

**MATERIAL AND EQUIPMENT STANDARD**  
**FOR**  
**ABRASIVE AIR BLASTING MACHINE**

**CONTENTS :**

**PAGE No.**

1. SCOPE .....	2
2. REFERENCES .....	2
3. CONFLICTING REQUIREMENTS.....	2
4. UNITS .....	2
5. DESIGN AND CONSTRUCTION.....	3
5.1 Abrasive Vessel.....	3
5.2 Blasting Nozzles.....	3
5.3 Blast Hoses .....	5
6. REQUIREMENT OF AIR, POWER, AND ABRASIVE.....	6
7. MATERIALS .....	7
8. NAMEPLATES .....	7
9. ACCESSORIES.....	7
10. INSPECTION AND TESTING.....	8
11. PREPARATION FOR SHIPMENT.....	9
12. GUARANTEES AND WARRANTIES .....	9

**APPENDICES:**

APPENDIX A .....	10
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## 1. SCOPE

**1.1** This Standard specification contains the minimum requirements, for portable blast cleaning machines for the purpose of cleaning and finishing for use in Iranian Petroleum Industries. Compressed air shall be used for propelling loose abrasives against the work surface for the purpose of cleaning and finishing.

**1.2** Compliance by the blast machine Vendor with, provisions of this Standard specification does not relieve him of his responsibility of furnishing properly designed equipment, mechanically suited to meet operating conditions specified.

**1.3** The machine shall be the product of a manufacturer regularly engaged in manufacturing of abrasive blasting machines and shall have been in regular production by the manufacturer for at least three years.

**1.4** No exceptions or deviations from this Standard are permitted without prior written approval of the Company. The intended deviations or exceptions shall be listed separately along with the reasons thereof for purchaser's consideration.

## 2. REFERENCES

Throughout this Standard the following standards and codes are referred to. The editions of these Standards and Codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standards and codes that occur after the date of this Standard shall be mutually agreed upon by the Company and the Vendor.

### ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

"Boiler and Pressure Vessel Code, Section VIII Div. 1 'Pressure Vessels'"

### BSI (BRITISH STANDARD INSTITUTE)

BS 5173	"Method of Test for Hoses"
Part 1	"Measurement of Dimensions"
Part 2	"Hydraulic Pressure Test"
Part 4	"Electrical Tests"
BS 903	"Methods of Testing Vulcanized Rubber"
Part A2	"Determination of Tensile Stress-Strain Properties"
Part A12	"Determination of Adhesion Strength"
Part A19	"Heat Resistance and Accelerated Aging Tests"

## 3. CONFLICTING REQUIREMENTS

In case of conflict between documents relating to the enquiry or order, the following priority of documents (whichever more stringent realized by Company) shall apply:

- **First Priority** : Purchase order and variation thereto.
- **Second Priority** : Data sheets and/or drawings.
- **Third Priority** : This Standard specification.

All conflicting requirements shall be referred to the Purchaser in writing. The Purchaser will issue conforming documentation if needed for clarification.

## 4. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

## 5. DESIGN AND CONSTRUCTION

### 5.1 Abrasive Vessel

Portable blast machines vessel shall be designed for the maximum weight of abrasive 310 kg which the vessel (single - compartment) can accept.

The vessel shall be designed in accordance with Section VIII, Div. 1 of ASME Code. For the larger capacity models generally the double-compartment tank may be used.

### 5.2 Blasting Nozzles

**5.2.1** The nozzle, through which the abrasive blast is ejected shall have the following functions:

- 1) Controlling the shape of the abrasive stream and thereby the blasting pattern.
- 2) Serving as a means for directing the stream.
- 3) Regulating the velocity of the blast.

**5.2.2** Blasting nozzles with a straight orifice are considered general purpose equipment and normally may be made in different lengths. For specified length of the straight orifice nozzle it should be held at optimum distance of the nozzle from the work surface to produce a dispersed pattern.

**5.2.3** Blasting nozzles with orifices of the venturi design (Fig. 1) are preferred for high-production applications. The venturi shape orifice of the nozzle shall accelerate the air- abrasive stream in its extending section and assures a uniform distribution of the abrasives over the area of the blasting pattern.

**5.2.4** For the blast cleaning of the inside surfaces of pipes and cylinders, as well as of other internal areas, angled nozzles with 1, 2 or 3 orifices directed at a 45-degree angle from the axis are preferred.

**5.2.5** To withstand, at very slow wear rate, the substantial abrasive effect of the air-abrasive stream passing through its orifice, the blasting nozzle shall be manufactured from ceramic, cast iron, tungsten carbide and boron carbide, cast or sintered carbide with carefully lapped orifice surfaces. Purchaser shall specify the material in purchaser order.

To protect the nozzle from harmful mechanical effects and also for operating convenience, the carbide nozzle shall be inserted into a jacket made of material with cushioning properties, such as specially compounded epoxy or low-rebound zinc alloy.

Nozzles' fitting shall be flanged or threaded end type whichever specified by the Purchaser.

**5.2.6** Blasting nozzles may be manufactured with different inside orifice diameters, each required for operation with a specified pressure of compressed air. A typical series venturi type nozzles shall be made in different sizes with the orifice dimensions and air requirements; specified in paragraph 6.

**5.2.7** If specified, a lever-actuated control device may be mounted on or adjacent to the nozzle coupling. The lever of this control device shall be connected by a separate air line to the air inlet valve on the blasting tank. Remote controls shall be designed to operate by the "dead man" system, shutting off the air when released by the operator deliberately or unintentionally, such as in the case of accidentally dropping the blasting end of the hose.

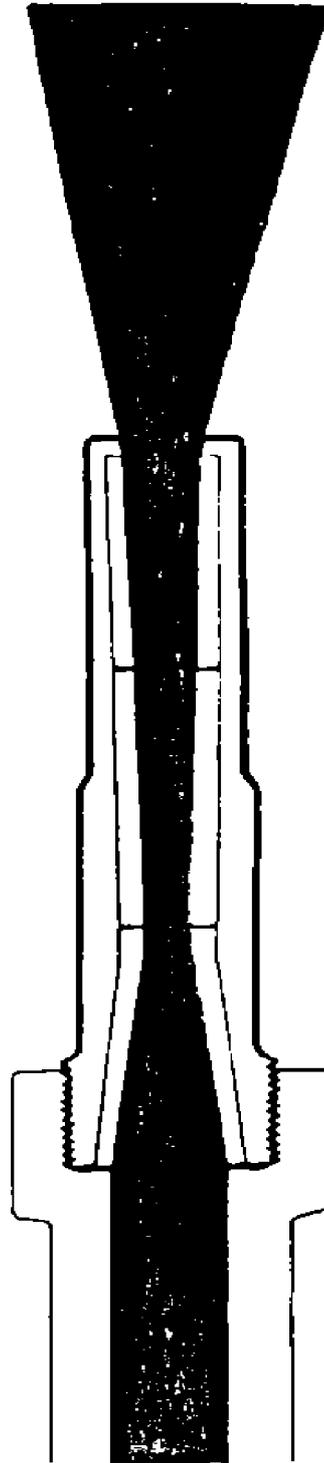
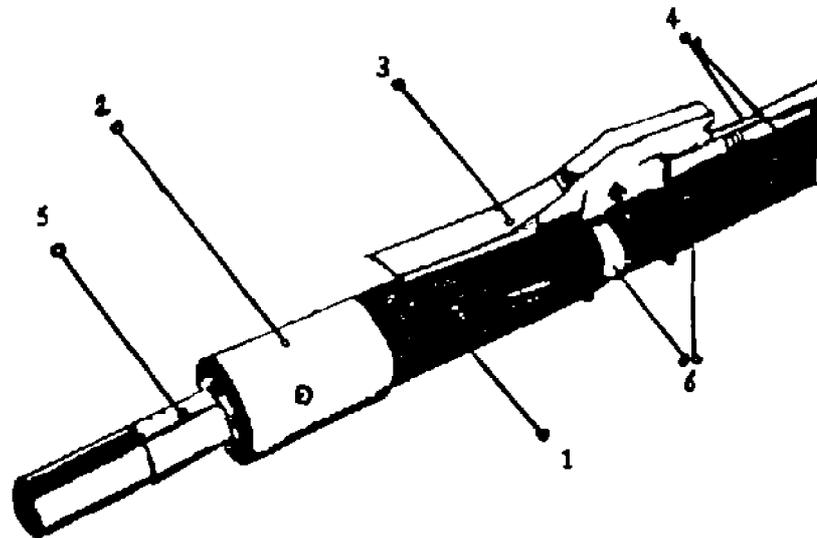


DIAGRAM SHOWING THE OPERATION OF A BLAST NOZZLE WITH VENTURI TYPE ORIFICE, THAT SUBSTANTIALLY INCREASES THE VELOCITY OF THE BLAST AND ASSURES UNIFORM ABRASIVE SPREAD WITHIN THE BLAST PATTERN.

Fig. 1



REMOTE-CONTROL ACTUATING-LEVER MOUNTED ON THE BLAST HOSE, ADJACENT TO THE NOZZLE HELD IN THE HAND OF THE OPERATOR. DETAILS OF THE COUPLING ATTACHED OVER THE HOSE, WITH THE INTERNAL THREAD MATING WITH THE THREADED END OF THE NOZZLE ARE ALSO VISIBLE.

Fig. 2

#### Detail Description:

- 1) Blast hose
- 2) Nozzle coupling
- 3) Actuating-lever
- 4) Control air lines
- 5) Nozzle assembly
- 6) Mounting straps

### 5.3 Blast Hoses

5.3.1 The hose shall be suitable for working pressures up to 8.6 bar.

5.3.2 The hose shall be antistatic and consist of:

- a) A rubber lining which is highly resistant to abrasion;
- b) a reinforcement applied by any suitable technique;
- c) an abrasion resistant outer rubber over.

The lining and cover shall be of uniform thickness, reasonably concentric, and free from air holes, porosity and other defects.

**5.3.3 Dimensions and tolerances**

**5.3.3.1** The bore of the hose shall be in accordance with the nominal dimensions and tolerances given in following table:

**HOSE NOMINAL BORES AND TOLERANCES**

NOMINAL BORE		TOLERANCE	
mm	in	mm	in
12.5	½	} ± 0.75 □	0.030
16	5/8		
19	¾		
25	1		
31.5	1¼		
38	1½		
45	1¾		
50	2		

**5.3.3.2** When measured in accordance with the method described in BS 5173: Part 1, the thickness of the lining and the cover shall not be less than the values given in following table:

**MINIMUM THICKNESS OF LINING AND COVER**

NOMINAL BORE	LINING	COVER
	mm	mm
Up to and including 19 mm	5.0	1.5
Above 19 mm	6.0	1.5

**5.3.3.3** The minimum length of hose shall not be less than 10 m. The tolerance on length shall be within ±1% of nominal length.

Hoses shall be supplied in lengths 10, 20, 30 and maximum 40 meters.

**6. REQUIREMENT OF AIR, POWER, AND ABRASIVE**

Unless otherwise specified, abrasive requirements of blast cleaning machines generally shall not be less than the values given in following table:

**AIR, POWER, AND ABRASIVE REQUIREMENTS OF BLAST CLEANING MACHINES**

NOZZLE ORIFICE, inch (INSIDE DIA./mm)	inch (mm)	1/8 (3.175)	3/16 (4.76)	1/4 (6.35)	5/16 (7.94)	3/8 (9.525)	7/16 (11.11)	1/2 (12.7)
Air requirement, 90 p/sq in. (6.33 kg/cm <sup>2</sup> )	cu ft/min. (m <sup>3</sup> min.)	18.5 (0.525)	41 (1.16)	74 (2.10)	126 (3.57)	173 (4.90)	240 (6.80)	309 (8.75)
Horsepower	hp	3.5	7.9	14.2	24.2	33.2	46.1	59.3
Sand usage per Hour, lbs (kg)	lbs (kg)	140 (63.5)	298 (135)	560 (254)	925 (420)	1315 (596)	1810 (821)	2320 (1052)

## **7. MATERIALS**

**7.1** Materials of construction shall be the manufacturer's standard for the specified operating conditions, except as required or prohibited by the purchase order or by this Standard.

**7.2** Materials shall be identified in the proposal with their applicable ASTM, AISI, ASME, or SAE numbers, including the material grade. When no such designation is available, the Vendor's material specification, giving physical properties, chemical composition, and test requirements, shall be included in the proposal.

**7.3** The Vendor shall specify ASTM optional tests and inspection procedures necessary to ensure that materials are satisfactory for the service. Such tests and inspections shall be listed in the proposal. The Purchaser should consider specifying additional tests and inspections.

**7.4** The Purchaser will specify the presence of any corrosive agents in the environment, including constitute that may cause stress corrosion cracking.

**7.5** The blast hose specification shall be in accordance with 5.3.

## **8. NAMEPLATES**

**8.1** A nameplate shall be securely attached at an easily accessible point on the equipment and on any other major piece of auxiliary equipment.

**8.2** The Purchaser's item number, the Vendor's name, the machine's serial number and the machine's size and type, as well as its minimum and maximum allowable design limits and rating data (including air requirement, sand usage, nozzle orifice inside diameter, etc.) shall appear on the machine's nameplate. The nameplate shall be made of 18cr-8Ni stainless steel or equivalent, securely fastened by pins of a similar material, and located for easy visibility.

## **9. ACCESSORIES**

**9.1** The following accessories shall be furnished for air-blasting machine:

- a)** inlet air hose,
- b)** moisture separation,
- c)** drain valve,
- d)** air pressure gage,
- e)** air inlet valve,
- f)** choke valve (anti-clog),
- g)** abrasive regulator,
- h)** tank quick snap coupling,
- i)** hose quick snap coupling,
- j)** abrasive tank sealing plunger,
- k)** exhaust valve,
- l)** exhaust silencer.

Typical cross-sectional diagram of a movable air-blasting machine is shown in Appendix A.

**9.2** Unless otherwise specified the blast cleaning machines shall be equipped with two wheels and a leg for third point support.

**10. INSPECTION AND TESTING**

**10.1 General**

**10.1.1** The Vendor shall provide the Purchaser with advance notification of certain shop inspections and testing as outlined in the Purchase Order or other agreement. The Purchaser’s representative shall have free entry, after prior notification by the Purchaser, to all Vendor and subvendor plants where work upon or testing of the equipment is in progress.

**10.1.2** It shall be the responsibility of the Vendor to notify subvendors of the Purchaser’s inspection requirements.

**10.2 Inspection**

**10.2.1** Vendor shall submit all inspection and test certificates to the Company.

**10.2.2** All painting of surfaces of pressure-containing parts shall be deferred until the specified inspection of that part is completed.

**10.3 Testing**

**10.3.1 General**

**10.3.1.1** The Vendor shall notify the Purchaser not less than 15 days prior to the date the equipment will be ready for testing.

**10.3.1.2** The Purchaser’s acceptance of shop test result shall not constitute a waiver of the Vendor’s obligation to provide equipment that meets all specified operating conditions.

**10.3.1.3** When specified, the Purchaser reserves the right to witness or observe the testing, dismantling, inspection, and reassembly of equipment.

**10.3.2 Pressure tests**

Pressure containing parts (including abrasive vessel, moisture separator, pipes) shall be tested hydrostatically at a minimum of 1½ times the maximum allowable working pressure but not less than 14 barg.

**10.3.3 Blasting hose test**

**10.3.3.1** Tensile strength and elongation test shall be carried out in accordance with method described in BS 903: Part A2 using dumb-bell test pieces of Type 1 dimensions. The test shall be carried out on test sheets of the appropriate rubber compound vulcanized under the same conditions as the hose.

The rubber used for the lining and the cover shall have a tensile strength and elongation at break not less than values given in following table:

**TENSILE STRENGTH AND ELONGATION AT BREAK**

	<b>TENSILE STRENGTH, min.</b>	<b>ELONGATION AT BREAK, min.</b>
Lining	MPa 12	% 400
Cover	10	350

Adhesion shall be determined by the method described in BS 903: Part A12. The adhesion between lining and reinforcement, between layers of reinforcement and between cover and reinforcement shall be not less than 2.0 KN/m.

**10.3.3.2** When carried out hydraulic pressure test in accordance with the method described in BS 5173: Part 2, the hose shall comply with the requirements of the following table and shall show no cracks or leaks at proof pressure.

**HOSE HYDROSTATIC PRESSURE REQUIREMENT**

PROPERTY	REQUIREMENT
Design working pressure	8.6 bar
Proof pressure	17.7 bar
Change in diameter at proof pressure	+ 15%, - 5%
Change in length at proof pressure	± 12%
Minimum burst pressure	25 bar

**10.3.3.3** When tested in accordance with the method described in BS 5173: Part 4, the electrical resistance shall not exceed  $2 \times 10^6$  ohm/m.

**10.3.3.4** The hose shall be age tested in accordance with the Method A and B of BS 903: Part A19 for 96 h at  $70 \pm 1^\circ\text{C}$ . Test pieces shall be prepared for determination of tensile strength and elongation at break as described in 2.5.4 of BS 903: Part A19.

**11. PREPARATION FOR SHIPMENT**

**11.1** The Vendor shall provide the Purchaser with the necessary instructions to preserve the integrity of the storage preparation after the equipment arrives at the job site.

**11.2** Preparation for shipment shall be made after all testing and inspection of the equipment has been accomplished and the equipment has been approved by the Purchaser. The preparation shall include at least that specified in 11.2.1 through 11.2.8.

**11.2.1** All exterior surfaces except machined surfaces shall be given a coat of the manufacturer’s standard paint.

**11.2.2** All exterior machined surfaces shall be coated with a suitable rust preventive.

**11.2.3** The interior of the equipment shall be clean and free of scale, welding spatter, and foreign objects.

**11.2.4** All flanged openings shall be provided with metal closures at least 4.8 millimeters thick, with rubber gaskets and at least four full-diameter bolts.

**11.2.5** All threaded openings shall be provided with steel caps or solid-shank steel plugs.

**11.2.6** Lifting points and lifting lugs shall be clearly identified.

**11.2.7** The equipment shall be identified with serial number. Separate shipment of materials is not allowed.

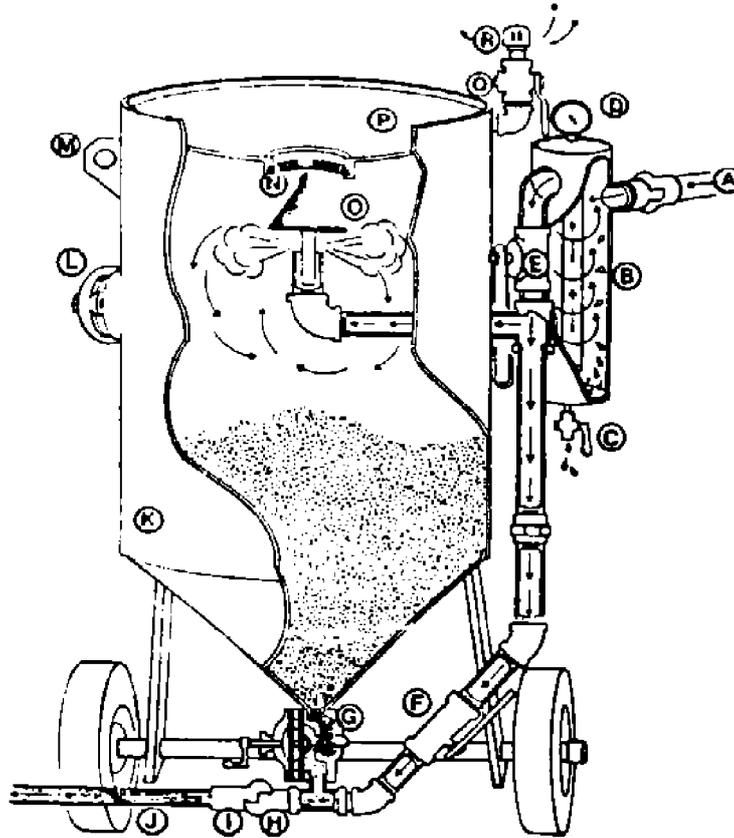
**11.2.8** One copy of the manufacturer’s standard instruction shall be packed and shipped with the equipment.

**12. GUARANTEES AND WARRANTIES**

All equipment and component parts shall be guaranteed by the Vendor against faulty design, defective or improper materials, poor workmanship, and failure due to normal usage for one year after being placed in the specified service, but not exceeding 18 months after the date of shipment. If any defects or malfunctions occur during the warranty period, the Vendor shall make all necessary or desirable alterations, repairs, and replacements free of charge.

**APPENDICES**

**APPENDIX A**



**TYPICAL CROSS-SECTIONAL DIAGRAM OF A MOVABLE AIR-BLASTING MACHINE WITH OPEN-JET OPERATION SHOWING THE PRINCIPAL ELEMENTS**

**Fig. 1**

- A. Air Hose**
- B. Moisture Separator**
- C. Drain Cock**
- D. Air Pressure Gage**
- E. Main Air Inlet Valve**
- F. Anti-Clog Choke Valve**
- G. Abrasive Regulator**
- H. Tank Quick Snap Coupling**
- I. Hose Quick Snap Coupling**
- J. Blasting Hose**
- K. Single Compartment Tank**
- L. Inspection Door;**
- M. Lifting Eyes**
- N. Sealing "O" Ring**
- O. Sealing Plunger**
- P. Abrasive Filling Head**
- Q. Exhaust Valve**
- R. Exhaust Silencer**