

**CLASSIC BLAST MACHINE  
2 CU. FT. TO 20 CU. FT. CAPACITY  
WITH MANUAL CONTROLS  
O. M. 06160**

**DATE OF ISSUE: 06/01/73  
REVISION: N, 02/17**

** WARNING**

**Do not use this equipment until you have READ this MANUAL and YOU UNDERSTAND its contents. \***

**These WARNINGS are included for the health and safety of the operator and those in the immediate vicinity.**

**\*If you are using a Clemco Distributor Maintenance and Parts Guide, refer to the orange warnings insert preceding the Index before continuing with the enclosed instructions.**

**Electronic files include a Preface containing the same important information as the orange cover.**

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## **WARNING**

- Employers are responsible for identifying all job site hazards, educating and training all persons who will operate and maintain these products, and ensuring that all blast operators and their assistants understand the warnings and information contained in these instructions relating to safe and proper operation and maintenance of this equipment.
- Serious injury or death can result from failure to comply with all Occupational Safety and Health Administration (OSHA) regulations and all manufacturer's instructions.
- This equipment is not intended for use in any area considered hazardous per National Electric Code NFPA 70 2011, Article 500.
- Read this document and follow all instructions before using this equipment.

OSHA regulations relating to abrasive blasting are contained in the Code of Federal Regulations, Title 29 (29 CFR 1910 General Industry; 1915 Maritime; 1926 Construction). The most pertinent include: 1910.94 Ventilation, 1910.95 Occupational Noise Exposure, 1910.132 Personal Protective Equipment, 1910.133 Eye and Face Protection, 1910.134 Respiratory Protection, 1910.135 Head Protection, 1910.244 (b) Remote Controls. Consult [www.osha.gov](http://www.osha.gov) for complete information.

### **NOTICE TO PURCHASERS AND USERS OF OUR PRODUCTS AND THIS INFORMATIONAL MATERIAL**

Clemco proudly provides products for the abrasive blast industry and is confident that industry professionals will use their knowledge and expertise for the safe and efficient use of these products.

The products described in this material, and the information relating to these products, are intended for knowledgeable, experienced users.

No representation is intended or made as to: the suitability of the products described here for any purpose or application, or to the efficiency, production rate, or useful life of these products. All estimates regarding production rates or finishes are the responsibility of the user and must be derived solely from the user's experience and expertise, not from information contained in this material.

It is possible that the products described in this material may be combined with other products by the user for purposes determined solely by the user. No representations are intended or made as to the suitability of or engineering balance of or compliance with regulations or standard practice of any such combination of products or components the user may employ.

Abrasive blast equipment is only one component of an abrasive blasting job. Other products, such as air compressors, air filters and receivers, abrasives, scaffolding, hydraulic work platforms or booms, equipment for lighting, painting, ventilating, dehumidifying, parts handling, or specialized respirators or other equipment, even if offered by Clemco, may have been manufactured or supplied by others. The information Clemco provides is intended to support the products Clemco manufactures. Users must contact each manufacturer and supplier of products used in the blast job for warnings, information, training, and instruction relating to the proper and safe use of their equipment.

### **GENERAL INSTRUCTIONS**

This material describes some, but not all, of the major requirements for safe and productive use of blast machines, remote controls, respirator systems, and related accessories. All equipment and accessories must be installed, tested, operated and maintained only by trained, knowledgeable, experienced users.

The blast operator and all workers in the vicinity must be properly protected from all job site hazards including those hazards generated by blasting.

Work environments involving abrasive blasting present numerous hazards. Hazards relate to the blast process from many sources that include, but are not limited to, dust generated by blasting or from material present on the surface being blasted. The hazards from toxic materials may include, but are not limited to, silica, cyanide, arsenic, or other toxins in the abrasives or in the coatings, such as lead or heavy metals. Other hazards from toxins include, but are not limited to, fumes from coating application, carbon monoxide from engine exhaust, contaminated water, chemicals or asbestos. In addition, physical hazards that may be present include, but are not limited to, uneven work surfaces, poor visibility, excessive noise, and electricity. Employers must identify all job site hazards and protect workers in accordance with OSHA regulations.

Never modify Clemco equipment or components or substitute parts from other manufacturers for any Clemco components or parts. Any unauthorized modification or substitution of supplied-air respirator parts violates OSHA regulations and voids the NIOSH approval.

### **IMPORTANT**

Contact Clemco for free booklets:

*Blast Off 2 – Guide to Safe, Productive, and Efficient Abrasive Blasting, and Abrasive Blasting Safety Practices – Guide to Safe Abrasive Blasting.*

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# OPERATIONAL INSTRUCTIONS

### *OPERATOR SAFETY EQUIPMENT*

## **WARNING**

- OSHA regulation 1910.134 requires appropriate respiratory protection for blast operators and workers in the vicinity of blasting. These workers must wear properly-fitted, properly-maintained, NIOSH-approved, respiratory protection that is suitable for the job site hazards. Blast respirators are to be worn only in atmospheres not immediately dangerous to life or health from which wearers can escape without use of the respirator.
- The employer must develop and implement a written respiratory protection program with required worksite- specific procedures and elements for required respirator use. The employer must provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable, and recur annually, and more often if necessary.
- NEVER use abrasives containing more than one percent crystalline silica. Fatal diseases, such as silicosis, asbestosis, lead or other poisoning, can result from inhalation of toxic dusts, which include, but are not limited to, crystalline silica, asbestos, and lead paint. Refer to NIOSH Alert 92-102; and OSHA CPL 03-00-007: “National Emphasis Program – Crystalline Silica”, in which OSHA describes policies and procedures for implementing a national emphasis program to identify and reduce or eliminate health hazards from exposure to crystalline silica. Numerous topics associated with the hazards of crystalline silica in silica blasting sand can be found on [http:// osha.gov/](http://osha.gov/). Clemco urges users of silica blasting sand to visit this website, and read and heed the information it contains.
- Always make sure the breathing air supply (respirator hose) is not connected to plant lines that supply gases that include, but are not limited to, oxygen, nitrogen, acetylene, or other non-breathable gas. Never modify or change respirator air line connections without first testing the content of the line for safe breathing air. Failure to test the line may result in death to the respirator user.

- Breathing air quality must be at least Grade D, as defined by the Compressed Gas Association specification G-7.1, per OSHA Regulation 29 CFR 1910.134. When compressed air is the breathing air source, a Clemco CPF (suitable sorbent bed filter) should be used. Respirator hose connecting the respirator to the filter must be NIOSH approved. Non- approved hose can cause illness from chemicals employed to manufacture the hose.

- All workers must always wear NIOSH-approved respirators when any dust is present. Exposure to dust can occur when handling or loading abrasive, blasting, cleaning up abrasive, or working in the vicinity of blasting. Before removing the respirator, test the air with a monitoring device to ensure it is safe to breathe.

- Clemco respirators DO NOT remove or protect against carbon monoxide or any other toxic gas. Monitoring devices must be used in conjunction with the respirator to ensure safe breathing air. Always locate compressors and ambient air pumps where contaminated air will not enter the air intake.

- Always use Clemco lenses with Clemco respirators; installing non-approved lenses voids the NIOSH approval. Respirator lenses are designed to protect the wearer from rebounding abrasive; they do not protect against flying objects, heavy high-speed materials, glare, liquids, or radiation.

### *INDUSTRY ORGANIZATIONS*

For additional information, consult:

Occupational Safety and Health Administration (OSHA) - [www.osha.gov](http://www.osha.gov)

Compressed Gas Association (CGA) - [www.cganet.com](http://www.cganet.com)

The Society for Protective Coatings (SSPC) - [www.sspc.org](http://www.sspc.org)

National Association of Corrosion Engineers (NACE) - [www.nace.org](http://www.nace.org)

American Society for Testing and Materials (ASTM) - [www.astm.org](http://www.astm.org)

National Institute of Occupational Safety and Health (NIOSH) - [www.niosh.gov](http://www.niosh.gov)

American National Standards Institute (ANSI) - [www.ansi.org](http://www.ansi.org)

# PREFACE

## *BLAST MACHINES AND REMOTE CONTROLS*

### **WARNING**

OSHA regulation 1910.169 describes the necessity of pressure relief valves on compressed air equipment. Do not operate blast machines with air compressors that are not equipped with properly functioning pressure relief valves.

OSHA regulation 1910.244(b) requires the use of remote controls on blast machines.

Serious injury or death can result from many sources, among them:

- Involuntary activation of the remote controls. Never modify or substitute remote control parts; parts are not compatible among different manufacturers. Welding hose is not suitable for remote control hose. Its ID and material composition make it unsafe for remote control use.
- Exceeding the maximum working pressure. Clemco blast machines are built to ASME-code and carry a 'U' or 'UM' stamp, and National Board/serial number. Every machine is marked with its maximum working pressure. Never exceed the maximum working pressure limits of the blast machine.
- Uncontrolled blast stream. High-velocity abrasive particles will inflict serious injury. Always point the blast nozzle in the direction of the blast surface only. Keep unprotected workers out of the blast area.
- Welding on the blast machine. Never weld on the blast machine; welding voids the National Board approval and may affect the dimensional integrity of the vessel.
- Moving the blast machine. Never manually move a blast machine containing abrasive, any machine containing abrasive must be moved with appropriate mechanical lifting equipment.

## *HOSES, COUPLINGS, AND NOZZLE HOLDERS*

- The inside diameter (ID) of air hoses, fittings, and connections should be at least four times larger than the nozzle orifice size. Blast hose ID should be three to four times the size of the nozzle orifice. Example: a #6 nozzle (3/8" diameter orifice) calls for 1-1/2" ID blast hose and 1-1/2" ID or larger compressor hose. All hose runs should be kept as short as possible and run in as straight a line as possible to reduce pressure loss.
- To install, squarely cut the end of the hose so that it fits snugly against the coupling or hose end shoulder. Always use the screws recommended by the manufacturer ensuring that they do not penetrate the inner wall. Make sure the couplings tightly fit the hose. Install cotter pins at every connection or use couplings with built-in lock-springs to prevent disengagement. Install safety cables at all connections to prevent whipping if hoses disengage or blow out.

## *MAINTENANCE AND REPAIR*

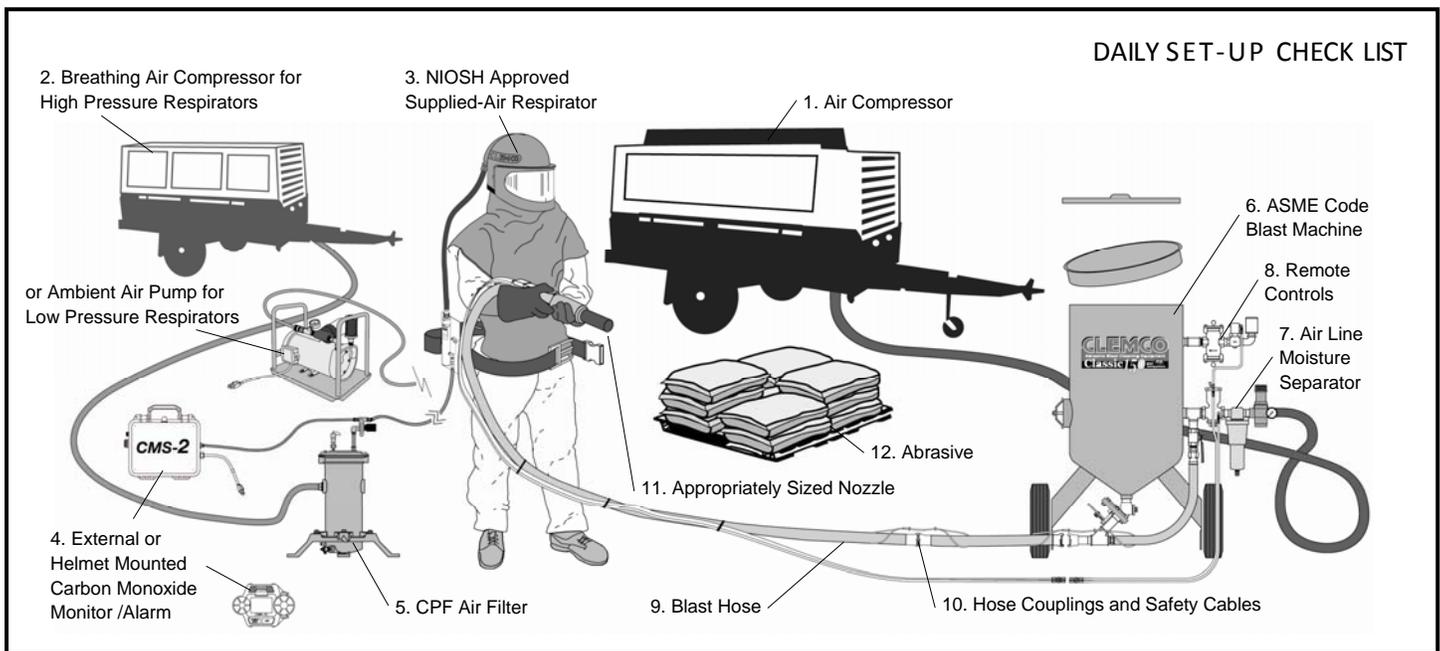
- Completely read and follow all service instructions and recommended maintenance intervals. Always shut off compressor and depressurize blast machine before performing any maintenance. At every service interval, clean all filters, screens, and alarm systems. If spring-loaded abrasive valves are used, always cage spring before disassembly.

## *WARRANTY*

The following is in lieu of all warranties, express, implied or statutory, and in no event shall seller or its agents, successors, nominees or assignees, or either, be liable for special or consequential damage arising out of a breach of warranty. This warranty does not apply to any damage or defect resulting from negligent or improper assembly or use of any item by the buyer or its agent or from alteration or attempted repair by any person other than an authorized agent of seller. All used, repaired, modified, or altered items are purchased "as is" and with all faults. In no event shall seller be liable for consequential or incidental damages. The sole and exclusive remedy of buyer for breach of warranty by seller shall be repair or replacement of defective parts or, at seller's option, refund of purchase price, as set forth below

1. Seller makes no warranty with respect to products used other than in accordance hereunder.
  2. On products seller manufactures, seller warrants that all products are to be free from defects in workmanship and materials for a period of one year from date of shipment to buyer, but no warranty is made that the products are fit for a particular purpose.
  3. On products which seller buys and resells pursuant to this order, seller warrants that the products shall carry the then standard warranties of the manufacturers thereof, a copy of which shall be made available to the customer upon request.
  4. The use of any sample or model in connection with this order is for illustrative purposes only and is not to be construed as a warranty that the product will conform to the sample or model.
  5. Seller makes no warranty that the products are delivered free of the rightful claim of any third party by way of patent infringement or the like.
  6. This warranty is conditioned upon seller's receipt within ten (10) days after buyer's discovery of a defect, of a written notice stating in what specific material respects the product failed to meet this warranty. If such notice is timely given, seller will, at its option, either modify the product or part to correct the defect, replace the product or part with complying products or parts, or refund the amount paid for the defective product, any one of which will constitute the sole liability of the seller and a full settlement of all claims. No allowance will be made for alterations or repairs made by other than those authorized by seller without prior written consent of seller. Buyer shall afford seller prompt and reasonable opportunity to inspect the products for which any claim is made as above stated.
- Except as expressly set forth above, all warranties, express, implied or statutory, including implied warranty of merchantability, are hereby disclaimed.

# PREFACE



DAILY SET-UP CHECK LIST

Make sure all blast operators are properly trained and suitably attired with a blast suit, safety boots, leather gloves, respiratory and hearing protection. Every day before start up, check all equipment components, including piping, fittings, and hoses, and valves, for leaks, tightness, and wear. Repair or replace as needed. Use the following checklist.

- 1. PROPERLY-MAINTAINED AIR COMPRESSOR** sized to provide sufficient volume (cfm) at given pressure for nozzle and other tools. ADD 50% volume (cfm) reserve to allow for nozzle wear. Use large compressor outlet and air hose (at least 4 times the nozzle orifice diameter). For oil-lubricated compressors, the employer shall 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 shall be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm. Follow the manufacturer's checklist and maintenance instructions.
- 2. BREATHING-AIR COMPRESSOR** (or oil-less ambient air pump) capable of providing Grade D quality air, located in a dust free area. Read # 1 above.
- 3. CLEAN, PROPERLY-MAINTAINED NIOSH-APPROVED SUPPLIED-AIR RESPIRATOR** worn by blast operators, and other workers exposed to blast dust. Make sure all respirator components are in place — all lenses, inner collar, and cape. Thoroughly inspect all components for wear. The NIOSH approval (approval number is listed in the owner's manual) is for a complete assembly from point of attachment on the CPF (sorbet bed) filter to the complete respirator. Substitution of any part voids the NIOSH approval.
- 4. CARBON MONOXIDE MONITOR/ALARM** installed at the CPF filter or inside the supplied-air respirator for monitoring for the presence of deadly CO gas and warning the operator(s) when the CO level reaches an unacceptable level. When an ambient air pump is used for breathing air, a CO monitor provides a measure of safety. Read # 1 above.
- 5. BREATHING-AIR FILTER (OSHA-REQUIRED sorbet bed filter)** for removal of moisture and particulate matter in the compressed air breathing-air supply. Monitor the condition of the cartridge and replace when odor is detected or at 3 month intervals, whichever comes sooner. The breathing air filter does NOT detect or remove carbon monoxide (CO). Always install a CO monitor/alarm.
- 6. BLAST MACHINE** (bearing U or UM stamp, National Board Number, and Maximum Working Pressure) sized to hold a 30-minute abrasive supply. Examine pop-up valve for alignment. Check piping, fittings, screens, valves for tightness, leaks, and wear. Always ground the machine to eliminate hazard of static shock. Install a blast machine screen to keep out foreign objects. Use a blast machine cover if left outdoors overnight. Never exceed the maximum working pressure of the vessel.
- 7. AIR LINE FILTER** (moisture separator) installed as close as possible to the blast machine inlet and sized to match the size of the inlet piping or larger air supply line. Clean filter and drain often. Damp abrasive causes operational problems.
- 8. REMOTE CONTROLS** are required by OSHA and must be in perfect operating condition. Test and check all components to ensure all parts are present and fully functional. Use genuine replacement parts. NEVER mix parts from different manufacturers. Never use welding hose for remote control hose.
- 9. BLAST HOSE** should have an inside diameter sized to suit the blast nozzle. The ID should be three to four times the size of the nozzle orifice diameter. Blast hose should be arranged in as straight a line as possible from the blast machine to the work area, avoiding sharp bends.
- 10. COUPLINGS AND NOZZLE HOLDERS** should fit snugly on the hose and be installed with manufacturer recommended screws. Coupling lugs must snap firmly into locking position. Gasket must always be used to form a positive seal, and cotter pins must be installed. Replace gasket when wear, softness or distortion is detected. Check nozzle holder for thread wear; replace at any sign of wear. Install safety cables at all connections.
- 11. NOZZLE** orifice size should be checked and nozzle replaced when worn 1/16" from original size. (No. 5 nozzle has 5/16" orifice diameter; replace when it measures 3/8"). Threads should be inspected daily for wear and nozzle should be replaced when wear is detected. Always use a nozzle washer.
- 12. ABRASIVE** must be a material specifically manufactured for blasting. It should be properly sized for the job. Check material safety data sheet for free-silica, cyanide, arsenic, lead and other toxins and avoid use when these toxic, harmful substances are present.
- SURFACE TO BE BLASTED** should be examined for hazardous substances. Take appropriate protective measures as required by OSHA to ensure the blast operator, other workers in the vicinity, and any bystanders are properly protected.

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## 1.0 INTRODUCTION

### 1.1 Scope

1.1.1 These instructions cover set-up, operation, maintenance, troubleshooting, and replacement parts for Clemco Classic, manually-controlled blast machines raging in size from 2 cu ft. through 20 cu ft. These instructions also contain important safety information required for safe operation of the machine. If this machine is intended for use with a blast operator, contact a Clemco distributor for the remote control system.

1.1.2 OSHA requires remote controls (valves that start and stop the blast process from a handle at the nozzle) on all blast machines, when a blast operator (the person who performs the blasting by holding and directing the nozzle) commands the nozzle. A manually-controlled blast machine (a blast machine fitted with simple ball valves at the inlet and outlet, which must be manually opened and closed to start and stop the blast process) is allowed only in cases where a machine is connected to a fixed nozzle or tool that is enclosed and separated from the operator and surrounding personnel.

1.1.3 This manual contains important safety information. All operators and personnel involved with the abrasive blast process must read and understand the contents of these instructions, including the orange cover. It is equally important that the machine tender is trained and qualified to safely operate the blast machine with manual controls and all other equipment used with the blast machine.

1.1.4 All personnel involved with the abrasive blasting process must be made aware of the hazards associated with abrasive blasting. The Clemco booklet "Abrasive Blasting Safety Practices" is included with every blast machine; it contains important safety information about abrasive blasting that may not be included in equipment operation manuals. The booklet is available in both English and Spanish; to request copies, email [info@clemcoindustries.com](mailto:info@clemcoindustries.com).

### 1.2 Hazard Alerts

1.2.1 Clemco uses safety alert signal words, based on ANSI Z535.4-2011, to alert the user of a potentially hazardous situation that may be encountered while operating this equipment. ANSI's definitions of the signal words are as follows:



**This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.**

## NOTICE

**Notice indicates information that is considered important, but not hazard-related, if not avoided, could result in property damage.**

## CAUTION

**Caution indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.**

## WARNING

**Warning indicates a hazardous situation that, if not avoided, could result in death or serious injury.**

## DANGER

**Danger indicates a hazardous situation that, if not avoided, will result in death or serious injury.**

### 1.3 Components and Operating Principles

#### 1.3.1 Components

1.3.1.1 The primary components of the blast machine are shown in Figure 1.

#### 1.3.2 Blast Machine

1.3.2.1 This blast machine is a manually-controlled machine, which means a machine tender pressurizes and depressurizes the machine, by opening and closing the manual ball valves on the blast machine.

1.3.2.2 Clemco blast machines (pressure vessels) are certified to conform to the ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, Division 1. It is the owner's responsibility to maintain the integrity of the vessel in accordance with the requirements of state regulations. Regulations may include regular inspection and hydrostatic testing as described in National Board inspection code and jurisdictional regulations and/or laws.

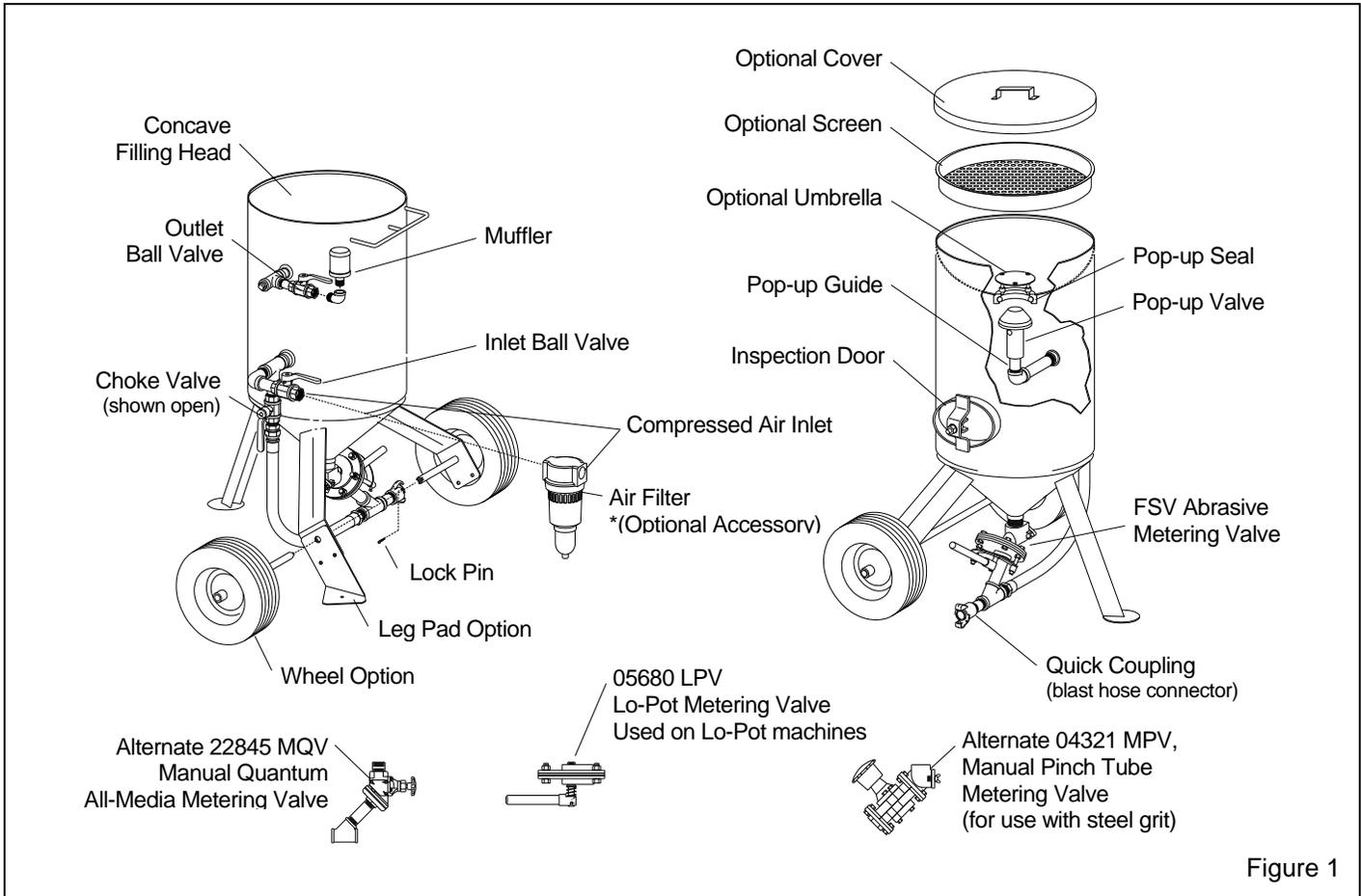


Figure 1

**⚠ WARNING**

**Welding, grinding, or drilling on the blast machine can weaken the vessel. Compressed air pressure can cause a weakened blast machine to rupture, resulting in death or serious injury. Welding, grinding, or drilling on the vessel, without a National Board R stamp, voids the Clemco ASME certification.**

**1.3.2.3** All welding repairs to the vessel must be performed by certified welders at shops holding a National Board R Stamp. Welding performed by any welder not properly qualified per the ASME code voids the Clemco ASME certification.

**1.3.2.4** Do not exceed the maximum working pressure rating (PSI) of the blast machine. The maximum pressure rating is stamped into ASME nameplate which is welded to the side of the vessel.

**⚠ WARNING**

**Excessive compressed air pressure can cause a blast machine to rupture. To prevent serious injury or death, do not exceed the rated pressure of the blast machine.**

**1.3.2.5** OSHA does not require pressure relief valves on blast machines when air compressors supplying air to the blast machines are built to ASME<sup>(1)</sup> code and comply with OSHA<sup>(2)</sup> regulations. OSHA regulation 1910.169 refers to the ASME code when describing the necessity of pressure relief valves on compressed air equipment. **DO NOT** operate blast machines with air compressors that are not equipped with properly-functioning pressure relief valves.

<sup>(1)</sup> American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section VIII, Division 1,

<sup>(2)</sup> Occupational Safety and Health Administration, 29 CFR 1910, 169.

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## 1.4 Abrasive

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### WARNING

**Abrasives and dust from blasting may contain toxic materials (e.g., lead paint, silica) that are hazardous to workers. Obtain a safety data sheet (SDS) for the blast abrasive and identify all substances removed by the blasting process.**

- **Silica sand (crystalline) can cause silicosis, lung cancer, and breathing problems in exposed workers.**
- **Slags can contain trace amounts of toxic metals such as arsenic, beryllium, and cadmium and have the potential to cause lung disease.**

**NO DUST IS SAFE TO BREATHE. DUST PRODUCED FROM ANY ABRASIVE OR FROM THE BLASTING PROCESS CAN CAUSE SERIOUS LUNG DISEASE AND DEATH WHEN INHALED. It is the employer's responsibility to train employees to identify hazardous substances and to provide suitable policies, procedures, monitoring, recordkeeping and personal protective equipment.**

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NOTE: Use only abrasives specifically manufactured for blasting that are compatible with the surface being blasted. Abrasives produced for other applications may be inconsistent in size and shape and produce an unsatisfactory finish, contain particles that could jam the abrasive metering valve, or cause irregular wear.

**1.4.1** Selection of blasting abrasive can play a significant part in worker health risk, job productivity, and maintenance of the blast machine. DO NOT USE abrasives containing more than one percent crystalline (free) silica. Obtain safety data sheets (SDS) for the blasting abrasive prior to blasting, paying particular attention to worker health risks and presence of any hazardous/toxic substances.

#### **1.4.2 Abrasive Size**

**1.4.2.1** The choice of abrasive size depends on the desired profile, cleaning rate, nozzle orifice size and availability of clean dry air. Generally, larger, denser abrasives provide a deeper profile, while smaller

abrasives clean faster. Most abrasive blasting is done with abrasive sizes between 16 and 80 mesh. Larger sizes may be used if the nozzle orifice is large enough to prevent particles to pass without jamming. Finer abrasives are especially sensitive to moisture and requires very dry air to prevent bridging in the metering valve.

**1.4.3 Sand:** Sand should never be used because of the respiratory hazards associated with abrasives containing free silica.

**1.4.4 Slag:** Slag abrasives are compatible with the blast machine fitted with an FSV metering valve or any of the alternate metering valve. Obtain safety data sheet (SDS) to identify hazardous substances.

**1.4.5 Steel:** Steel shot and steel grit may be used with machines fitted with an alternate Quantum or manual PVR pinch-tube metering valve. Alternate valves are shown in Section 8.2. Shot applications may require the use of a pneumatically-operated metering valve such as the Sentinel or Auto-Quantum, to prevent surging at startup.

**1.4.6 Silicon Carbide, Aluminum Oxide, and Garnet:** These are the most aggressive, high-volume abrasives used in the blasting industry. These abrasives may be used, but the service life of any equipment components which come in contact with the abrasive will be reduced. Use a nozzle lined with boron carbide with these abrasives.

**1.4.7 Glass Bead:** Most beads are treated to ensure free-flow operation even under moderately high-humidity. Glass beads subjected to excessive moisture may be reused after thorough drying and breaking up of any clumps. Clean, dry air is a necessity. Glass bead applications may require the use of a pneumatically-operated metering valve, such as the Sentinel or AQP Auto-Quantum, which can help to prevent surging at startup.

**1.4.8 Lightweight Media:** Plastic media and most agricultural media may be used occasionally in a standard blast machine. Exclusive use of plastic, and some other lightweight media, requires a blast machine with a 60° conical bottom for continuous, uninterrupted media flow.

2.0 INITIAL SET-UP

**⚠ WARNING**

Clemco supplies an exhaust muffler with all blast machines of 2 cu. ft. capacity and larger. The muffler reduces exhaust noise and prevents abrasive from exhausting upward or sideways into the air. When the blast machine is depressurized, the muffler body pops up to diffuse the air and abrasive. When the machine is fully depressurized, the muffler body drops, permitting trapped abrasive to empty. For the muffler to work properly, it must be installed with the body facing up, as shown in Figure 1.

If an application requires the muffler to be removed, the exhaust piping must be plumbed to direct exhausting air in a direction that ensures no persons will be exposed to possible injury from high velocity air and abrasive, which escapes when the blast machine is depressurized.

2.1 Storage Hopper

2.1.1 When a storage hopper is installed above the blast machine, an umbrella, mounted above the pop-up opening, is required. Refer to Section 8.3, Item 22 for optional bolt-on umbrella.

2.2 Set Up for Multiple Blast Machines Operating From a Common Compressed Air Supply

**NOTICE**

If multiple machines are operating from a common compressed air supply, and a machine is under pressure, when another machine is pressurized, the sudden, increased demand for air can reverse air flow from the machine that is under pressure, and contaminate the compressed air supply with abrasive-laden air. Install check valves at the piping inlet to prevent the reversal of air.

2.2.1 Where multiple blast machines are operating from a single air source, install a ball-cone check valve at the air supply on each machine. Refer to the illustration in Figure 2 to install the check valve.

2.2.2 If the machines are placed close together, use a receiver tank or manifold and run separate air lines from it

to each machine. The check valves may be located on the receiver tank outlets if the air line goes directly to the blast machine and nowhere else.

2.2.3 Use a Clemco ball-cone check valve shown below. A smaller-size valve can restrict air movement and reduce nozzle pressure.

- 1-NPT inlet valve and piping  
use 1-1/4-NPT check valve ..... Stock No. 02088
- 1-1/2-NPT inlet valve and piping  
use 1-1/2-NPT check valve ..... Stock No. 02296

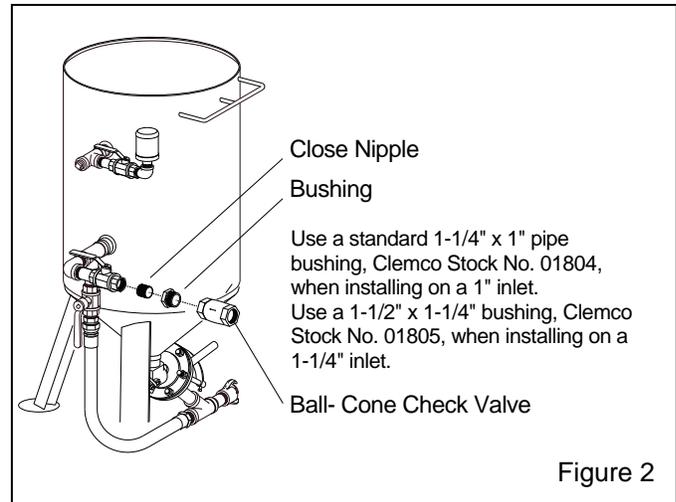


Figure 2

2.3 Install Optional Air Filter (Moisture Separator) Figure 3

2.3.1 Install an optional compressed-air filter to the inlet valve as shown in Figure 3. It is recommended that a filter be installed at this location to remove moisture from air before it enters the machine. If problems with moisture persists after installing the filter, a dryer or aftercooler may be required in the air-supply line.

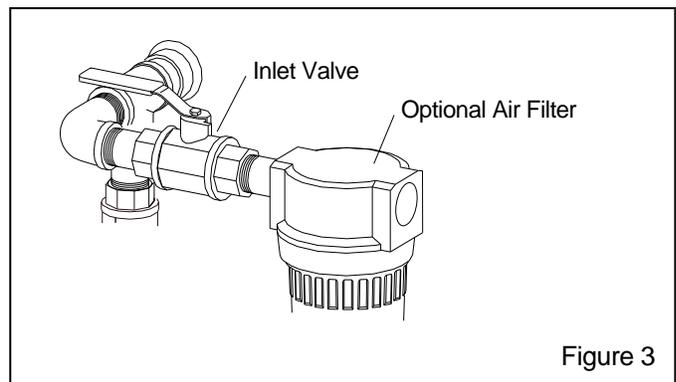


Figure 3

2.4 Compressed-Air Supply Hose Connection

2.4.1 Apply thread sealant to the male pipe threads of an air fitting that is compatible with the air supply hose fitting, as noted in Section 2.4.2, and install it onto the optional air filter or 1-1/4 NPT ball located at the blast

machine inlet valve as shown in Figure 4. NOTE that the style of connection shown in Figure 4 is for reference only.

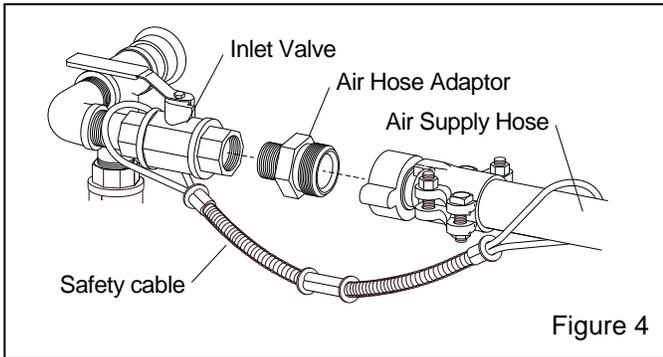


Figure 4

**⚠ WARNING**

Hose disconnection while under pressure can cause serious injury or death. Use safety lock pins or safety wire to lock twist-on (claw-type) couplings together and prevent accidental separation while under pressure, and safety cables to prevent hose from whipping should separation occur.

2.4.2 Attach an air line from the compressor to the hose fitting installed on the blast machine inlet. For best blasting performance, refer to the table in Figure 5 for the minimum recommended hose size based on the nozzle orifice size. A smaller diameter hose can result in a reduction in nozzle pressure.

AIR LINE RECOMMENDATIONS BASED ON NOZZLE SIZE	
Nozzle Orifice Size	Recommended Air Supply Line
No. 3, 3/16"	3/4" ID or larger
No. 4, 1/4"	1" ID or larger
No. 5, 5/16"	1-1/4" ID or larger
No. 6, 3/8"	1-1/2" ID or larger
No. 7, 7/16"	2" ID or larger
No. 8, 1/4"	2" ID or larger

Refer to the compressed air and abrasive consumption table in Figure 6 for approximate air consumption.

Figure 5

3.0 OPERATION

3.1 Transporting and Moving

**⚠ WARNING**

Failure to observe the following warnings before transporting or moving a blast machine can result in serious injury or death.

- Always empty the blast machine before lifting or hoisting.
- Never hoist the machine by the handle or piping, or with a sling through the handle or piping.
- Always use lift equipment that is rated higher than the weight of the machine and accessories.
- When transporting a machine on a pallet, always securely attach the machine to a sturdy pallet.
- Always securely anchor the machine to the transport vehicle.
- Anyone using material handling equipment to move, transport, or lift the machine must be experienced, and able to recognize and avoid hazards associated with handling this type of machinery, and to safely operate the equipment.

3.1.1 Transporting a blast machine

3.1.1.1 Always empty the machine before transporting. Transporting the machine containing abrasive can increase the weight to an unsafe handling limit, and could cause abrasive to settle in the piping.

3.1.2 Moving a blast machine

**⚠ WARNING**

Do not manually move the machine on an incline, or on a slippery or irregular surface that can cause the operator to slip or lose balance. Sudden weight shifts when the machine is tilted on an incline, and slipping or tripping while moving the machine will cause the operator to lose control of the machine, causing severe injury and property damage.

**⚠ WARNING**

**Never attempt to manually move a blast machine when it contains abrasive. An empty machine may be moved manually in a forward direction, on level flat surfaces.**

**3.1.2.1** An empty machine may be slid manually, on level flat surfaces, by at least two people.

**3.1.2.2** Slide the machine by pushing it in a forward direction toward the wheels. To avoid tripping hazards that may be out of view, do not back-up while moving the machine.

**3.1.2.3** The Clemco Mule (Stock No. 20331) is designed to facilitate moving empty 2 cu. ft. to 6 cu. ft. capacity Clemco blast machines. Contact a Clemco Distributor for additional information.

**3.2 Set-Up for Operation**

**3.2.1** Locate the compressor upwind from the blasting operation to prevent contaminated air from entering the compressor intake.

**3.2.2** Attach an air line from the compressor to the air-supply hose connector installed on the blast machine inlet. For best blasting performance, use the minimum recommended hose size as noted in Figure 5. Refer to the compressed air and abrasive consumption table in Figure 6 for approximate air consumption.

Compressed Air and Abrasive Consumption									
Consumption rates are based on abrasive that weigh 100 pounds per cubic foot									
Nozzle Orifice Size (in.)	Pressure At The Nozzle (psi)								Air, Power and Abrasive Requirements
	50	60	70	80	90	100	125	140	
No. 2 1/8"	11	13	15	17	19	20	25	28	Air (cfm)
	67	77	88	101	112	123	152	169	Abrasive (lbs/hr)
	2.5	3	3.5	4	4.5	5	5.5	6.5	Compressor (hp)
No. 3 3/16"	26	30	33	38	41	45	55	61	Air (cfm)
	150	171	196	216	238	264	319	353	Abrasive (lbs/hr)
	6	7	8	9	10	10	12	14	Compressor (hp)
No. 4 1/4"	47	54	61	68	74	81	98	108	Air (cfm)
	268	312	354	408	448	494	608	676	Abrasive (lbs/hr)
	11	12	14	16	17	18	22	24	Compressor (hp)
No. 5 5/16"	77	89	101	113	126	137	168	186	Air (cfm)
	468	534	604	672	740	812	982	1085	Abrasive (lbs/hr)
	18	20	23	26	28	31	37	42	Compressor (hp)
No. 6 3/8"	108	126	143	161	173	196	237	263	Air (cfm)
	668	764	864	960	1052	1152	1393	1538	Abrasive (lbs/hr)
	24	28	32	36	39	44	52	59	Compressor (hp)
No. 7 7/16"	147	170	194	217	240	254	314	347	Air (cfm)
	896	1032	1176	1312	1448	1584	1931	2138	Abrasive (lbs/hr)
	33	38	44	49	54	57	69	77	Compressor (hp)
No. 8 1/2"	195	224	252	280	309	338	409	452	Air (cfm)
	1160	1336	1512	1680	1856	2024	2459	2718	Abrasive (lbs/hr)
	44	50	56	63	69	75	90	101	Compressor (hp)

- For nozzle sizes 3/8" to 1/2", blast machines should be equipped with 1-1/4" or larger piping and inlet valve to prevent pressure loss.
- Air requirements were measured by a flow meter under actual blasting conditions, and are therefore lower than figures for air alone, with no abrasive.
- Horsepower requirements are based on 4.5 cfm per horsepower.
- Figures are for reference only, and may vary for different working conditions. Several variables, including metering valve adjustments, can affect abrasive flow.
- Figures show approximate compressed air and abrasive consumption when nozzles are new. Consumption will increase as the nozzle wears.

Figure 6

**3.2.3** Make sure the coupling gaskets are in place and in good condition before connecting the blast hose to the quick coupling on the blast machine. **NOTE: When connecting a nylon coupling to a nylon coupling, make sure the coupling spring lock pins are at 180 degrees** (Pins should enter the open hole of the adjoining coupling). The spring lock pins prevent accidental separation of hose couplings during blasting. One lock pin is used when connecting nylon to metal and two are used when connecting two metal couplings.

**3.2.4** Make sure that all blast hose couplings and compressed-air supply hose connections are secured with safety lock pins to lock the couplings together and prevent accidental separation while under pressure, and safety cables to prevent hose from whipping should separation occur. Lock pins and safety cables are listed in Section 8.1 of this manual.

## **⚠ WARNING**

**Hose disconnection while under pressure can cause serious injury or death. Use safety lock pins or safety wire to lock twist-on (claw-type) couplings together and prevent accidental separation while under pressure, and safety cables to prevent hose from whipping should separation occur.**

**3.2.5** Make sure the choke valve is open; the valve is open when the handle position is aligned with the piping, as shown in Figure 9.

## **⚠ WARNING**

**This machine is NOT equipped with remote controls. Do not use the machine without OSHA required remote controls, if a blast operator is controlling the nozzle. Ignoring this warning places the operator at risk of severe injury or death from accidents that can occur from an uncontrolled blast nozzle.**

**3.2.6** Make sure the ventilation system is running, the nozzle fixture is secure, and the blasting area is contained.

**3.2.7** Close the inlet valve and outlet valve (handles perpendicular to the valves) as shown in Figure 7.

**3.2.8** Close the abrasive metering valve. The FSV and LPV (Lo-Pot valve) are closed when the handle is all the way to either side of center, refer to Figure 11. The alternate MPV manual pinch tube metering valve and Quantum metering valves are closed when the metering

knob is turned fully clockwise. **NOTE:** it is not necessary to close the metering valve after the initial startup and adjustment per Section 4.1.

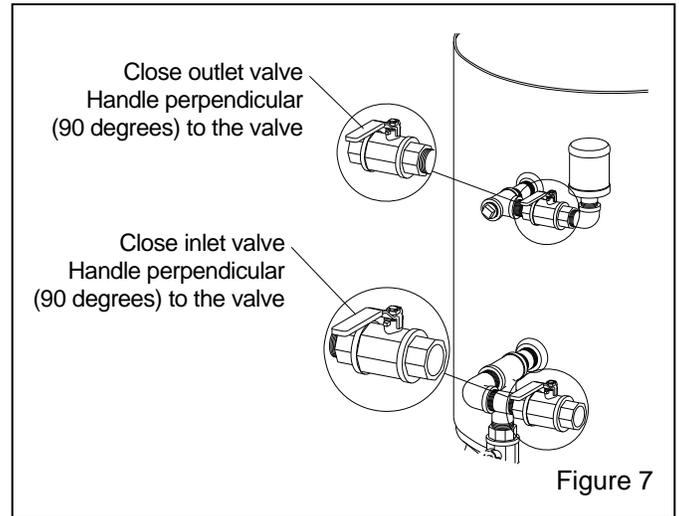


Figure 7

**3.2.9** Close the air valve on the compressor. Start the compressor, and bring it to operating temperature and pressure. The pressure must be more than 40 psi, but must not exceed the blast machine's rated pressure.

**3.2.10** Load abrasive into the machine by following the instructions in Section 3.7.

**3.2.11** Slowly open the compressor air valve to pressurize the air-supply line. Listen for noise that indicates any open lines or leaks.

**3.2.12** Do not allow anyone near the blast machine except machine tenders, who are appropriately fitted with approved protective equipment.

## 3.3 Personal Protective Equipment

### **⚠ WARNING**

**Before blasting, test the coating and substrate for toxic materials (such as lead, other heavy metals, or asbestos). These hazards require special measures to protect the operators and the environment.**

**Obtain a safety data sheet (SDS) for the blast abrasive to identify hazardous substances. Silica sand (crystalline) can cause silicosis, lung cancer, and breathing problems in exposed workers. Slag abrasives may contain trace amounts of toxic metals such as arsenic, beryllium, and cadmium. Any abrasive dust has potential to cause lung disease.**

Abrasive blasting operations can create high levels of dust and noise. No dust is safe to breathe. Abrasive blasting can produce harmful dust. Failure to wear NIOSH-approved respirators can result in serious lung disease or death. The respirators must be properly-fitted and maintained NIOSH-approved, type-CE supplied-air respirators approved for abrasive blasting.

During abrasive blasting, abrasive particles and dust in the area around the blast machine and blast nozzle become airborne. Everyone working in the vicinity of abrasive blasting must wear properly-maintained, NIOSH-approved, respiratory protection and eye protection appropriate for the job site hazards.

Loud noise generated by the use of compressed air can cause hearing damage. Everyone in the blasting area must wear approved hearing protection.

It is the employer's responsibility to train employees to identify hazardous substances and to provide suitable policies, procedures, monitoring, recordkeeping and personal protective equipment.

**3.3.1** Pot tenders and **anyone else that may be exposed to the hazards generated by the blasting process** must wear appropriate protective gear, including abrasive-resistant clothing, leather gloves, eye and hearing protection, and a NIOSH-approved type CE supplied-air respirator.

**3.3.2** Don protective blasting attire outside the blast area, in a clean non-hazardous environment, free of contaminants, where the air is safe to breathe.

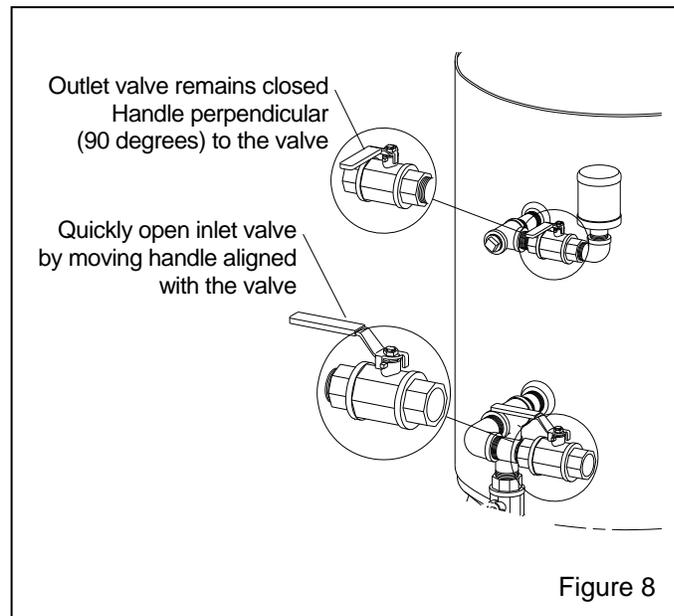
### 3.4 To Start Blasting, Refer to Figure 8

**3.4.1** Make sure that the blast nozzle is secure and directed only at objects intended to be blasted.

**3.4.2** The machine tender closes the outlet valve, and while standing back and facing away from the concave filling head, quickly opens the inlet valve as shown in Figure 8. This action causes the pop-up valve to seal off the filling port and the machine will pressurize.

## ⚠ WARNING

This blast machine is fitted with simple ball valves which must be manually opened and closed to start and stop the blast process. The use of this machine is allowed only in cases where a machine is connected to a fixed nozzle or tool that is enclosed and separated from the operator and surrounding personnel. Any work performed within the blast area must be done by personnel properly fitted with approved safety gear.



**3.4.3** If the abrasive metering valve is closed as instructed, in 3.2.8, only air will exit the nozzle. Adjust abrasive flow per Section 4.1.

## ⚠ WARNING

**Do not leave the machine unattended. If an emergency occurs, such as a burst in the blast hose, shut-down the machine immediately.**

### 3.5 Operation and Function of the Choke Valve Refer to Figure 9

**3.5.1** Always fully open the choke valve while blasting; open is when the handle position is vertical and aligned with the piping as shown in Figure 9.

**3.5.2** Closing the choke valve while blasting, lowers pressure in the pusher line from the pressure in the vessel. Closing the choke valve forces abrasive through

the metering valve to clear minor blockage such as damp abrasive, or is used to rapidly empty the machine at the end of the day.

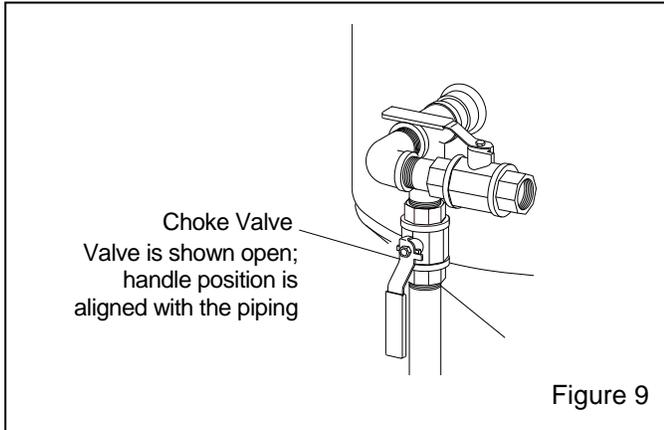


Figure 9

## NOTICE

**Do not blast with choke valve closed or partially closed. Prolonged blasting with the choke valve partially closed will accelerate wear on the metering valve.**

### 3.6 Stop Blasting, Refer to Figure 10

**3.6.1** To depressurize the machine and stop blasting, the machine tender first closes the inlet valve, and while standing back and facing away from the concave head and exhaust muffler, promptly opens the outlet valve. The pop-up valve automatically drops when air is expelled from the machine and pressure equalizes.

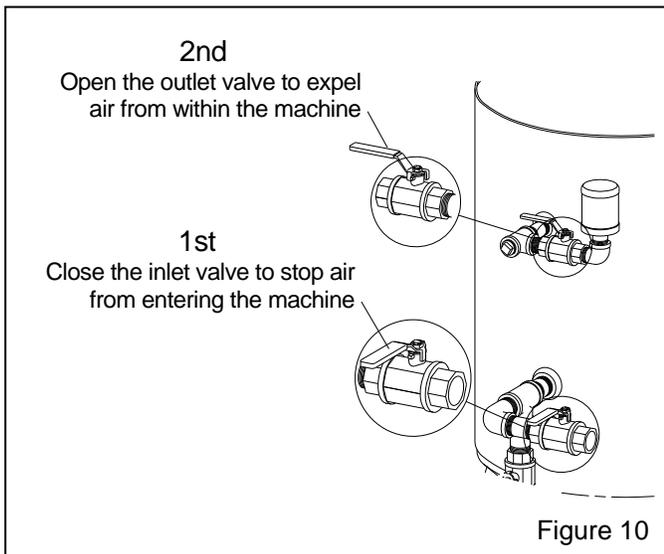


Figure 10

### 3.7 Loading Abrasive into the Blast Machine

**3.7.1** Depressurize the machine to stop blasting per Section 3.6.

## WARNING

**Obtain safety data sheets (SDS) for the blast abrasive. Abrasive blasting with sands containing crystalline (free) silica can lead to serious or fatal respiratory disease. As NIOSH recommends, do not use abrasives containing more than trace amounts (more than one percent) of free silica.**

**3.7.2** Load abrasive into the machine by pouring it into the concave head. Use an optional screen (listed in Section 8.1) placed over the filling head to prevent foreign objects from falling inside. Foreign objects will jam the machine. Abrasive flows through the filling port into the machine. Keep the abrasive level below the top of the pop-up valve to prevent abrasive on the pop-up valve from being forced up and out of the top of the machine when it pressurizes.

**3.7.3** After the machine is filled, pressurize the machine to start blasting per Section 3.4.

### 3.8 Emptying the Machine of Abrasive

**3.8.1** Empty the machine of all abrasive when shutting down for the day. Condensation dampens abrasive and causes flow problems. When working in environments subject to extreme temperature changes, or very humid conditions, condensation may develop inside the machine. Emptying the machine at the end of the work day eliminates trouble caused from moist abrasive when starting a new day's blasting. One way to avoid having to empty the machine is to load only as much abrasive as will be used during the work period. If the machine must be purged of abrasive, do the following:

**3.8.2** With the blast machine OFF, turn blast pressure to approximately 40-50 psi, close the choke valve, and fully open the abrasive metering valve.

**3.8.3** To prevent wear to the nozzle holder threads, firmly attached the nozzle to the nozzle holder. Removing the nozzle is not recommended. If circumstances require the nozzle to be removed, also remove the nozzle washer. Purging the machine without a nozzle will eventually erode the thread area of the nozzle holder. Thread wear can cause a hazardous condition when the nozzle is reinstalled.

## **⚠ WARNING**

**The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. A loose fitting nozzle may eject under pressure and can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. When nozzle washers are worn, abrasive can erode nozzle threads.**

**3.8.4** Point the nozzle into a drum or suitable container, or toward the direction where the abrasive is to be disposed.

**3.8.5** Make sure the blast hose is secure before pressurizing the machine.

**3.8.6** Depressurize the machine when empty, and open the choke valve.

**3.8.7** If the nozzle was removed, thoroughly inspect the nozzle holder threads for wear before installing the nozzle washer and reattaching the nozzle.

### **3.9 Shutdown**

**3.9.1** Empty the blast machine per Section 3.8.

**3.9.2** When finished emptying the machine, and after cleanup is completed, remove protective clothing outside the blasting area, in a clean environment where the air is safe to breathe.

**3.9.3** Close the compressed-air supply valve at the compressor.

**3.9.4** Drain receiver tank, filters, and water collecting devices, and bleed the compressed-air-supply hose.

**3.9.5** Shutdown the compressor.

**3.9.6** Cover the machine when not in use. Refer to Section 8.1 for optional covers.

## **4.0 ADJUSTMENTS**

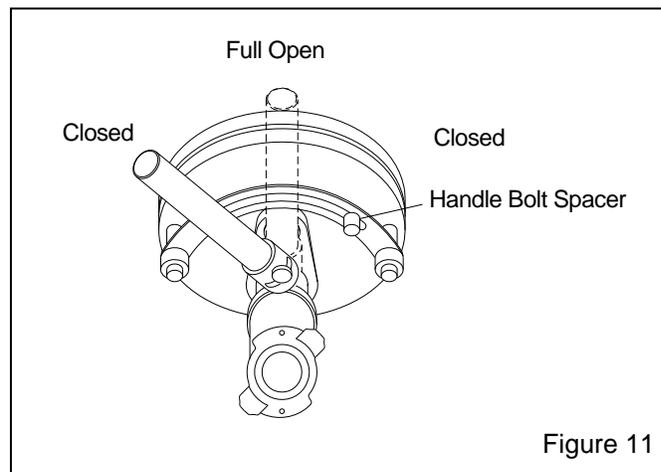
### **4.1 Adjust Abrasive Flow, Refer to Figure 11**

NOTE: These instructions explain the adjustment of handle-type FSV and LPV (Lo-Pot) metering valves. Knob-type valves are adjusted by turning the knob clockwise for less abrasive, or counterclockwise for more abrasive. Separate manuals are provided with alternate valves.

**4.1.1** Abrasive flow is adjusted at the metering valve located at the bottom of the blast machine.

**4.1.2** Begin adjustments with the metering valve closed. The FSV and LPV metering valves are closed when the handle is turned to either side of center until it hits the stops, as shown in Figure 11. The alternate Quantum or MPV manual pinch tube metering valve are closed when the metering knob is turned fully clockwise.

**4.1.3** The machine tender increases abrasive flow by moving the handle toward center, no more than 1/4" at a time, allowing time for the flow to stabilize before readjusting. The valve is fully open when the handle is centered.



**4.1.4** Optimum abrasive flow depends on the type and size of abrasive and blasting pressure, and can best be determined by experience. Use as little abrasive as possible while maintaining the maximum cleaning rate. The air/abrasive mixture should be mainly air. As a rule, abrasive coming out of the nozzle should barely discolor the air when seen against a contrasting background.

**4.1.5** Once the correct flow is attained, loosen the wing nut on the gauge unit and move the handle bolt spacer against the metering handle. This helps to return the setting to its original position, when temporary adjustments are required.

## 5.0 PREVENTIVE MAINTENANCE

NOTE: The following preventive maintenance instructions pertain to the blast machine. Read the owner's manuals for all blast accessories for inspection and maintenance schedules.

### 5.1 Daily or More Frequent Inspection

5.1.1 With the air OFF, before blasting, do the following:

- Make sure that couplings are secure and lock pins and safety cables are in place.
- Make sure the nozzle supporting fixture is secure.

5.1.2 Do the following during blasting:

- Inspect all couplings and coupling gaskets for leaks.
- Check the blast machine vessel for leaks. If leaks are found around the pop-up valve, inspection door, pipefittings ports on the side of the machine or at the bottom of the cone, stop blasting immediately and repair or replace worn parts.

## NOTICE

**If leaks are allowed to continue, abrasive erosion can cause extensive or irreparable damage to the blast machine.**

- Check all external piping and valves for leaks. If leaks are found, stop blasting and repair.
- Inspect blast hose, couplings, and nozzle holders for leaks. At the first sign of a leak, stop blasting and repair or replace worn parts.

## ⚠ WARNING

**Leaks around couplings and nozzle holders indicate worn or loose-fitting parts. Nozzle holders and couplings that do not fit tightly on hose, and nozzles that do not fit tightly in nozzle holders can disconnect while under pressure. Impact from objects (nozzles, couplings, hoses, or abrasive) disconnected by pressure during operation can cause severe injury..**

## 5.2 Weekly Inspection

5.2.1 With the air OFF, before blasting, do the following:

- Inspect the blast hose for wear; squeeze the hose every two to three feet, looking for soft spots. Soft spots mean the hose is worn. Replace the blast hose before the tube wears as far as the fabric plies.

## ⚠ WARNING

**Worn blast hose can suddenly burst. Couplings and nozzle holders may not adequately grip worn hose, causing them to blow off under pressure. Compressed air and abrasive escaping from a burst hose, or disconnected coupling or nozzle holder, can cause severe injury.**

- Remove nozzle for inspection. Replace with a new nozzle if the orifice diameter is worn 1/16" or more, or if the liner is damaged.
- Make sure the nozzle washer is in good condition and in place before reattaching the nozzle.

## ⚠ WARNING

**The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. A loose fitting nozzle may eject under pressure and can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. When nozzle washers are worn or missing, abrasive can erode nozzle threads.**

- When an air filter is used, inspect the filter element and clean the bowl.

5.2.2 After blasting inspect the following:

- Note the time it takes to fully depressurize the machine after the outlet valve is opened. When depressurizing time increases noticeably inspect the exhaust muffler per Section 6.5.

### 5.2.3 Monthly Inspection

With the air OFF, before blasting, do the following:

- Check the pop-up valve's urethane coating for cracks and grooves. Replace the pop-up valve at the first sign of wear. See Section 6.3.
- Inspect the rubber pop-up seal, and replace at the first sign of wear, drying, or cracking. See Section 6.4.

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## 6.0 SERVICE MAINTENANCE

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### WARNING

To avoid serious injury from the sudden release of compressed air, observe the following before performing any maintenance.

- Depressurize the blast machine.
  - Turn OFF the compressed air supply. Bleed the air-supply line to the blast machine.
  - Lockout (be certain the air supply is OFF and that it cannot be started while work is in process) and tagout (be certain the air supply is clearly marked to prevent re-starting while work is in process) the compressed air supply.
- 

### 6.1 Removing Damp Abrasive from the Blast Machine

**6.1.1** To clear a minor blockage caused by damp abrasive, while blasting, rapidly open and close the choke valve several times.

**6.1.2** For more difficult blockages, proceed as follows: Refer to Section 6.2 to check for obstructions in the metering valve.

**6.1.2.1** With the blast machine depressurized, disconnect the blast hose and remove the gasket from the quick coupling on the machine.

**6.1.2.2** Place the machine so that the outlet is pointed away from any objects or persons.

---

### WARNING

**The machine's outlet must be pointed away from any objects or persons. Stand clear of the path of exiting abrasive. It may come out at high velocity. Impact from exiting abrasive can cause severe injury.**

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**6.1.2.3** Close the choke valve and fully open the abrasive metering valve.

**6.1.2.4** Pressurize the machine to force out any damp abrasive.

**6.1.2.5** When the obstruction has been removed, depressurize the machine. Remove the nozzle and nozzle washer, and reattach the hose. Open the choke

valve and close the abrasive metering valve. Pressurize the machine to clear the hose. When the hose is cleared, depressurize the machine so the nozzle and nozzle washer can be attached.

---

### WARNING

**The threads on the nozzle and nozzle holder must be inspected each time the nozzle is secured to the holder. A loose fitting nozzle may eject under pressure and can cause severe injury. Check the threads for wear, and make sure the nozzle holder securely holds the nozzle. The nozzle washer must also be inspected for wear. Worn nozzle washers can cause thread erosion.**

---

**6.1.2.6** Once the hose is cleared, start the machine using normal procedures.

### 6.2 Clearing Obstructions in the Abrasive Metering Valve and Blast Machine

**6.2.1** If the nature of the obstruction permits emptying the machine of abrasive, follow the instructions per Section 3.8.

**6.2.2** Make sure the machine is depressurized. Turn OFF the compressed-air supply. Lockout and tagout the air supply, and bleed the air-supply line to the blast machine.

**6.2.3** Remove the metering valve inspection plate by removing the wing nuts securing it.

**6.2.4** Check the metering valve for blockage by inserting a finger into the opening, to feel for an obstruction or foreign object.

**6.2.5** If the metering valve is clear, remove the blast machine inspection door and check inside for foreign objects.

**6.2.6** Make sure the inspection door gasket is in good condition, and in place before re-bolting the door onto the machine.

**6.2.7** Make sure the abrasive metering valve inspection plate O-ring is in good condition and in place before reassembling the inspection plate.

**6.2.8** Check to make sure all inspection doors are secure before starting the compressed-air supply.

### 6.3. Replacing the Pop-Up Valve, Figure 12

**6.3.1** All service on the pop-up valve must be done with the machine is depressurized, the compressed air supply OFF and the air supply locked-out and tagged-out.

**6.3.2** To gain access to the pop-up valve, loosen the nut on the clamp and remove the clamp and inspection door.

**6.3.3** Using a small pipe wrench, unscrew the pop-up valve guide by turning it counterclockwise. Remove the pop-up valve and guide from the machine.

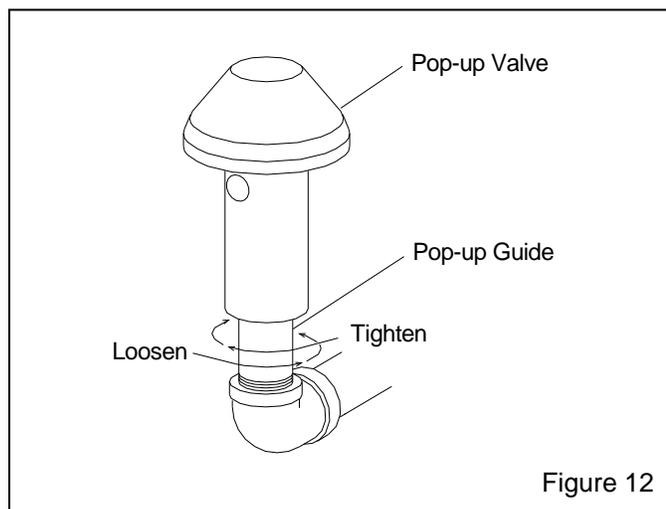


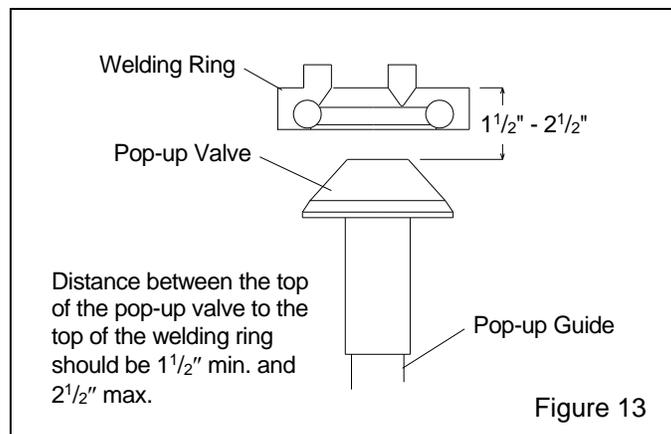
Figure 12

**6.3.4** While the pop-up valve is out, check alignment as follows: Screw a 1-1/4" nipple that is at least 12" long, into the elbow in place of the pop-up guide. Check the alignment through the pop-up filling port. The nipple should be close to the center of the port. If it is not, adjust the horizontal pipe. A misaligned pop-up valve could result in early valve failure, or abrasive leakage when the machine is pressurized or depressurized.

**6.3.5** Slide the new pop-up valve over the guide, and then screw the valve guide (with the pop-up valve on it) into position inside the machine. Tighten the guide wrench-snug, but not wrench-tight. Over-tightening the guide will make it difficult to remove, the next time the pop-up valve needs replacement.

**6.3.6** Refer to Figure 13 to check the pop-up height. If the pop-up sits too low, misalignment could occur when the pop-up comes up against the seal. If the pop-up sits too high, it will take longer for abrasive to flow through the opening. Adjust the height by replacing the guide with one that is longer or shorter.

**6.3.7** Put a new gasket on the inspection door before bolting the door onto the machine.



### 6.4 Replacing the Pop-Up Seal

**6.4.1** All service on the blast machine must be done with the compressed air OFF and the air supply locked-out and tagged-out.

**6.4.2** Remove the old seal using fingers, screwdriver, or similar object, to work the seal out of the retaining groove.

**6.4.3** Push the new seal all the way through the port and then fit it into the retaining groove. For the last few inches, pull up on the seal to pop it into position.

### 6.5 Exhaust Muffler, Figure 14

## **⚠ WARNING**

**Replace the muffler or element body as soon blast machine depressurization time increases noticeably. Longer depressurization time indicates the porous element body is becoming clogged. If the element becomes plugged, excessive air pressure can build up inside the element, and cause it to burst, which can result in injury.**

**6.5.1** All service on the muffler must be done with the compressed air OFF and the air supply locked-out and tagged-out.

**6.5.2** Using a pipe wrench, unscrew the 1" pipe guide, to remove the muffler assembly from the exhaust elbow.

**6.5.3** Remove the three lock-nuts and screws, and separate all parts.

**6.5.4** Inspect for wear. Replace parts that show signs of wear. Replace the cap if the urethane coating is worn. Always replace the element body.

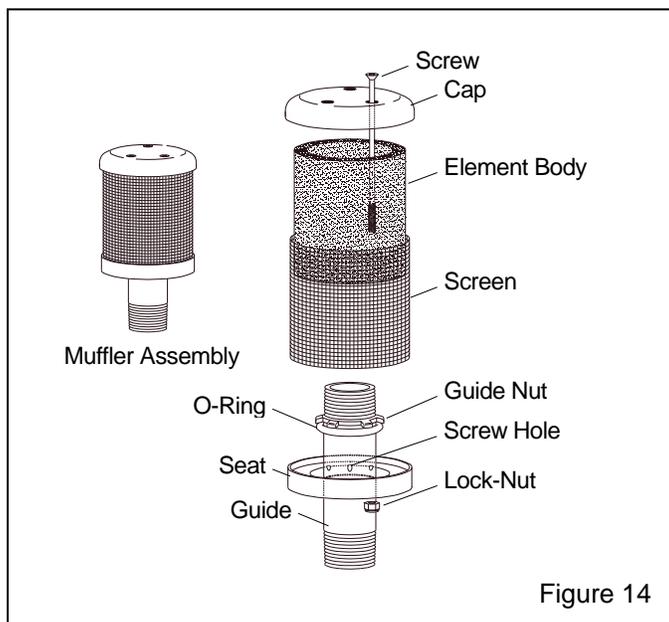


Figure 14

**6.5.5** Make sure the guide nut is fastened tightly to the guide.

## **⚠ WARNING**

**Replace the guide and guide nut if the nut is not tightly fused to the guide. A loose fitting nut can work off the guide, permitting the muffler assembly to launch under pressure, and cause severe injury.**

**6.5.6** Clean parts to be reused, with a non-caustic solvent or detergent, and dry thoroughly.

**6.5.7** Reassemble, taking care to correctly insert the screws in the seat plate; the screw holes are the three closest to the center. The outermost holes are vent holes.

**6.5.8** Firmly tighten the lock-nuts.

**6.5.9** Use a pipe wrench to attach the muffler assembly to the exhaust elbow. In its final position, the muffler must face up.

## **⚠ WARNING**

**The muffler reduces exhaust noise, and prevents abrasive from exhausting upward or sideways when the blast machine is depressurized. To reduce risk of injury from abrasive carried by high velocity air, the muffler must be installed with the body facing up.**

## 7.0 TROUBLESHOOTING

NOTE: This section only identifies conditions and problems with the blast machine. Always refer to the appropriate section of this manual, or manuals for accessory equipment, before servicing the equipment.

## **⚠ WARNING**

**To avoid serious injury when troubleshooting the machine, turn OFF the compressed air, and lockout and tagout the air supply.**

**7.1 Neither abrasive nor air comes out of the nozzle while the machine is under pressure**

**7.1.1** Depressurize the blast machine. After the pop-up valve has dropped, remove the nozzle, and check for obstruction.

**7.1.2** Make sure that both the abrasive metering valve and choke valve are open.

**7.2 Air only (no abrasive) comes out the nozzle**

**7.2.1** Abrasive metering valve may be closed or needs adjustment. Adjust the metering valve per Section 4.1.

**7.2.2** Blast machine may be empty.

**7.2.3** Abrasive may be damp. Refer to Section 6.1 to clear damp abrasive.

**7.2.4** Check the abrasive metering valve for obstructions per Section 6.2.

**7.3 Heavy abrasive flow**

**7.3.1** Make sure the choke valve is open. The valve is open when the handle position is aligned with the piping.

**7.3.2** Abrasive metering valve may be open too far. Adjust abrasive flow per Section 4.1.

**7.4 Abrasive surging**

**7.4.1** A moderate amount of abrasive surge is normal at startup. Should the flow of abrasive continue to surge, reduce the amount of abrasive in the air stream by adjusting the metering valve. Adjust abrasive flow per Section 4.1.

**7.4.2** Machine depressurizing too slowly; quickly open the outlet valve when depressurizing the machine. Slow depressurization will load the blast hose with abrasive, and cause surging at startup.

7.4.3 Check the exhaust muffler for blockage. Slow depressurization will load the blast hose.

**7.5 Intermittent abrasive flow**

7.5.1 Moisture in the blast machine or in the air supply. Drain moisture from the compressor's receiver tank, and if so equipped, the blast machine's air filter. If problem with moisture persists, a dryer or aftercooler may be required in the air-supply line.

7.5.2 Abrasive worn from reuse. Replace abrasive.

**7.6 Blast machine will not pressurize.**

7.6.1 Make sure the compressor is ON and all air-supply valves to the machine are open.

7.6.2 Insufficiently-sized air-supply hose or reduced-size fittings between the compressor and blast machine. Refer to Section 2.4.

7.6.3 Dirty filter in moisture separator. Check filter element.

7.6.4 Pop-up valve stuck, or internal piping worn or out of alignment. Inspect internal piping.

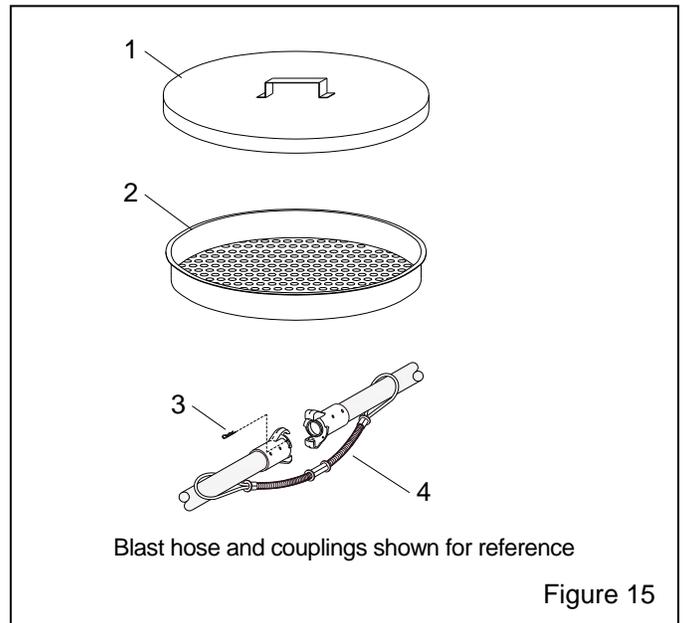
**7.7 Blast machine will not depressurize or depressurizes too slowly.**

7.7.1 Exhaust muffler blocked. Refer to Section 6.5.

**8.0 REPLACEMENT PARTS**

**8.1 Blast Machine Accessories, Figure 15**

- (-) Cover, poly bag with Clemco logo for
  - 2 and 3 cu ft machines, medium ..... 15097
  - 4 and 6 cu ft machines, large ..... 15143
- 1. Cover, steel for
  - 14" diameter machine .....02334
  - 16" diameter machine .....02335
  - 20" diameter machine .....20358
  - 24" diameter machine .....02336
  - 30" diameter machine .....02337
  - 36" diameter machine .....28651
- 2. Screen, recessed type, for
  - 14" diameter machine .....03098
  - 16" diameter machine .....03099
  - 20" diameter machine .....20357
  - 24" diameter machine .....03100
  - 30" diameter machine .....03101
  - 36" diameter machine .....02391
- 3. Safety lock pin, package of 25 ..... 11203
- 4. Safety cable,
  - for 1-1/2" to 3" OD hose ..... 15013
  - for 1-1/2" to 4" OD hose ..... 27405



8.2 Blast Machine and Accessories, Figure 16

Item	Description	Stock No.
1.	Ball valve with handle, 1-inch NPT .....	02396
	1-1/4-inch NPT .....	02397
2.	Handle, 1" ball valve, .....	22531
	1-1/4" ball valve .....	22532
3.	Pop-up valve, 4" with external sleeve .....	03699
4.	Internal pop-up guide, toe nipple, for 2 and 3 cu ft 1-1/4" x 6-1/2" .....	01754
	6 cu ft 1-1/4" x 6" .....	01753
5.	Adaptor, male NPT x male JIC 1" NPT .....	11720
	1-1/4" NPT .....	22529
6.	Pusher line assemblies, rubber 1" ID x 21" (2 cu ft machine) .....	22508
	1" ID x 28" long (3 cu ft & 6 cu ft) .....	23673
	1-1/4" ID x 28" long (3 cu ft & 6 cu ft) .....	23674
	1-1/4" ID x 31" long (7, 10 & 20 cu ft) .....	23675
	1" x 19" long (Lo-Pot machines) .....	24167
	1-1/4" x 19" long (Lo-Pot machines) .....	24168
7.	Coupling, 1-1/4" CF .....	00551
8.	Leg pad, right, for 2 cu ft machine .....	20735
	3 cu ft and 6 cu ft machine .....	03654
9.	Leg pad, left, for 2 cu ft machine .....	20736
	3 cu ft and 6 cu ft machine .....	03655

10.	Wye, 1-1/4" standard .....	01818
11.	Metering valve, FSV w/ wye .....	02427
12.	Gasket, CQG coupling, (package of 10) .....	00850
13.	Wheel and tire, 10 x 2.75, for 2 cu ft .....	20349
14.	Axle for 2 cu ft for 10" wheel, .....	20734
	3 cu ft for 16" wheel, .....	02402
	6 cu ft for 16" wheel, .....	02403
15.	Wheel and tire, 16 x 400 .....	20427
16.	Axle and 16" wheel set for 3 cu ft machine .....	02822
	6 cu ft machine .....	02350
17.	Washer, 1" thrust .....	03825
18.	Retaining ring, 1" .....	03824
19.	Inspection door assembly, 6" x 8" .....	02377
20.	Gasket, 6" x 8" inspection door .....	02369
21.	Seat, pop-up gum rubber, standard use .....	02325
	neoprene, for hot climates .....	02380
22.	Umbrella, optional, 4" bolt-on .....	02318
23.	Muffler, exhaust .....	05068
24.	Metering valve, MPV manual pinch tube (alternate) .....	04321
25.	Metering valve, LPV for Lo-Pot machines .....	05680
26.	Metering valve, MQV manual Quantum (alternate) .....	22845
27.	Safety lock pin, package of 25 .....	11203

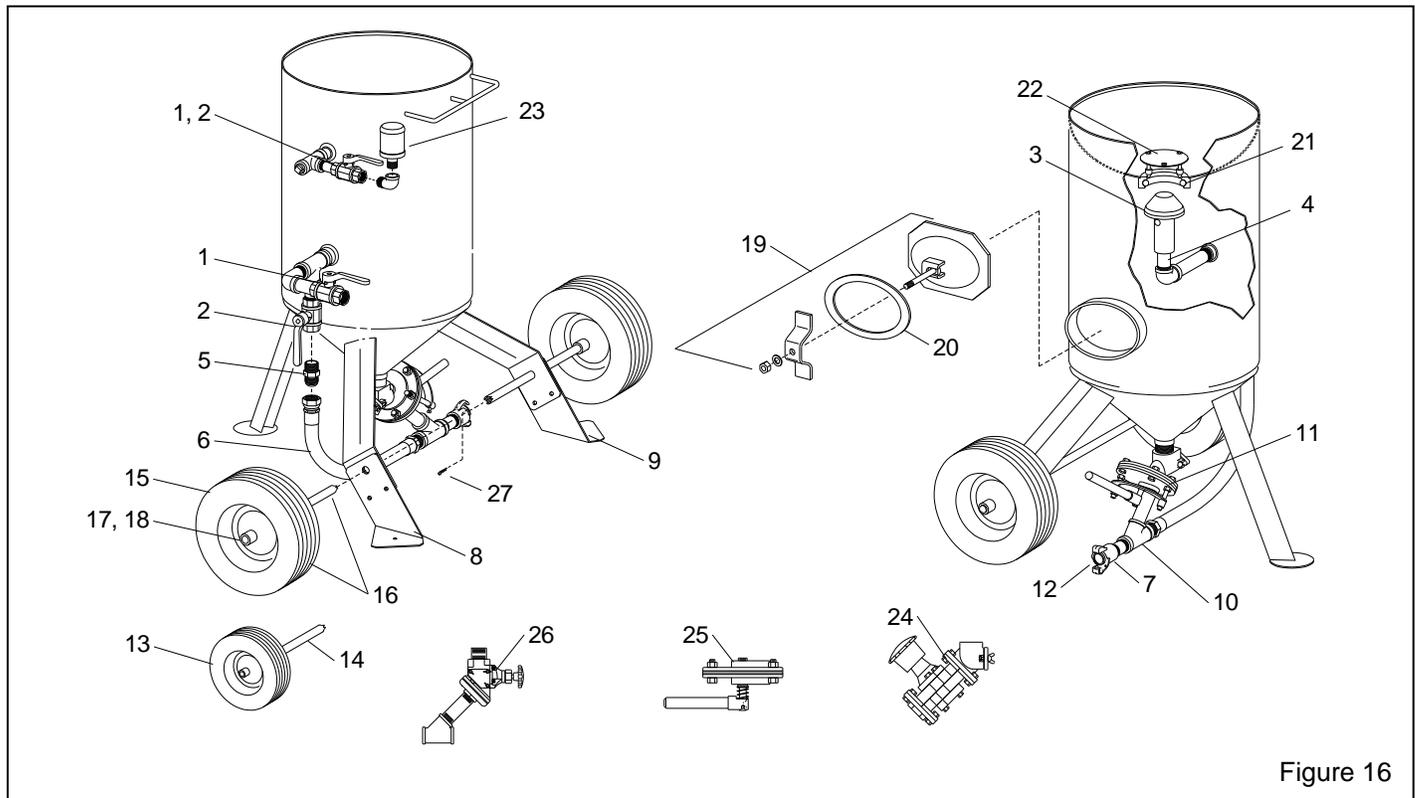


Figure 16

8.3 FSV Abrasive Metering Valve, Figure 17

Item	Description	Stock No.
(-)	Metering valve, complete .....	02427
1.	Upper body .....	02422
2.	Valve disc w/ stem .....	02423
3.	Gasket, rubber, 2 required .....	02424
4.	Disc-stainless .....	02425
5.	Lower body .....	02426
6.	Metering handle, heavy duty .....	20498
7.	Cap screw, 1/4-NC x 1-1/4" hex-head .....	03054
8.	Wing nut, 1/4-NC .....	03113
9.	Handle bolt spacer .....	02431
10.	Valve handle pin .....	20246
11.	Gauge unit .....	02433
12.	Set screw, 1/4-NC x 1/2" square-head .....	03080

13.	Spring, compression .....	01982
14.	Stud .....	02436
15.	Packing gland .....	02437
16.	O-ring, 7/8" OD .....	21165
17.	Gasket, shaft .....	02439
18.	Inspection plate .....	02440
19.	Cap screw 5/16-NC x 1" hex-head .....	03152
20.	Wing nut, 5/16-NC .....	03213
21.	O-ring .....	01990
22.	Nipple, heavy wall 1-1/2" x close .....	01791
23.	Wye, 1-1/4" standard .....	01818
24.	Nipple, 1-1/4" x 5" .....	01721
25.	Nut, 1/2-NC hex .....	03511
26.	Cap screw, 1/2-NC x 1-3/4" hex-head .....	03455
27.	Washer, 1/4" flat .....	03116
28.	Hitch pin .....	20245

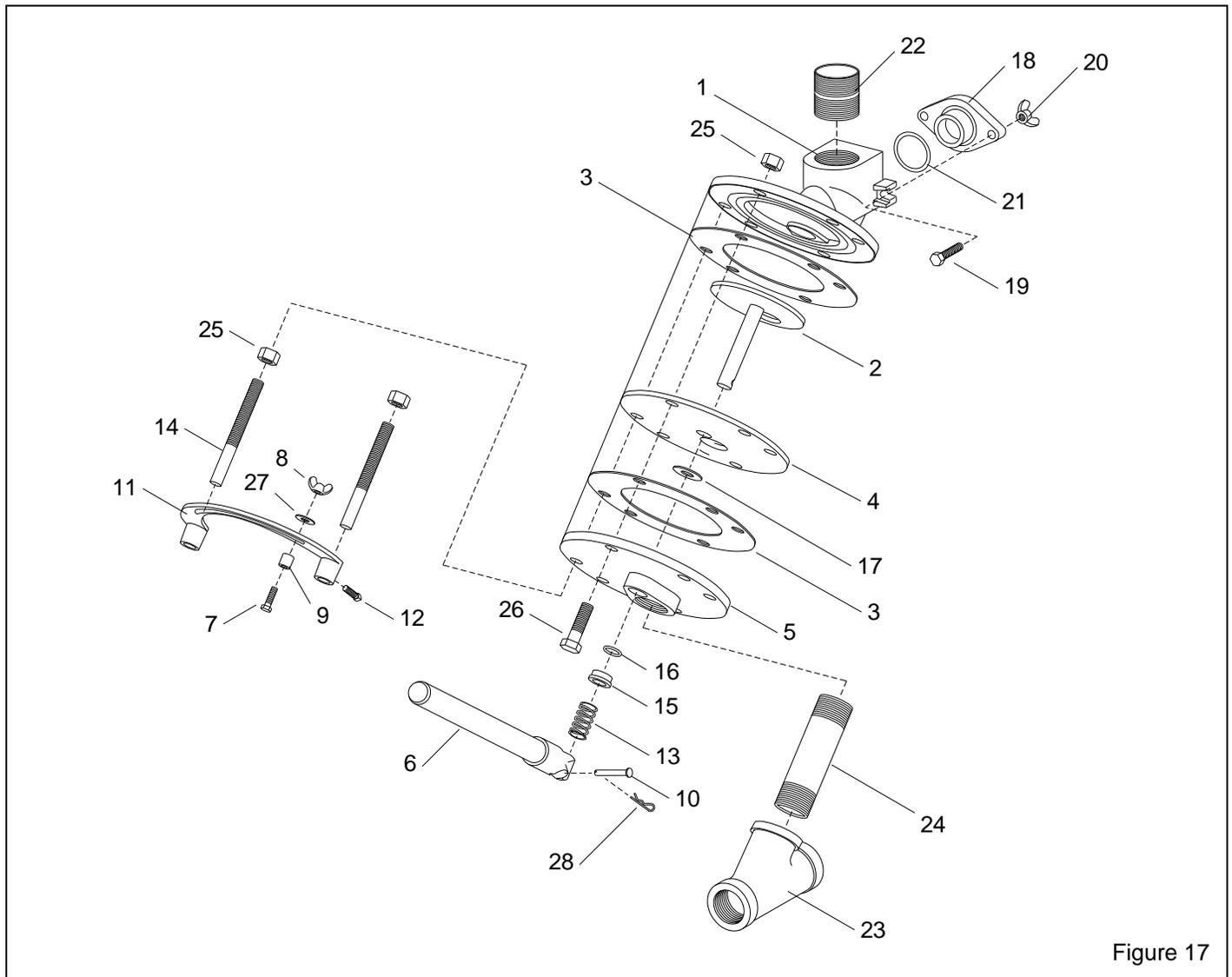


Figure 17

8.4 Exhaust Muffler, Figure 18

Item	Description	Stock No.
(-)	Muffler, complete .....	05068
1.	Screw, 8-32 x 4" .....	05061
2.	Cap, coated .....	05067
3.	Body, element .....	05065
4.	Screen .....	05060
5.	Guide w/ guide nut .....	22344
6.	O-ring, 1-1/4" ID .....	05069
7.	Seat .....	05062
8.	Lock-nut, 8-32 stainless steel .....	05815

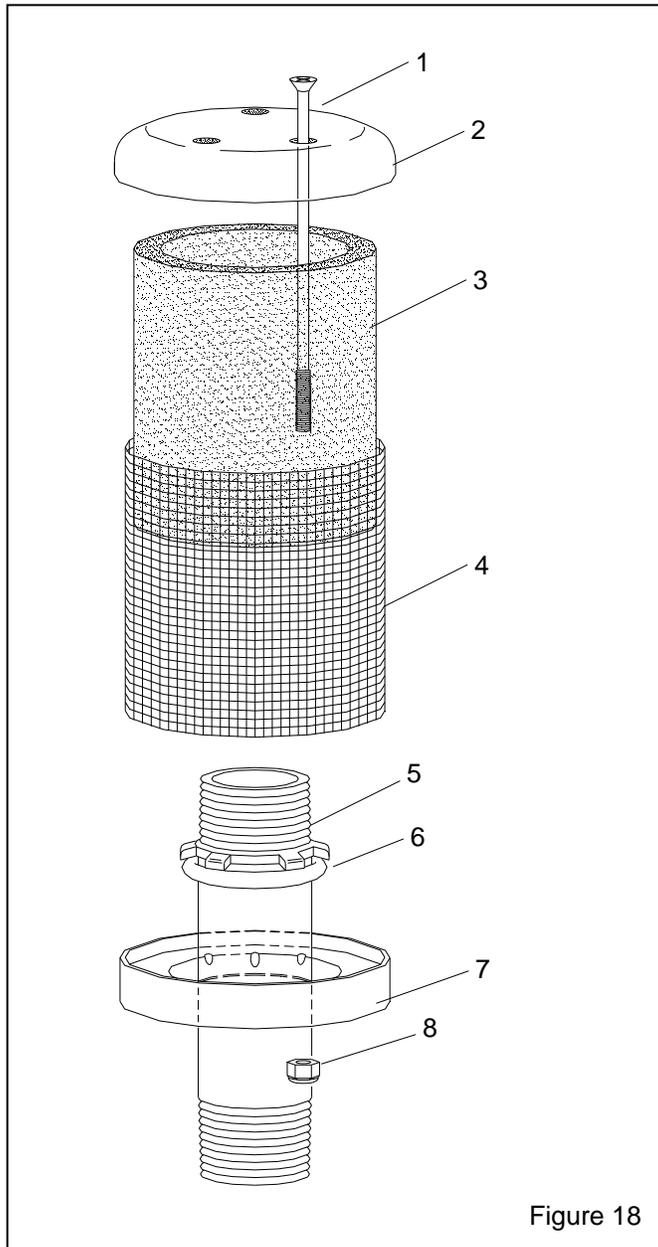


Figure 18