The Use of Personal Protective Equipment and
Regulations & Standards Affecting Safe Abrasive Blasting:

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Employers understand that safety is one of the most important ingredients to a successful business. However, providing a safe workplace and ensuring a safe and environmentally-sound environment is complex. Navigating the course to fool-proof safety can be mind-boggling.

Since 1970, the primary references for determining the minimum safety and environmental standards in the workplace have been the Occupational Safety & and Health Administration (OSHA) and the Environmental Protection Agency (EPA) mandated by Titles 29 and 40 of the Code of Federal Regulations. These regulations incorporate thousands of standards from hundreds of agencies and organizations. The purpose of this article is to attempt to provide the reader a basic understanding of the minimum standard to provide a safe work environment for their employees and the general public when using open-air abrasive blasting equipment.

There are three primary industries, which perform abrasive blasting; they are General Industry (29 CFR 1910), Maritime (29 CFR 1915), and Construction (29 CFR 1926). OSHA has developed regulations for these industries. The most basic elements of these standards include the following sections, which may be found on OSHA's website, www.osha.gov. They are:

General Industry		Maritime		Construction	
Reference	Title	Reference	Title	Reference	Title
29 CFR 1910.6	Incorporation By Reference	29 CFR 1915.5	Incorporation By Reference	29 CFR 1926.28	Personal Protective Equipment (PPE)
29 CFR 1910.94(A)	Ventilation –Abrasive Blasting	29 CFR 1915 Subpart C	Surface Preparation & Preservation	29 CFR 1926.52	Occupational Noise Exposure
29 CFR 1910.95	Occupational Noise Exposure	29 CFR 1915.34	Mechanical Paint Removers	29 CFR 1926.57(F)	Ventilation – Abrasive Blasting
29 CFR 1910 Subpart I	Personal Protective Equipment (PPE)	29 CFR Subpart I	Personal Protective Equipment	29 CFR 1926.59	Hazard Communication
29 CFR 1910.132	PPE – General Requirements	29 CFR 1915.152	PPE – General Requirements	29 CFR 1926 Subpart E	Criteria For Personal Protective Equipment
29 CFR 1910.133	PPE – Eye & Face Protection	29 CFR 1915.153	PPE – Eye & Face Protection	29 CFR 1926.96	PPE – Occupational Foot Protection
29 CFR 1910.134	PPE – Respiratory Protection	29 CFR 1915.154	PPE - Respiratory Protection	29 CFR 1926.100	PPE – Head Protection
29 CFR 1910.135	PPE – Head Protection	29 CFR 1915.155	PPE – Head Protection	29 CFR 1926.101	PPE – Hearing Protection
29 CFR 1910.136	PPE – Occupational Foot Protection	29 CFR 1915.157	PPE – Hand & Body Protection	29 CFR 1926.102	PPE – Eye & Face Protection
29 CFR 1910.138	PPE – Hand Protection	29 CFR 1915 Subpart K	Portable, Unfired Pressure Vessels, Drums & Containers, Other Than Ship's Equipment	29 CFR 1926.103	Respiratory Protection
29 CFR Subpart M	Compressed Gas & Compressed Air Equipment	29 CFR 1915.172	Portable Air Receivers & Other Unfired Pressure Vessels	29 CFR 1926.306	Air Receivers
29 CFR 1910.169	Air Receivers	29 CFR 1915 Subpart Z	Toxic And Hazardous Substances	29 CFR 1926 Subpart Z	Toxic And Hazardous Substances
29 CFR 1910.307	Hazardous (Classified) Locations	29 CFR 1915.1200	Hazard Communication		
29 CFR 1910 Subpart Z	Toxic And Hazardous Substances				
1910.1200	Hazard Communication				

There are more than 40 references in 29 CFR which address the basic hazards associated with open air abrasive blasting. The regulations governing these three industries address the requirement for Job Hazard Analysis (JHA) when the operator wears Personal Protective Equipment. Because a JHA is required by all the OSHA covered industries, I will use a JHA to identify not only the proper PPE but also to identify other hazards and relevant regulations as they apply to open air abrasive blasting. Table "B" contains a Job Hazard Analysis.

This Job Hazard Analysis is modeled after OSHA publication #3071 and can be downloaded from www.osha.gov/Publications/osha3071.pdf.

Job Description: Blasting Setup	Analyst: Tom Enger		Date: April 1, 2009
Task/Activity	Hazard Description	Hazard Control	Regulation - Standard
Move Pot To Work Area Tilt Pot onto back wheels and push to work area. Upright Pot.	Pot Tips, crush hand/fingers & toes; back injury; collateral damage	Move Pot empty, use Mule, inspect wheels prior to moving, inspect work surface for tipping hazards. Use Gloves & Steel Toe Shoes	General Duty Clause, Section 5(a)(1) OSH Act 29CFR1910.136 &.138 29CFR1926.96 & Subpart E 29CFR1915.152 & .157
	Back Injury, sprain/strain (pot weight≥600lbs, Abrasive weight≥600lbs)	Move Pot empty, Remove all abrasive prior to moving. Inspect wheels, inspect work surface	General Duty Clause, Section 5(a)(1) OSH Act NIOSH "Work Practices Guide for Manual Lifting" PB94-176930LJM
	Floor/Scaffold Failure Under Load	Assure Scaffold/Floor is design to handle Load of Pot & Abrasive @≥1,200lbs	1926 Subpart L - Scaffold Specifications 1910.28 - Safety requirements for scaffolding. 1915.71 - Scaffolds or staging. Scaffolding Safety Requirements ANSI/ASSE A10.8-2001
Set Up Pot	Hand Injury From Sharp/Rough Equipment Edges.	Heavy Cotton/Leather Gloves	29CFR1910.138 29CFR1915.157 29CFR1926Subpart E
Add Abrasive	Inhalation Hazard, When Adding Abrasive	Type CE Abrasive-blast Respirator. Industrial Environmental Audit To Determine PELs	29CFR1910.94(a) 29CFR1910.134 29CFR1915.154 29CFR1626.103 29CFR1910 Subpart Z 29CFR1915 Subpart Z 29CFR1926 Subpart Z 42CFRpart84
Hook Up Blast Hose & Nozzle	Regulatory Violation ESD, explosion/fire(Hazards associated with these violation occur during operation of equipment)	ESD/Conductive blast hose, metal couplings, conductive washers/blast hose system	29CFR1910.307(b)(2)(i) 29CFR1915.34(c)(1)(i) 29CFR1915.34(c)(1)(ii) 29CFR1915.34(c)(1)(iii) 29CFR1926.407(b)(2)(i)
	Regulatory Violation (Hazards associated with these violation occur during operation of equipment)	Inspection/Quality of Hose, coupling, deadman, Whip-check/clips, Nozzle & Nozzle Support is a regulatory requirement.	29CFR1915.34(c)(2) 29CFR1915.34(c)(1)(iii) 29CFR1915.34(c)(1)(iv) 29CFR1926.302(b)(1) 29CFR1926.302(b)(5) 29CFR1926.302(b)(7) 29CFR1926.302(b)(10)
Hook Up Air Supply Hose To Pot	Regulatory Violation (Hazards associated with these violation occur during operation of equipment)	Inspection/Quality of Hose, Coupling, Whip-checks/clips Pressure Reducing Valve On Air Supply Line	29CFR1915.34(c)(2) 29CFR1915.34(c)(1)(iii) 29CFR1915.34(c)(1)(iv) 29CFR1926.302(b)(1) 29CFR1926.302(b)(5) 29CFR1926.302(b)(7) conductive standard

Job Description: Blasting Setup	Analyst: Tom Enger		Date: April 1, 2009
Task/Activity	Hazard Description	Hazard Control	Regulation - Standard
Inspect Pot For Damage	Regulatory Violation (Hazards associated with these violations occur during operation of equipment)	Inspect Compressor To assure relief valve is operable & Comp. Does not exceed pot rating. Inspect For Non-approved ASME Welds/Modification	29CFR1910.169(b)(3) 29CFR1915.172(c) 29CFR1926.306(b)(3) ASME-VIII,Div.1,UG-125(g)(1) ASME-VIII, Div. 1, ?see terry
Inspect Pot Piping	Possible failure when pressure is turned on	Inspect piping, especially piping in abrasive stream for wear and excessive rust.	General Duty Clause, Section 5(a)(1) OSH Act
Set Up Respirator & Put On Respirator			
Select Respirator	Unapproved Respirator, Regulatory Violation (Hazards associated with these violations occur during operation of equipment)	Assure you have NIOSH Respirator, Approved For Abrasive Blasting & toxins associated with surface and abrasive.	29 CFR 1910.94(a)(5) 29 CFR 1915.34(c)(3) 29 CFR 1926.57(f)(5) 42 CFR Part 84 OSHA 3142 – Lead In Construction NIOSH - Respirator User Notice: All Users of Type CE, Abrasive-Blast Supplied-Air Respirators NIOSH Respirator Selection Logic 2004 - Home
Inspect Respirator	Unapproved Respirator Assemblies, Damaged parts. (Hazards associated with these violations occur during operation of equipment)	Inspect Breathing Hose, Helmet, Air Hose, Air Control Valve, & Cape. All Parts Should be From Same Manufacturer. Check For Cleanliness.	29 CFR 1910.94(a)(5) 29 CFR 1915.34(c)(3) 29 CFR 1926.57(f)(5) 29 CFR1910.134(h)(3) 42 CFR Part 84
Inspect Absorbent Bed Filter	Regulatory Violation (Hazards associated with these violations occur during operation of equipment)	Absorbent Bed Filter is Normally Cartridge Type & is Replaceable. Check Housing & Regulator For Damage	29 CFR 1910.134(I)(5)(iii)&(iv) 29 CFR 1915.154 29 CFR 1926.103 29 CFR 1910.94(a)(6)
Inspect Gage/Regulator At Respirator Connection	Regulatory Violation (Hazards associated with these violations occur during operation of equipment)	29 CFR 1910.134(I)(5) requires Respirator to Meet 42 CFR Part 84, This reg. Requires use of Gage/Regulator	42 CFR Part 84.82 (Gages) 42 CFR Part 84.148 & .149 42 CFR Part 84.155
Connect Breathing Air	Regulatory Violation, Improper Fittings or Tanks (Hazards associated with these violations occur during operation of equipment)	Ensure breathing air couplings are incompatible with outlets for nonrespirable worksite air. Ensure breathing gas containers are marked for Breathing	29 CFR 1910.134(I)(8) 29 CFR 1910.134(I)(9)
	Regulatory Violation, Non-complaint Breathing Air From Compressor (Hazards associated with these violations occur during operation of equipment)	Use, Calibrate High temperature & Carbon Monoxide Alarm Place Compressor Intake away From contaminated air (car exhaust)	29 CFR 1910.94(a)(6) 29 CFR 1910.134(I) ANSI/CGA G-7.1
Put On Blast Suit	Regulatory Violation, Blast Suit Mandated By OSHA (Hazards associated with these violations occur during operation of equipment)	Put on “Blast Suit” Coveralls or appropriate alternative	29 CFR 1910.94(a)(5)(v) 29 CFR 1910.132 29 CFR 1915.152 29 CFR 1915.157 29 CFR 1926.57(f)(5)(v) 29 CFR 1926.95
Put On Safety Shoes:	Regulatory Violation, Safety Shoes Mandated By OSHA (Hazards associated with these violations occur during operation of equipment)	Put on Safety Shoes	29CFR1910.94(a)(5)(v)&(v)(a) 29CFR1910.136 29CFR1915.153 29CFR1915.157 29CFR1926.57(f)(5)(v)& v)(a) 29CFR1926.95 29CFR1926.96 ANSI Z41.1

Job Description: Blasting Setup	Analyst: Tom Enger		Date: April 1, 2009
Task/Activity	Hazard Description	Hazard Control	Regulation - Standard
Put On Proper Hearing Protection	Regulatory Violation, Hearing Protection Mandated By OSHA (Hazards associated with these violations occur during operation of equipment)	Properly use hearing protection based on Noise survey	29CFR1910.95 29CFR1910.95 App B 29CFR1910.132 29CFR1926.52 29CFR1926.101 ANSI S3.19 For NRR
Put On Face Protection	Regulatory Violation, Face Protection Mandated By OSHA (Hazards associated with these violations occur during operation of equipment)	Inspect Inner Respirator Lens for ANSI Z87.1 Stamp or Put on Safety glasses/shield compliant with ANSI Z87.1	29 CFR 1910.94(a)(5)(v)(b) 29 CFR 1910.133 29 CFR 1915.152 29 CFR 1915.153 29 CFR 1926.57(f)(5)(v)(b) 29CFR1926.95 29CFR1926.102 ANSI Z87.1
Put On Head Protection	Regulatory Violation, Head Protection Mandated By OSHA (Hazards associated with these violations occur during operation of equipment)	Inspect Inner Respirator for ANSI Z89.1 Stamp/Label or Put on protection compliant with standards	29 CFR 1910.133 29 CFR 1910.135 29 CFR 1915.152 29 CFR 1926.57(f)(1)(ii) 29CFR1926.95 29CFR1926.100 ANSI Z89.1
Put On Leather/Canvas Gloves	Regulatory Violation, Hand Protection Mandated By OSHA (Hazards associated with these violations occur during operation of equipment)	Put on Gloves that have adequate coverage and durability to resist abrasive rebound and misdirected blast stream (IE: Leather/Canvas Gloves with Gantlets)	29 CFR 1910.94(a)(5)(v) 29 CFR 1910.132 29 CFR 1910.138 29 CFR 1915.152 29 CFR 1915.157 29 CFR 1926.57(f)(5)(v)(b) 29CFR1926.95 29CFR1926.102
Turn On Breathing Air Line	Operator Receives Toxic or Degraded Air	Assure Compressor, Monitors, Absorbent Bed, Gages/Regulators and alarms are all working properly	29 CFR 1910.94(a)(5) 29 CFR 1915.34(c)(3) 29 CFR 1926.57(f)(5) 29 CFR1910.134(h)(3) 29 CFR 1910.134(l)(5)(iii)&(iv) 29 CFR 1915.154 29 CFR 1926.103 29 CFR 1910.94(a)(6) 29 CFR 1910.134(l)(8) 29 CFR 1910.134(l)(9) 29 CFR 1910.94(a)(6) 29 CFR 1910.134(l) 42 CFR Part 84 42 CFR Part 84.82 (Gages) 42 CFR Part 84.148 & .149 42 CFR Part 84.155 ANSI/CGA G-7.1
	Operator Is Not Physically Fit and Suffers Harm By the use of Respirator	Assure each operator has annual Pulmonary Fitness Test	29 CFR 1910.94(a)(5)(iv) 29 CFR 1910.134(e) 29 CFR 1915.134 29 CFR 1926.103
Turn On Blast Air	Inadvertent operation of Blast Nozzle, damaged surrounding equipment, injury of operator/bystanders	Inspect Operators Remote to assure proper operation and condition	29CFR1915.34(c)(1)(iv) 29CFR1926.302(b)(10)
	Pot Failure, Piping Failure, Air & Blast Hose Failure	Inspect Pot for Wear and None ASME approved welding, Inspect fittings & Hoses for Wear. Check to make sure pressure on compressor does not exceed blast equipment ratings	29CFR1910.169(b)(3) 29CFR1915.34(c)(2) 29CFR1915.172(c)(2) 29CFR1926.306(b)(3) ASME-VIII,Div.1,UG-125(g)(1) ASME-VIII, Div. 1, ?see terry ASME Standards ? (see terry)
	Blast & Air Hose disconnects at couplings	Inspect and install whip checks and safety clips onto couplings	29CFR1915.34(c)(1)(iii) 29CFR1926.302(b)(1) 29CFR1926.302(b)(2)

Job Description: Blasting Setup	Analyst: Tom Enger		Date: April 1, 2009
Task/Activity	Hazard Description	Hazard Control	Regulation - Standard
Actuate Blast Machine	Initial pressure pushes operator off platform – Injury	Install handrails or Require fall protection use Proper Blast Hose grip and operator position for Blasting	1926 Subpart L - Scaffold Specifications 1910.28 - Safety requirements for scaffolding. 1915.34(c)(3)(v) 1926.500 1915.71 - Scaffolds or staging. Scaffolding Safety Requirements ANSI/ASSE A10.8-2001
Blast Surface	Body/By-Stander Injury From Rebound	Wear Proper PPE: Helmet/Respirator, Shoes, Gloves, Clothing, Face/eye protection,	Blast Suit: 29 CFR 1910.94(a)(5)(v) 29 CFR 1910.132 29 CFR 1915.152 29 CFR 1915.157 29 CFR 1926.57(f)(5)(v) 29 CFR 1926.95 Safety Shoes: 29CFR1910.94(a)(5)(v)&(v)(a) 29CFR1910.136 29CFR1915.153 29CFR1915.157 29CFR1926.57(f)(5)(v)& v)(a) 29CFR1926.95 29CFR1926.96 ANSI Z41.1 Face/Eye Protection: 29 CFR 1910.94(a)(5)(v)(b) 29 CFR 1910.133 29 CFR 1915.152 29 CFR 1915.153 29 CFR 1926.57(f)(5)(v)(b) 29CFR1926.95 29CFR1926.102 ANSI Z87.1 Head Protection: 29 CFR 1910.133 29 CFR 1910.135 29 CFR 1915.152 29 CFR 1926.57(f)(1)(ii) 29CFR1926.95 29CFR1926.100 ANSI Z89.1 Leather/Canvas Gloves 29 CFR 1910.94(a)(5)(v) 29 CFR 1910.132 29 CFR 1910.138 29 CFR 1915.152 29 CFR 1915.157 29 CFR 1926.57(f)(5)(v)(b) 29CFR1926.95 29CFR1926.102
	Noise Level exceeds 85 TWA & 130dBA OSHA MAX. Hearing damage	Wear Proper hearing protection using Hearing conservation Program and NIOSH recommendations	29CFR1910.95 29CFR1910.95 App B 29CFR1910.132 29CFR1926.52 29CFR1926.101 ANSI S3.19 For NRR Compendium of Hearing Protection Devices - Online Version NIOSH Publication No. 98-126 NIOSH Publication No. 96-110

Job Description: Blasting Setup	Analyst: Tom Enger		Date: April 1, 2009
Task/Activity	Hazard Description	Hazard Control	Regulation - Standard
	Inhalation Hazards From Abrasive and Blasted Surface	Perform Industrial Environmental Audit to determine toxins generated by blasting operations.	29CFR 1910.94(a)(2)(ii) 29CFR 1910.94(a)(5)(ii)(c) 29CFR 1910.94(a)(5)(iv) 29CFR 1910.94(a)(6) 29CFR 1910.132(d)(1) 29CFR 1910.134(a)(2) 29CFR 1910.134(d)(1)(ii) 29CFR 1910.134(d)(1)(iii) 29CFR 1910.134(d)(3)(I) 29CFR 1910.134(I)(1)(ii)thru(j) 29CFR 1910 Subpart Z 29CFR 1915.34(a)(4) 29CFR 1915.34(c)(3)(I)thru(iii) 29CFR 1915.152(b) 29CFR 1915.154 29CFR 1915 Subpart Z 29CFR 1926.55(a) 29CFR 1926.57(d)(2) 29CFR 1926.57(f)(1)(vi) 29CFR 1926.57(f)(2)(I)thru(iii) 29CFR 1926.57(f)(5)(I)thru(iv) 29CFR 1926.57(f)(6) 29CFR 1926.103 29CFR 1926 Subpart Z
		Proper Respirator selection & Use	29CFR 1910.94(a)(1)(ii) 29CFR 1910.94(a)(5) 29CFR 1910.94(a)(6) 29CFR 1910.134 29CFR 1915.154 29CFR 1926.57(f)(5)&(6) 29CFR 1926.103 NIOSH Pub. #. 2005-100
	Tripping Hazards	Maintain Clean Work Area, Remove Spent abrasive	29CFR 1910.22 29CFR 1915.77 29CFR 1926.25 29CFR 1926.57(f)(7)
	ESD – Explosion Shock	Use Conductive Blasting System, IE Hoses & Couplings	29CFR 1910.307(b)(2)(i) 29CFR 1915.13(b)(11) 29CFR 1915.34(c)(1)(i) 29CFR 1915.34(c)(1)(ii) 29CFR 1915.34(c)(1)(iii) 29CFR 1926.407(b)(2)(i)
Stop Blasting Operation	Inadvertent Operation Of Nozzle	Hang Nozzle on appropriate Hook, Assure Safety Latch operates properly	29CFR 1915.34(c)(1)(iii) 29CFR 1926.302(b)(10)

Table B

We have now identified all the basic regulatory references that address the process for safely blasting a surface outside of an enclosure or blast room. Figure 1 below better illustrates these basic regulatory requirements and standards by component.

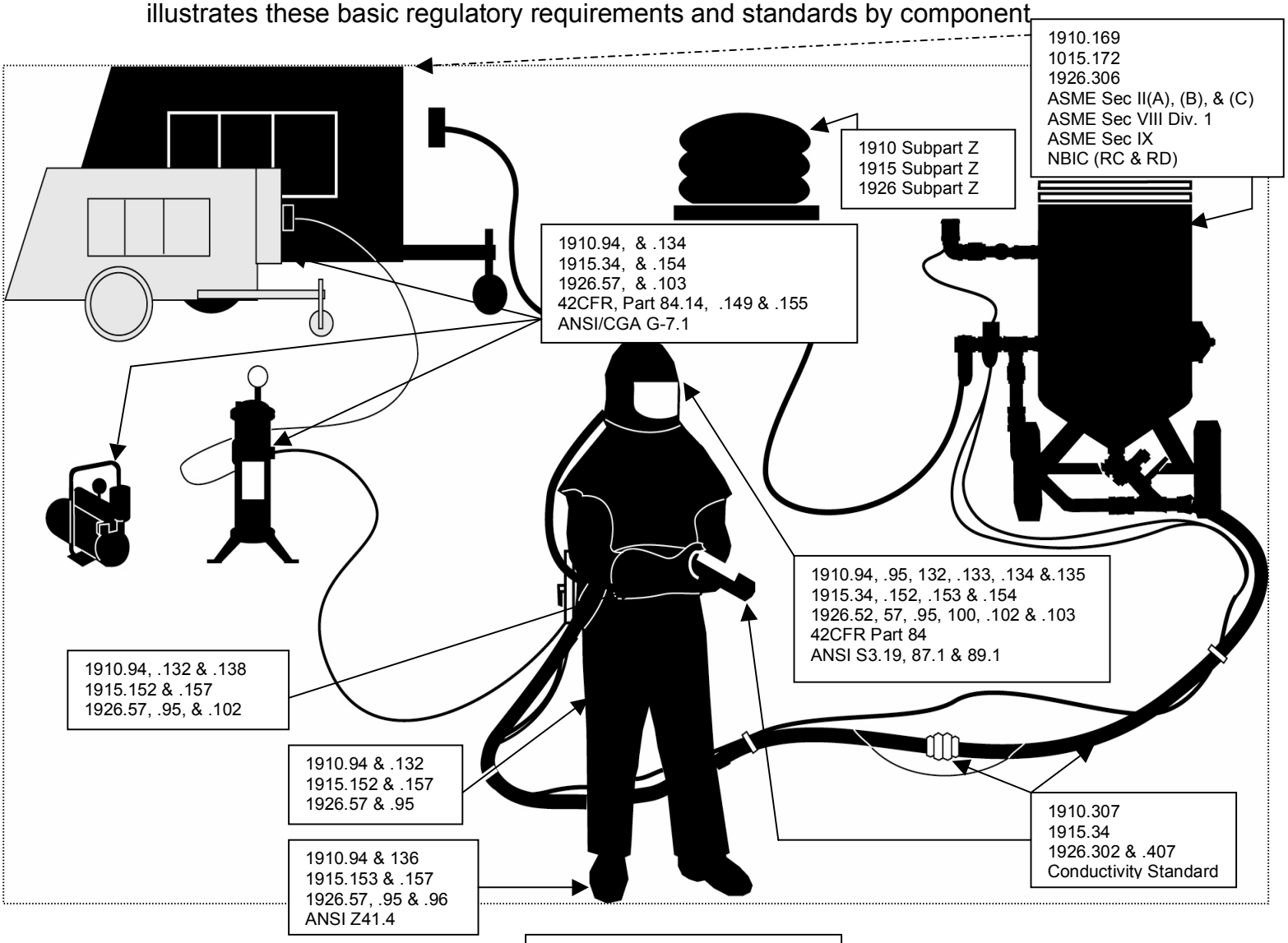


Figure 1

This article reviews the basic safety regulations and standards that directly affect how abrasive blasting is performed in an ambient environment. The above analysis does not delve into the multitude of referenced standards incorporated by the basic regulations and standards this article lists; but it has established that there are standards to support the following layman discussion on what an operator must have to safely work and be fully complaint when operating abrasive blast equipment. There are three basic elements of abrasive blasting: the abrasive, the personal protection equipment the operator uses, and the abrasive-delivery system.

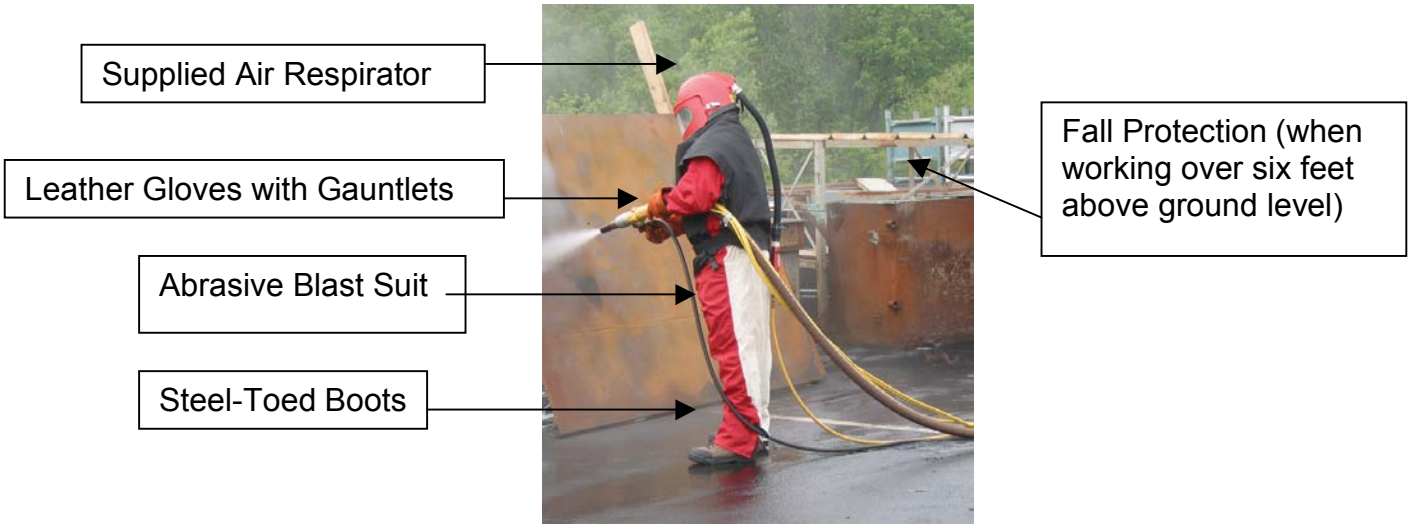
The first hazard, the abrasive, brings into consideration the surface being cleaned or prepared for coating operations. There are a multitude of abrasives the operator may use and they must be aware of the hazards associated with not only the abrasive but also the surface they are blasting. The most common abrasives used in open-air blasting include but are not limited to:

- Sand, and
- Slags

There are numerous hazards associated with these abrasives and the surface contamination that is being removed. The government is also aware of these, and has placed the responsibility of protecting and educating the worker squarely on the shoulders of the employer. Most employers specialize in very specific surface preparation and coating operations. The best way to determine the hazards generated by these abrasives and coatings is to have a local Certified Safety Professional or Certified Industrial Hygienist perform a workplace environmental audit and determine the appropriate worker protection. Safety professionals and industrial hygienists are listed in local directories available to employers on these websites:

- Safety Professionals: http://www.asse.org
- Industrial Hygienists: http://www.aiha.org

Once the professional performs the environmental audit, the employer can determine the proper protection for the operator. In the vast majority of applications the following Personal Protective Equipment will be required when performing abrasive blasting:



Leather Gloves and Steel-Toed Boots are commonly acknowledged to be necessary and are commercially available from safety supply stores. There are several different types of fall protection available, the most common type for scaffolding is handrails and toe boards. When handrails and toe boards are not used or available, the most common fall protection involves a harness and a shock-absorbing lanyard.

Blast Suits are not normally provided by safety supply houses but are readily available through an Abrasive Blasting Equipment Distributor. The two basic types are:

Lightweight Blast Suit, For Use In Hot Environments

Leather Blast Suit, For Use in Cooler Environments

Blast Suits are preferable over heavy jeans and a shirt because they seal out the abrasive material from entering the operator's clothing and irritating the skin. The use of Blast Suits also provides the operator outer clothing, which can be removed and cleaned.

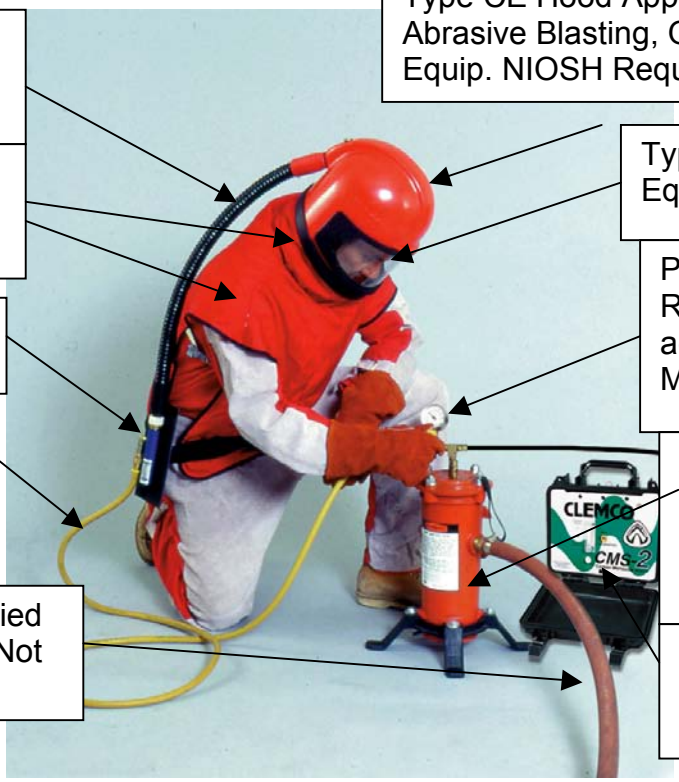
The most common respirator used in the surface preparation operation is the Supplied Air Respirator (SAR). This respirator is the most complex piece of Personal Protection Equipment the operator uses and is also the most controlled by federal safety regulations. Every major manufacturer of Supplied Air Respirators provides an owner's manual with every respirator. These manuals provide all the operation, maintenance and cleaning instructions required for the use of the respirator. OSHA requires every respirator user to understand not only the hazards the respirator protects him or her from, but also how to maintain the respirator. Conscientious manufacturers have web sites where owners can download these manuals if the originals get lost. Three examples of these web sites include:

- Clemco's Apollo Respirators: http://clemcoindustries.com
- Bullard 88VX Series: http://www.bullard.com
- 3-M Helmet Systems Headgear W-Series: http://www.3m.com

OSHA's respiratory standard requires more than just reading these manuals. The manual should be the cornerstone of an effective respiratory safety program.

A common mistake made by employers in the surface preparation industry is issuing a Supplied-Air Respirator only to the operator of the blast equipment. The use of Supplied-Air Respirators should be based on the industrial environmental survey the Safety Professional performs. Another common mistake operators and employers make is using non-original replacement parts for these respirators. All manufacturers must get their respirators approved by the National Institute of Occupational Safety and Health (NIOSH). NIOSH approval is valid only when all the manufacturer's parts are used. There is no acceptable or approved non-original aftermarket replacement part, PERIOD! Everything that comes in the original respirator box must be replaced by the same item from the original manufacturer.

While there are low-pressure Supplied-Air Respirators available for use with an ambient air pump, the vast majority of SARs are high-pressure respirators, which use air compressors for the air supply. There are air compressors, which are oil-less and do not present a carbon monoxide hazard; however, the majority of compressors employers use are oil-lubricated and require a carbon monoxide alarm as well as a high-temperature alarm. It is also common for employers to use the same compressor for providing breathing air as they use for operating the blast machine. It is important to remember to place the intake of the compressor away from sources of carbon monoxide, i.e.: cars and trucks.



The above figure shows one of the most commonly used Supplied Air Respirators. It is composed of a

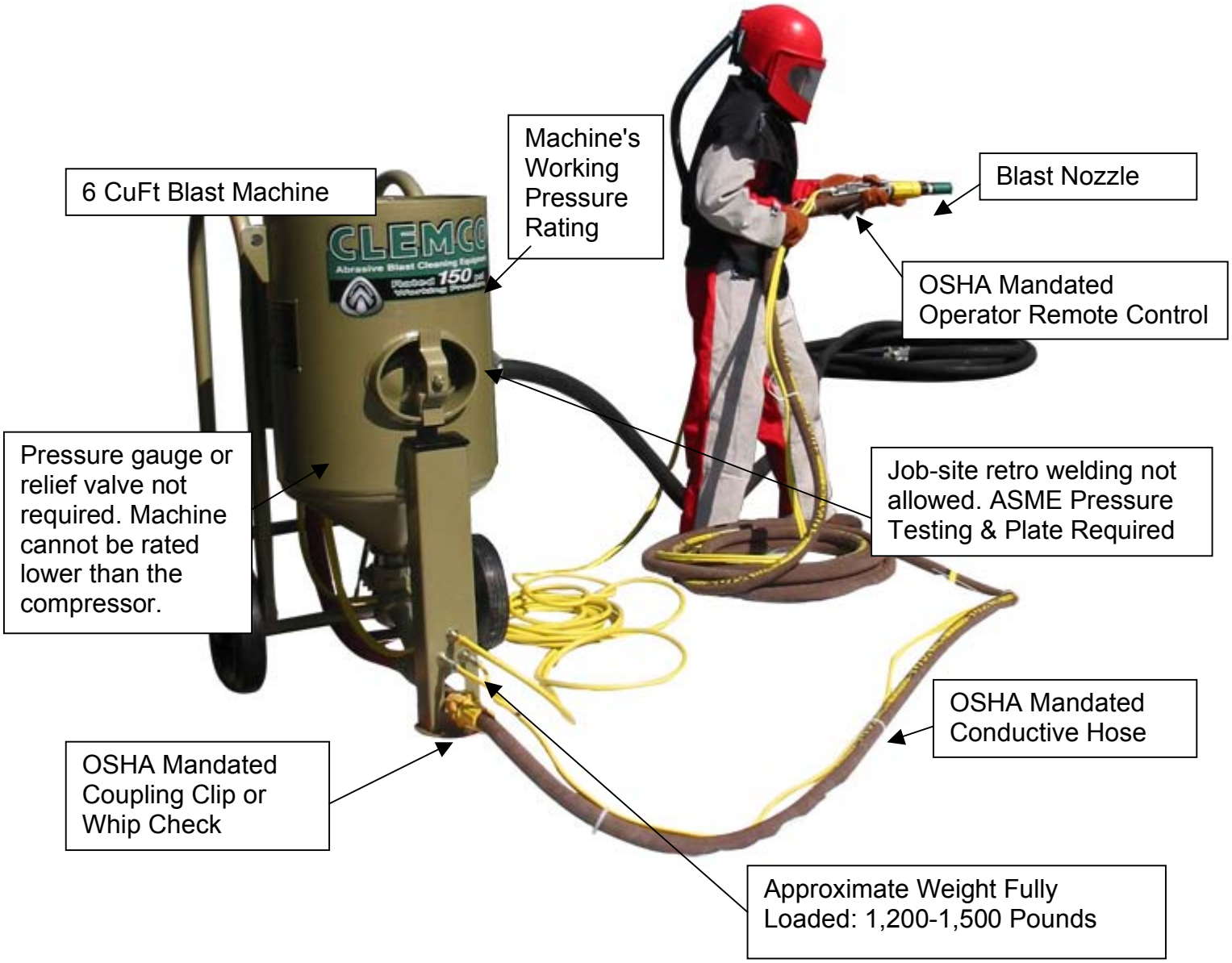
- Helmet
- Removable Knitted Collar
- Breathing Air Hose
- Air Control Valve
- Cape
- Air Supply Line
- Helmet Lenses

The only acceptable replacement parts for any of these items are those made by the original manufacturer.

This Supplied-Air Respirator must be supplied by what is termed as Grade D breathing air, as well as having oil, mist and odors removed. The sorbent bed filter shown in the picture removes oil, mist and odors, but does not create Grade D air. The air entering this filter already must be Grade D. Most compressors can provide Grade D air; however several precautions must be taken. The air must be monitored for Carbon Monoxide. There are exceptions to the requirement for using CO monitors; but they are few and the alternative is restrictive. The alternative is that all breathing systems include a CO monitor. The air coming from most compressors is also extremely hot. OSHA requires a high-temperature alarm or switch on the compressor. It is recommended the employer supply the user with a air-temperature control valve as shown in the picture above. There are air control valves, which do not provide cooling; however for a minimal investment, the employer can provide an air supply that makes this very demanding operation comfortable. Every Supplied Air Respirator requires a defined airflow. This airflow is mandated by NIOSH and is controlled by the regulator. Lastly the manufacturer of the respirator must supply the airline from the sorbent bed to the air control valve. These air lines are commonly color-coded for easy recognition.

This type of Supplied-Air Respirator has an Assigned Protection Factor (APF) of 25. This NIOSH rating means that the operator can work in an environment with contaminants defined by OSHA that are present at 25 times the permissible exposure limit. The safety professional who performs the original environmental audit will determine the concentration of OSHA-defined contaminants. All three manufacturers listed above also obtained an OSHA exception to NIOSH's APF of 25 rating for lead. The OSHA exception rates these respirators as having an APF of 1000 for lead.

The third element, the abrasive delivery system, is the surface preparation equipment itself. The most common piece of equipment is the 6 cubic foot capacity blast machine, commonly called a “Six-Sack Pot.” This slang is used to describe the number of bags of abrasive material loaded into the pot at one time. Below is one of the most popular 6 cubic foot capacity blast machines:



Misuse and abuse of surface preparation equipment is the major cause of all acute injuries when performing surface preparation. Common causes of injury are:

- Moving machine while loaded with abrasive
- Placing fully loaded machine on scaffolding not rated for heavy loads
- Operator remote being bypassed, taped or tied down
- Hose or nozzle being worn out and rupturing while under high pressure
- Coupling not being fully engaged and screwed tightly onto conductive hose causing a break in the conductive hose system and static discharge
- Coupling screws missing or not fully screwed into the hose
- Deflated tires

Abrasive blasting remains the predominant method to efficiently prepare a surface for coatings. However, abrasive blasting poses specific hazards, which must be addressed prior to beginning operation. The Federal or State Occupational Heath and Safety Administration mandates all the above minimal monitoring and training requirements. The very best way to assure a safe and compliant workplace is to implement a Safety Audit and Training program developed by a Certified Safety Professional that is tailored to a specific operation.

Several environmental standards also apply to open air abrasive blasting. These standards are predominantly promulgated by Title 40 of the Code of Federal Regulations. These regulations can be found on the website, http://www.epa.gov/epahome/cfr40.htm.

These federal regulations for environmental protection are based primarily on the Clean Air Act. They normally control the dust (PM10, or PM5) generated by open air blasting. The degree of dust abatement is predominantly controlled by a local governmental authority, which may be the State, County, or Air Pollution Control District. It is the contractor's responsibility to obtain the proper permit, normally known as a dust abatement permit, and comply with its standards. The primary document the surface preparation industry uses to comply with these regulations is the SSPC Guide #6, titled "Guide for Containing Debris Generated During Paint Removal Operations" (Publication No. 97-21, ISBN #1-889060-22-4). This document can be purchased and downloaded from the internet by going to http://www.sspc.org/standards/guidescopes.html#g6.

This article quickly touches on the environmental requirements for using dust containment systems while preparing a surface to be painted; however what controls containment more often is owner-mandated protection of the area surrounding the surface preparation work. Always take the time to investigate the surrounding area and the customer requirements for protection of non-work-site property.

Surface preparation, using open-air blasting is a very effective and economical way to provide high-quality surfaces ready to receive state-of-the-art coatings. Costs associated with employee accidents, regulatory actions, or damage to surrounding property add unnecessary costs. A well-planned job, which provides a safe environment for both the contractor's employees and the general public, always pays off in large cost savings and customer satisfaction.