Specific Operating Requirements

Blasting Cabinets

- Ventilation is required so that there is a continuous flow of air into all openings in the enclosure during blasting. The exhaust shall promptly clear the dust laden air within the cabinet after blasting.
- Inlets and access openings are to be baffled to minimize escape of abrasive or dust particles into adjacent work areas. No visible spurts of dust are to be observed. Slit, abrasive resistant baffles are needed at all small access openings where dust might escape. These are to be regularly inspected and replaced when needed.
- Before the cabinet is opened, the blast is to be closed off, and the exhaust system operated long enough to remove the dusty air within.
- Safety glass protected by screening is needed for observation windows where hard cutting abrasives are used.
- Doors are to be flanged and fit tight when closed.
- Dust leaks are to be promptly repaired.
- Static pressure drop at exhaust ducts is to be measured after installation and periodically thereafter to assure satisfactory operation.
- Exhaust ducts are to be cleaned whenever there is an indication of a partial blockage.
- An abrasive separator is to be used in installations where the abrasive is recirculated.
- Air exhaust from the cabinet is to be discharged through dust collecting equipment.
- Dust collectors are to be installed, so that accumulated dust can be emptied and removed without contaminating other work areas.

Blast Cleaning Rooms

Ventilation is needed so that there is a continuous flow of air into the room from all doorways and other openings.

- Doors on blast cleaning rooms are to be operable from both inside and outside. If there is a small operator access door, the large work access door may be closed or opened from the outside only.

- Static pressure drop at exhaust ducts is to be measured after installation and periodically thereafter to assure satisfactory operation.
- Exhaust ducts are to be cleaned whenever there is an indication of a partial blockage.
- An abrasive separator is to be used in installations where the abrasive is recirculated.
- Air exhaust from the room is to be discharged through dust collecting equipment.
- Dust collectors are to be installed so that accumulated dust can be emptied and removed without contaminating other work areas.

Open Air Blasting

- Ventilation for open air blasting work is not needed. Provide and ensure use of personal protective equipment for the abrasive blaster.

Blast Cleaning Nozzles

Make sure nozzles are all of the following:

1. Mounted on a support when not in use
2. Equipped with operating valves that are manually held open
3. Pressurized tanks used to supply abrasive should be connected to the manual control of the nozzle to prevent the buildup of static charges
4. The relief valve or opening should be located so that it can safely vent

Inspection and Maintenance

- Make sure the exhaust ventilation system is fully operational by checking the static pressure drop at the exhaust ducts leading from the equipment when an installation is completed and annually after installation.
- Repair or clean exhaust systems when dust leaks are found or the pressure drop gauge indicates a change exceeding 20 percent.
- Use an abrasive separator to separate larger particles for reuse on installations where abrasive is recirculated.
- Set up dust collecting equipment to:
 1. Empty and remove accumulated dust without contaminating work areas
 2. Discharge the air used in blast cleaning equipment
- Dispose of fine dust from dry collectors by:
 1. Emptying and transporting the fine dust in enclosed containers
 2. Using a sluice with a wetting process to contain the dust

Resources

A copy of OAR 437, Division 2, Subdivision G, Occupational Health & Environmental Control, Ventilation, may be obtained from the Occupational Safety and Health Division (OSHA) by contacting them at:

Address: 350 Winter Street NE, Salem, OR 97301-3882

Telephone: 503.378.3272 or 800.922.2689

Web site: <http://www.osha.org>

EPA Guidelines on Abrasive Blast Cleaning:

http://www.epa.sa.gov.au/pdfs/guide_abrasive.pdf