Great Western Painting

SANDBLASTING

29 CFR 1926.57 Ventilation
29 CFR 1926.302 Power-operated hand tools.

When performing abrasive blasting operations, from a safety standpoint, there are numerous hazards that must be addressed.

First and foremost are respiratory hazards. During blasting operations, dust hazards are created as the abrasive materials and the surface coatings are shattered and pulverized to particles of respirable size. The composition and **toxicity of the abrasive dust** as well as the coating must be known to determine the:

a. specific respiratory hazards.

b. appropriate respirator to be selected to negate these hazards.

The many types of abrasive materials have varying degrees of hazard -- silica sand being probably the most hazardous mineral abrasive used. Whenever possible, its use should be limited and, if possible, a substitute material used. Other types of abrasives include: synthetic or natural mineral grains; metallic shot or hard grit (made of steel or chilled cast iron); and organic abrasives such as ground corncobs and walnut shells. These and other engineering controls such as containment [blast cleaning macines & cabinets; blasting rooms or portable equipment] and ventilation are important for employee safety.

The hazards of steel or cast iron dust are relatively minimal, however, combustible organic abrasives may be pulverized fine enough to be capable of forming explosive mixtures with air.

The coatings that are being blasted may, for example, contain lead (in paints); arsenic (in furnaces); cadmium (plating); and even silica sand (embedded in the surface of castings). All these types of hazards require specific respiratory protection and are serious health hazards.

In addition to respiratory hazards, the following safety concerns, which apply to both abrasive blasting workers **and** those who may be exposed to hazards they create, depending on the job, need to be addressed during abrasive blasting operations:

a. protective clothing and equipment must provide protection to the eyes, face, and body of the **operator**.

   Note: Equipment for the protection of the eyes and face will be supplied to the operator when the respirator design does not provide such protection.

b. protective clothing and equipment must provide protection to the eyes, face, and body of all personnel working in the vicinity of abrasive blasting operations.

Note: Equipment for the protection of the eyes and face will be supplied to any other personnel working in the vicinity of abrasive blasting operation.

c. fall protection.

d. scaffold & ladder safety.

e. release of toxic dust.

f. **potentially explosive mixtures**. The blast nozzle must be bonded and grounded to prevent the buildup of static charge.

   1. organic abrasives which are combustible will only be used in automatic systems. Reference NFPA 68-1954.

g. high pressure hoses and couplings.

h. securing the work area to deny unauthorized entry.

i. working in a permit-required confined space.

j. injury from the blast, itself. To reduce the likelihood of injury, the **blast cleaning nozzles must be equipped with an operating valve that must be held open manually**. A support will be provided on which the nozzle may be mounted when it is not in use.

There may be times during sandblasting operations that hazardous dusts are released into the atmosphere that exceed the concentrations specified in the *"Threshold Limit Values of Airborne Contaminants for 1970"* of the American Conference of Governmental Industrial Hygienists, listed below:

MINERAL DUSTS

Substance	[a]**mppcf**
SILICA	
Crystalline Quarts Threshold Limited calculated from the formula	[b](250) ÷ (%SiO_2+5)
Cristobalite.	20
Amorphous, including natural diatomaceous earth	
SILICATES (Less than 1% crystalline silica)	
Mica	20
Portland Cement	20
Soapstone	20
Talc (non-abestiform)	20
Talc (fibrous), use asbestos limit	
GRAPHITE (Natural)	15
INERT OR NUISANCE PARTICULATES	50 (or 15 mg/m³ which-ever is the smaller) of total dust <1% SiO
Note 1 Covers all organic and inorganic particulates not otherwise regulated. Same as Particulates Not Otherwise Regulated.	Note 1 See Table above
Note 2 Inert or Nuisance Dusts includes all mineral, inorganic, and organic dusts as indicated by examples in TLV's Appendix D.	

a. Millions of particles per cubic foot or air, based on impinger samples counted by lightfield techniques.

b. The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

Operational procedures and general safety: Dust will not be permitted to accumulate on the floor or on ledges outside of an abrasive-blasting enclosure, and dust spills will be cleaned up promptly. Aisles and walkways will be kept clear of steel shot or similar abrasive which may create a slipping hazard.

The PEL for particles not otherwise regulated is 5.0 mg/m³. The PEL for respirable dust containing crystalline silica is determined by the below formula:

PEL = 10 mg/m³ ÷ (%SiO_2+2), where %SiO_2+2 refers to the amount of crystalline silica measured in the sample.

Below the above threshold limits, no action is required, however, employees may wear dust masks for personal comfort.

As always, engineering controls are preferred to personal protective equipment to deal with job site hazards. Therefore, local exhaust ventilation is a preferred method of maintaining atmospheres that have dust levels below the concentrations noted in the Dust Table, above.

If it is necessary to use respiratory protection equipment [when effective engineering controls are not feasible or while they are being instituted] as defined in paragraph 1910.134(a) and (b), we will follow the provisions of our respiratory protection program as defined as described in 1926.103. Respirators will be selected that prevent atmospheric contamination of harmful dust, fogs, fumes, mists, gases, smokes, sprays, or vapors.

Per NIOSH:

Type CE abrasive-blast supplied-air respirators are the only respirators suitable for use in abrasive-blasting operations.* Currently, there are four kinds of Type CE abrasive-blast respirators certified by NIOSH. These four kinds of respirators and the NIOSH recommended assigned protection factors (APF) are:

1. a continuous-flow respirator with a loose-fitting hood and an APF of 25;
2. a continuous-flow respirator with a tight-fitting facepiece and an APF of 50;
3. a positive-pressure respirator with a tight-fitting half-mask facepiece and an APF of 1000;
4. a pressure-demand or positive-pressure respirator containing a tight-fitting full facepiece and an APF of 2000.

***Note: Air purifying and powered-air purifying respirators are not recommended for abrasive blasting operations, but may be suitable for auxiliary work such as outside clean-up operations.**

Also per NIOSH:

1. Silica sand should NOT be used as an abrasive medium.
2. Respirators should not be used as the only means of preventing or minimizing exposures to airborne contaminants. Dust source controls such as containment systems, local exhaust systems, and good work practices should be implemented as the primary means of protecting workers. When dust source controls cannot keep exposures below the recommended exposure limits, controls should be supplemented with the use of respiratory protection.
3. Environmental monitoring by trained personnel should be conducted in all abrasive-blasting applications. This is necessary to select the proper respirator (APF) and insure that workers are not overexposed (i.e., measured contaminant concentration is less than the exposure limit multiplied by the respirator APF).
4. Anytime environmental conditions, airborne contaminants, or their concentrations are highly variable or poorly defined, high level respiratory protection should be used, even if silica is not the abrasive agent.
5. If silica sand is used, despite its much greater hazard relative to other abrasive agents, only the highest level protection respirators (i.e., respirators certified by NIOSH as pressure-demand or positive pressure and with NIOSH recommended APFs of 1000 or 2000) should be used.
6. Respirators will only provide a satisfactory level of protection when they are selected, fitted, used, and maintained according to the manufacturer's written instructions, NIOSH approval limitations and guidelines, and OSHA regulatory requirements.

If a compressor is used for supplying breathable air by way of air line hoses to an abrasive blasting respirator, it is a Type "C" system. The hose couplings used on these systems must not be compatible with any other gas systems. Breathable air -- not pure oxygen -- is used in these systems. **By definition, this breathable air must and will be free from harmful quantities of dust, mist, and noxious gases**.

An abrasive-blasting respirator will be used which covers the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive.

All safety and standby devices will be maintained in working order such as alarms to warn of compressor failure or overheating. Compressors will be located so that contaminated air does not enter the system and suitable in-line filters will be installed. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in the event of a compressor failure shall be in place. If an oil lubricated system is used, it shall have a high temperature and carbon monoxide alarm.

Additionally, we will ensure that compressed air does not have oxygen concentrations that are greater than 23.5%.

Compressors used to supply breathing air to respirators must be constructed and situated so as to:

1. prevent entry of contaminated air into the air-supply system;
2. minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (5.56 deg.C) below the ambient temperature;
3. have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.
4. have a tag containing the most recent change date and the signature of the person authorized by the employer to perform the change. The tag shall be maintained at the compressor.

For compressors that are not oil-lubricated, we will ensure that carbon monoxide levels in the breathing air do not exceed 10 ppm.

For oil-lubricated compressors, we will use a high temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply will be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

If cylinders are used to supply breathing air to respirators, they will meet the following requirements:

a. cylinders will be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 178);
b. cylinders of purchased breathing air will have a certificate of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air; and
c. the moisture content in the cylinder will not exceed a dew point of -50 deg.F (-45.6 deg.C) at 1 atmosphere pressure.

Note: Under no circumstances are employees to use compressed air for cleaning unless the pressure is reduced to less than 30 p.s.i. [10 p.s.i. in California]. Flying debris can injure the employee or a fellow worker.

<u>Symptoms of silicosis:</u>

Silicosis (especially the acute form) is characterized by shortness of breath, fever, and cyanosis (bluish skin); it may often be misdiagnosed as pulmonary edema (fluid in the lungs), pneumonia, or tuberculosis. Severe mycobacterial or fungal infections often complicate silicosis and may be fatal in many cases [

Three types of silicosis:

1. Chronic silicosis: usually occurs after 10 or more years of exposure to crystalline silica at relatively low concentrations
2. Accelerated silicosis: results from exposure to high concentrations of crystalline silica and develops 5 to 10 years after the initial exposure
3. Acute silicosis: exposure to extremely high concentrations & symptoms develop within a few weeks to a few years.

Medical Monitoring of Workers Exposed to Crystalline Silica:

Medical examinations should occur before job placement and at least every 3 years thereafter.

Note: More frequent examinatinos may be necessary for workers at risk for acute or accelerated silicosis.

Medical examinations must include at least the below items:

1. A medical and occupatinoal history to collect data on worker exposure.
2. Chest X-rays.
3. Pulmonary function testing.
4. Annual evaluation for tuberculosis.

NIOSH Safety Recommendations:

NIOSH recommends the following measures to reduce crystalline silica exposures in the workplace and prevent silicosis and silicosis-related deaths:

1. Prohibit silica sand (or other substances containing more than 1% crystalline silica) as an abrasive blasting material and substitute less hazardous materials.
2. Conduct air monitoring to measure worker exposures.
3. Use containment methods such as blast-cleaning machines and cabinets to control the hazard and protect adjacent workers from exposure.
4. Practice good personal hygiene to avoid unnecessary exposure to silica dust. The below are administrative controls:
   a. Wash hands and face before eating.
   b. No eating, drinking or tobacco products in the blasting area.
   c. Shower before leaving work site.
   d. Vehicles parked away from contaminated area.

5. Wear washable or disposable protective clothes at the worksite; shower and change into clean clothes before leaving the worksite to prevent contamination of cars, homes, and other work areas.
6. Use respiratory protection when source controls cannot keep silica exposures below the NIOSH REL.
7. Provide periodic medical examinations for all workers who may be exposed to crystalline silica.
8. Post signs to warn workers about the hazard and to inform them about required protective equipment.
9. Provide workers with training that includes information about health effects, work practices, and protective equipment for crystalline silica.
10. Report all cases of silicosis to the state health department as well as OSHA or MSHA.