

<b>SAUDI ARABIAN OIL COMPANY (Saudi Aramco)</b> <b>GENERAL INSTRUCTION MANUAL</b>		<b>G. I. NUMBER</b>	
		6.021	
		<b>ISSUE DATE</b>	<b>REPLACES</b>
<b>ISSUING ORG.</b>	LOSS PREVENTION DEPARTMENT	4/25/2007	10/16/2001
<b>SUBJECT</b>	SAFETY REQUIREMENTS FOR ABRASIVE BLAST CLEANING	<b>APPROVAL</b>	<b>PAGE NO.</b>
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## REFERENCES

- (1) U.S. Code of Federal Regulations Title 29, Occupational Safety and Health Administration, Labor, Part 1910, Section 1000, Air Contaminants (29 CFR 1910.1000)
- (2) Saudi Aramco Construction Safety Manual
- (3) ANSI/ASC Z9.4 - 1985, Abrasive Blasting Operations - Ventilation and Safe Practices
- (4) GI 1780.001 - Atmosphere-Supplying Respirators
- (5) SAES-H-102 - Safety Requirements for Coating Applications
- (6) GI 2.100 - Work Permit System
- (7) SAES-A-105 - Noise Control
- (8) NFPA 77, 2007 edition, Recommended Practice on Static Electricity
- (9) API RP 2003, 6th edition, 1998, Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents
- (10) ANSI/API Publication 2015, 6th edition, 2001, Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks
- (11) API Publication 2026, 2nd edition, 1998, Safe Access/Egress Involving Floating Roofs of Storage Tanks in Petroleum Service
- (12) API Publication 2217A, 3rd edition, 2005, Guidelines for Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries
- \*\*(13) GI 150.001 - Asbestos Hazard Management

## 1. INTRODUCTION

This General Instruction outlines Saudi Aramco safety requirements for abrasive blast cleaning. It includes requirements for operators, assistants, and other people in the area. Mandatory safety requirements for surface preparation and paint application shall be per section II.11 of the Saudi Aramco Construction Safety Manual and SAES-H-102, Safety Requirements for Coating Applications. Basic safety requirements for abrasive blast cleaning are given below.

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## 2. GENERAL SAFETY REQUIREMENTS

- 2.1 In restricted areas, blast cleaning shall be conducted in accordance with GI 2.100, Work Permit System. Abrasive blast cleaning is considered HOT WORK and accordingly where flammables could be present, gas tests shall be carried out prior to commencing abrasive blast cleaning operations. Other hot work requirements shall be adhered to as stipulated in GI 2.100 and form SA-924-2, Hot Work Permit.
- 2.2 Where abrasive blast cleaning is to be carried out in a confined space, confined space entry procedures must be followed (see GI 2.100, Work Permit System, and form SA-924-4, Confined Space Entry).
- 2.3 SAES-A-105, Noise Control, shall be referred to for details about allowable noise levels and exposure durations for workers. When noise levels exceed 85 dBA, hearing protection shall be provided to all workers in the affected area.
- 2.4 All operators of abrasive blast cleaners shall be instructed and trained in the correct use and hazards associated with abrasive blast cleaning equipment and abrasive materials.
- 2.5 Surfaces other than those receiving preparation should be protected from damage due to abrasive blast cleaning operations.
- 2.6 An abrasive blast cleaning gun must never be pointed at any person or part of the body; such action can result in serious injury.
- 2.7 Abrasive blast cleaning equipment may only be operated with all protective guards and controls in place and working properly, and in accordance with manufacturer's recommendations.
- 2.8 Areas where abrasive blast cleaning is in progress shall be suitably barricaded to keep unauthorized personnel out of the hazardous area, or otherwise protected. Warning signs shall be posted in hazardous areas with suitable warnings of the potential dangers (e.g., "No Entry-Abrasive Blast Cleaning in Progress").
- 2.9 Combustible abrasives (nut shells, etc.) capable of forming explosive mixtures with air shall not be used.
- 2.10 Before abrasive blast cleaning any in-service pressure containing equipment (piping, tanks, vessels, etc.), ensure that non-destructive testing has been carried out or other methods used to determine that the wall thickness is adequate for abrasive blast cleaning.
- 2.11 Utilize approved safety harness and fall protection as required.

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### 3. MEDICAL EXAMINATIONS

Saudi Aramco employees who carry out abrasive blast cleaning shall contact the Occupational Medicine Section, Preventive Medicine Services Division to arrange for a pre-placement professional medical examination including a chest X-ray and a pulmonary function study. These examinations shall be repeated at least every two years. Contractors shall establish equivalent bio-monitoring programs (using non-Saudi Aramco medical facilities) for their employees who conduct abrasive blast cleaning for Saudi Aramco. The results of the medical examinations shall be available, if requested by the Saudi Aramco Medical Services Organization.

### 4. BREATHING AIR SUPPLY

Breathing air shall meet the requirements and be tested in accordance with GI 1780.001, Atmosphere-Supplying Respirators.

### 5. PERSONAL PROTECTIVE EQUIPMENT

5.1 Abrasive blast cleaners shall wear an air supplied hood, type "CE" supplied-air respirator, approved for abrasive blast cleaning by the National Institute for Occupational Safety and Health (NIOSH) of the United States Department of Health and Human Services, and the Mine Safety and Health Administration (MSHA) of the U.S. Department of Labor, or an equivalent organization as determined by the Loss Prevention Department. Other workers in or around the work area must wear a high efficiency dust-filter respirator approved by NIOSH/MSHA or an equivalent organization for the airborne contaminants likely to occur from abrasive blast cleaning.

5.2 Abrasive blast cleaners shall also wear personal protective equipment that includes safety goggles, leather or neoprene gloves, leather or neoprene apron, hearing protection, safety shoes and coveralls. Abrasive blast cleaning assistants may require all of the above personal protective equipment, dependent on their proximity to the abrasive blast cleaning operator. Other personal protective equipment may be required depending on the work being carried out and the location—refer to the Construction Safety Manual, Area Loss Prevention Division or, if necessary, the Environmental Compliance Division, Environmental Protection Department.

### 6. ABRASIVE BLAST CLEANING EQUIPMENT

6.1 An electrical bonding system that bonds nozzle, hose, blasting equipment and the material being cleaned shall be provided, and this bonding system shall be grounded to prevent a build up of static charges. Ground continuity tests shall be conducted by an electrician to ensure proper grounding (resistance one megohm or less). Bonding and grounding connections shall be inspected before each job is started and whenever equipment is repositioned at a job site.

6.2 Hoses and nozzle fittings shall be securely fixed to prevent unplanned disengagement during abrasive blast cleaning operations.

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6.3 Abrasive blast cleaning equipment shall be designed to automatically shut off the flow of abrasive and propellant, if for any reason the operator releases the control switch.

## 7. ABRASIVE BLAST CLEANING THE EXTERIOR OF ATMOSPHERIC STORAGE TANKS IN HYDROCARBON SERVICE

7.1 Abrasive blast cleaning the exterior of in-service floating roof tanks shall not be allowed above the wind girder. No abrasive blast cleaning shall take place on the roof or interior tank wall of an in-service floating roof tank.

7.2 Cone roof atmospheric storage tanks can be externally abrasive blast cleaned while in service provided that the roof is structurally safe for personnel movement, periodic gas test results show that there are no flammables present, connections are protected against damage, and all general safety requirements have been met.

7.3 Given below are precautions to minimize ignition hazards when abrasive blast cleaning the exterior of atmospheric storage tanks while in hydrocarbon service. Tanks shall be considered in-service as long as they contain hydrocarbons or other flammable or combustible products, or if any product inlet or outlet pipelines on the tank are not blinded.

7.3.1 The Work Permit System shall be used and gas tests shall be carried out in the area to be abrasive blast cleaned, in addition to areas where abrasive blast cleaning hoses, equipment and compressors are located.

7.3.2 Minimize the amount of abrasive blast cleaning equipment in dikes. The abrasive blasting machine shall be located at grade level and upwind from the tank.

7.3.3 The abrasive blasting machine and hose couplings shall be grounded at grade level or bonded to the storage tank. The abrasive blasting nozzle shall be bonded to the work surface or both the nozzle and the work surface shall be effectively grounded.

7.3.4 If scaffolding is used the metal parts shall be electrically bonded to the tank.

7.3.5 To prevent overloading, the abrasive material shall not be allowed to accumulate on items that could be damaged, such as the roof or scaffolding.

7.3.6 During abrasive blast cleaning operations, tanks must not be receiving or discharging products. Exceptions include floating roof tanks that are only abrasive blast cleaned externally below the wind girder.

7.4 In addition to the precautions given in section 7.3, the following precautions shall be taken when abrasive blast cleaning cone-roof tanks.

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7.4.1 Each vent in the immediate area of abrasive blast cleaning shall be sealed or fitted with a vertical stack 2.5 m high (approximately 8 ft). If vents are sealed, at least one vent of proper size, depending on tank capacity and product handled, shall be left open and fitted with a 2.5 meter (8 ft) stack. NOTE: Ensure that the seals on vents are removed before the tank is pumped out or receives product.

7.4.2 Where possible work should be carried out upwind of the tank vent so that vapors are carried away from the work area.

7.5 The abrasive blast cleaning of refrigerated LPG dome roof atmospheric storage tanks shall be treated on a case-by-case basis, and the abrasive blast cleaning procedure shall be reviewed by the Chief Fire Prevention Engineer, Loss Prevention Department.

## 8. HEALTH HAZARDS ASSOCIATED WITH ABRASIVE BLAST CLEANING

8.1 Silica sand is an extremely hazardous abrasive material. The use of silica sand for abrasive blasting operations is prohibited at all Saudi Aramco facilities and on all Saudi Aramco projects and construction sites. Safer alternative blasting agents are available.

8.2 The type of coating to be removed by abrasive blast cleaning shall be known in order to make a proper evaluation of the hazard from blast residue. Where uncertainty exists, tests shall be carried out to determine the potential health and environmental hazards as well as required protective measures.

8.3 The concentration of air contaminants being inhaled by operators or other personnel within the area shall not exceed Permissible Exposure Limits (PELs) specified in 29 CFR 1910.1000. Since PELs are normally exceeded for ambient air in and around blast cleaning operations, the personal protective equipment for breathing described in Section 5 (Personal Protective Equipment) shall be worn.

8.4 Abrasive blast cleaning residue shall be cleaned up regularly and disposed of in accordance with the recommendations of the Environmental Protection Department.

\*\* 8.5 If the work entails removal or disturbance of asbestos containing materials, all requirements in GI 150.001, Asbestos Hazard Management, shall be complied with.

APPROVED: \_\_\_\_\_  
MANAGER,  
Loss Prevention Department

DATE: \_\_\_\_\_