Brunel Energy, Inc.

Abrasive Blasting

Contents

1. Purpose

1.1. Brunel Energy, Inc., herein, "the Company," has established an Abrasive Blasting Program compliant with OSHA's requirements for safely performing blasting operations.

1.2. The Company will limit exposure to less than the threshold limit value (TLV).

2. Applicability

2.1. This policy applies to employees, subcontractors and/or visitor(s) of the Company. For the purposes of this policy, an employee shall be considered on the job whenever he/she is:

2.1.1. On or in, any company or client property, including parking areas; or

2.1.2. On company time even if off company premises (including paid lunch, rest periods and periods of being on call).

2.2. As a condition of employment, Company employees are required to abide by additional governmental or customer policies and requirements that may be imposed at a worksite in addition to the requirements of these policies and procedures. Nothing set forth in this policy constitutes, construes, or interprets in any way as a contract of employment.

3. Definitions

3.1. ***Abrasive blasting*** is the most common surface preparation technique used to remove old paint and other surface materials such as rust, mill scale, dirt, and salts. In abrasive blasting, compressed air is used to propel abrasive material from a blast pot, through a blasting hose to a nozzle, where it is directed to the work area at high velocity by the operator.

3.2. ***Base materials*** are the materials used, i.e., iron, and non-iron- containing metals.

3.3. ***Media*** is the blasting abrasives used for paint removal and surface preparation in fabrication shops and bridges include coal slag, copper slag, and other metallic grit and shot.

3.4. ***Surface Coatings*** are any paints or primers used to protect base materials from corrosion.

4. Responsibilities

4.1. Manager(s):

4.1.1. Are responsible for the implementation of this policy on the project.

4.2. HSE Supervisor(s):

4.2.1. Are responsible for providing approval for the use of media blasting materials under this policy and will maintain this document.

4.3. Employee(s):

4.3.1. Must follow the safety and health guidelines in this policy, wear or use required protective equipment while working, and report all hazardous conditions to his or her supervisor.

4.4. Subcontractor(s):

4.4.1. Must follow the safety and health guidelines in this policy, wear or use required protective equipment while working, and report all hazardous conditions to his or her company contact.

5. Procedure

5.1. Precautions

5.1.1. Abrasives and the surface coatings on the materials blasted are shattered and pulverized during blasting operations and the dust formed will contain particles of respirable size. Employees who are engaged in abrasive blasting are at an increased risk of exposure to toxic dusts, high noise levels, and a range of other safety and health hazards. Helpers (e.g., the "pot tender" and cleanup personnel) and others may also be at risk if they work in the vicinity of areas where abrasive blasting is conducted.

5.1.2. The composition and toxicity of the dust from blasting operations shall be considered in making an evaluation of the potential hazards.

5.1.3. The following requirements must be in effect prior to conducting any blasting of unknown materials, including coatings to reduce the employee’s exposures via inhalation, ingestion, skin absorption, or any contact with any substance or material at a level concentration above those recommended by (ACGIH):

5.1.3.1. Obtain positive documentation on materials/ingredients or remove sample(s) and conduct lab analysis of materials. This shall be done before materials are shipped to a jobsite, or before any on-site blasting is initiated.

5.1.3.2. Identification should be coordinated with the client.

5.1.3.3. The composition and toxicity of the dust created during blasting operations shall be considered in making an evaluation of the potential health hazards.

5.1.3.4. Where there is potential for flammable or explosive dust mixtures, the blast nozzle shall be bonded and grounded to prevent the buildup of static charges.

5.1.3.5. Organic abrasives shall be used only in automatic systems.

5.1.3.6. Identify contractually, before shipment, who is responsible for waste to be generated and plan accordingly for disposal.

5.1.3.7. Review blasting methods and materials then select the proper respiratory protection for the anticipated hazard(s).

5.1.3.8. Use a National Institute for Occupational Safety and Health (NIOSH) approved type C or CE supplied air respirator for abrasive blasting. Follow the Company’s respiratory protection

5.1.3.9. Grit materials to be used shall be identified and the appropriate SDS of the grit reviewed. Elements in the SDS shall be included in the activity plan and reviewed with all involved team members.

5.1.4. Dust shall not be permitted to accumulate on the floor or on ledges outside of an abrasive blasting enclosure. Dust spills shall be cleaned up promptly. Aisles and walkways shall be kept clear of steel shot or similar abrasives which may create a slipping hazard.

5.2. Safe Work Practices

5.2.1. Employees operating abrasive blasting equipment must be trained in the safe operations of that equipment in accordance with the manufacture's user instructions.

5.2.2. Training should include equipment inspection and procedures to follow if equipment is not functioning properly.

5.2.3. Designated blasting areas must be established based on the size of the project and composition of the materials being used and removed.

5.2.4. Designated areas may also include areas downwind of the blasting operations.

5.2.5. Access to designated areas should be limited to workers involved in the abrasive blasting operation.

5.2.6. Shielding may be required for coatings containing lead or asbestos. Unless documented, all materials must be tested to determine their composition before blasting.

5.2.7. Work areas preparation includes but is not limited to:

5.2.7.1. Marking the area with warning signs,

5.2.7.2. Covering sewer drains and air intakes,

5.2.7.3. Protecting instrumentation.

5.2.7.4. Appropriate work permits in accordance with safe work procedures must be completed.

5.3. Equipment Handling

5.3.1. To prevent back strains and crushing injuries the following guidelines shall be used when moving blasting equipment:

5.3.1.1. Utilize a forklift, crane, or other type of lifting device for transporting a blast machine.

5.3.1.2. Always use a lifting device when the machine contains abrasive.

5.3.1.3. Never manually move a blast machine where abrasive has been spilled on hard surfaces or on a wet or slippery surface.

5.3.1.4. Never attempt to manually move a blast machine containing abrasive.

5.3.1.5. Always disconnect hoses from machines to avoid interference during moving.

5.4. Air Compressors

5.4.1. Air compressors must be in a well-ventilated area and placed up wind from the blasting operation and out of the range of dust and flying abrasives. The area must be able to contain large volumes of clean, toxicant-free air.

5.4.2. Air compressors create high pressure, precautions must be taken to prevent the release of the compressors generated pressure.

5.4.3. Air for abrasive blasting respirators must be free of harmful quantities of dust, mists, or noxious gases and must be inspected daily, prior to use and comply with CFR 1910.134(I) (Respiratory Protection).

5.4.4. The pressure setting on a compressor shall never be adjusted above the blast equipment maximum working pressure rating. The maximum working pressure rating is indicated on the manufacturer's metal identification plate.

5.5. Blast Pot

5.5.1. Blast pots and/or compressors must be positioned on level ground in-between the compressor and the surface to be blasted, to allow visual contact between the pot tender and operator.

5.5.2. All couplings and pipefittings on the blast pot, compressor and hoses must be airtight.

5.5.3. Blast pots must be inspected daily prior to use.

5.6. Hoses and Connectors

5.6.1. Couplings must have safety wires in place and be secure as required by federal safety regulations. The operator shall be responsible for ensuring that each coupling has safety wires in place.

5.6.2. Whip checks must be installed at bull hose connections.

5.6.3. Operator should hold onto the blast hose until the air pressure from the nozzle drops off to zero.

5.6.4. Do not use hoses with soft spots.

5.6.5. Never use tape to repair a blown-out hose.

5.6.6. Immediately replace a hose if a blowout or leak occurs.

5.6.7. Hose ends must meet coupling gaskets to prevent leaks and to maintain static electricity conductivity.

5.7. Nozzles and Remote Controls

5.7.1. Blast nozzles shall be bonded and grounded to prevent the buildup of static charges. Where flammable or explosive dust mixtures may be present, the abrasive blasting enclosure, the ducts, and the dust collector shall be constructed with loose panels or explosion venting areas, located on sides away from any occupied area, to provide pressure relief in case of explosion following the principles set forth in the National Fire Protection Association Explosion Venting Guide. NFPA 68-1954.

5.7.2. Organic abrasives which are combustible shall be used only in automatic systems.

5.7.3. Blast cleaning nozzles shall be equipped with an operating valve which must be held open manually or have a “deadman valve”. A support shall be provided on which the nozzle may be mounted when it is not in use.

5.7.4. All blast machines must be equipped with remote control systems to start and stop the blasting process.

5.7.5. An air actuated remote-control lever or choke electric remote-control switch shall never be tapped, strapped, or tied down.

5.7.6. If a delay in reaction time occurs, check for dust and dirt build-up around pivot pins before resuming blasting. The tension on the lever springs should be tested and replaced immediately if they do not respond rapidly.

5.7.7. Substituting component pieces with other manufacturer’s parts is not allowed.

5.7.8. Blast nozzles shall be inspected for wear and cracks on the inner liner. When a nozzle orifice is worn 1/16” larger than its original size, it should be replaced.

5.7.9. Nozzles and nozzle holders should be inspected for deterioration of thread form. Threads on nozzles and their companion holders must not be cross-threaded, worn, or distorted.

5.7.10. Hoses that are being tied and lifted to blasting operations being conducted above grade, i.e., scaffolds, shall be depressurized to prevent accidental start-up.

5.8. Operator Signals

5.8.1. When performing blasting operations and sound and vision is limited the Company’s hand and sound signals will be used. The signals may encompass visual hand movements, flashing light, pulls on a rope or sounds made by banging a hammer or using a horn or electric buzzer.

5.8.2. Every operator must become familiar with the signals to be used on the jobsite.

5.9. Environmental Controls

5.9.1. Organic abrasives which are combustible shall be used only in automatic systems. Where flammable or explosive dust mixtures may be present, the construction of the equipment, including the exhaust system and all electrical wiring, shall conform to the requirements of American National Standard Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1-1961 (NFPA 911961), and Subpart S of 1926.57 (Ventilation).

5.9.2. The work area must be inspected for exterior electrical power lines that may endanger operators.

5.9.3. Operators should use care to avoid directly blasting power lines and insulators.

5.9.4. Do not blast in atmospheres that contain flammable fumes.

5.9.5. Take precautions at the work site to eliminate hazardous surface obstacles that may cause tripping hazards or interfere with worker mobility.

5.9.6. Blast-cleaning enclosures shall be exhaust ventilated in such a way that a continuous inward flow of air will be maintained at all openings in the enclosure during the blasting operation.

5.9.7. Hoses must be checked during freezing temperatures to ensure there is no ice prior to pressurizing the hoses.

5.9.8. Operators should be provided with adequate drinking water during hot temperatures.

5.10. Health Hazards

5.10.1. The composition and the toxicity of dust formed from materials shattered and pulverized during the blasting operation shall be considered in making an evaluation of the potential health hazards.

5.10.2. Abrasive blasting operations can create high levels of dust and noise. Abrasive material and the surface being blasted may contain toxic materials (e.g., lead paint, silica) that are hazardous to workers.

5.10.3. Silica sand (crystalline) can cause silicosis, lung cancer, and breathing problems in exposed workers.

5.10.4. Coal slag and garnet sand may cause lung damage similar to silica sand (based on preliminary animal testing).

5.10.5. Copper slag, nickel slag, and glass (crushed or beads) also have the potential to cause lung damage.

5.10.6. Steel grit and shot have less potential to cause lung damage.

5.10.7. Slags can contain trace amounts of toxic metals such as arsenic, beryllium, and cadmium.

5.10.8. After dust inhalation, the hazard next in order of severity in abrasive blasting is that of hearing damage.

5.10.9. Other hazards associated with abrasive blasting are the mechanical hazards of media ricochet and the ever-present dangers of one blaster inadvertently shooting another or of a jammed open hose. All of these problems shall be considered when evaluating protective clothing requirements.

5.11. How to Protect Workers from Exposure to Abrasive Blasting Materials

5.11.1. Each abrasive blasting operation is unique, involving different surfaces, coatings, blast material, and working conditions. Before beginning work, employers should identify the hazards and assign a knowledgeable person trained to recognize hazards and with the authority to quickly take corrective action to eliminate them.

5.11.2. Use engineering and administrative controls, personal protective equipment (PPE), including respiratory protection, and training to protect workers involved in abrasive blasting activities.

5.11.3. Engineering controls, such as substitution, isolation, containment, and ventilation are the primary means of preventing or reducing exposures to airborne hazards during abrasive blasting operations.

5.11.4. Administrative controls, including the use of good work and personal hygiene practices, can also reduce exposure. When engineering and administrative controls cannot keep exposures to hazardous materials below OSHA permissible exposure limits, respiratory protection must be used.

5.12. Exposure Controls

5.12.1. Substitution

5.12.1.1. Management ensures that employers evaluate the available blasting agents and select the safest blasting agent that is appropriate for the work being performed.

5.12.1.2. Use a less toxic abrasive blasting material.

5.12.1.3. Use abrasives that can be delivered with water (slurry) to reduce dust.

5.12.2. Isolation and Containment

5.12.2.1. Ensure abrasive blasting operations be isolated to minimize exposure to employees and prevent exposure to others in the work area and the environment.

5.12.2.2. Use barriers and curtain walls to isolate the blasting operation from other workers.

5.12.2.3. Use blast rooms or blast cabinets for smaller operations.

5.12.2.4. Use restricted areas for non-enclosed blasting operations.

5.12.2.5. When open air blasting must be conducted, exclusion zones can be used to protect employees and others in the vicinity from exposure to elevated levels of hazardous air contaminants. Exclusion zones can also be used in conjunction with blasting rooms and temporary enclosures. The extent of the zone should be based on the risk to all unprotected people and the weather conditions at the time of the blasting. Exclusion zones should be posted with appropriate warning signs and restricted to those employees wearing respiratory protection.

5.12.2.6. Keep coworkers away from the blaster.

5.12.3. Ventilation

5.12.3.1. All blast-cleaning enclosures must be adequately ventilated. Abrasive blasting rooms, portable blast-cleaning equipment, and temporary containment structures must have sufficient exhaust ventilation to: (1) prevent a buildup of dust-laden air and reduce the concentrations of hazardous air contaminants; (2) increase operator visibility; and (3) prevent any leakage of dust to the outside. Exhaust ventilation systems must be constructed, installed, inspected, and maintained according to the OSHA Ventilation standard for abrasive blasting. (29 CFR 1910.94(a))

5.12.3.2. The exhaust air from blast-cleaning equipment must be discharged to the outside through an appropriate dust collector to protect the workplace, the environment, and the surrounding community from hazardous air contaminants. The dust collector should be set up so that the accumulated dust can be emptied and removed without contaminating work areas.

5.12.3.3. Adequate ventilation is also necessary to maintain visibility so that the operator can safely and efficiently perform his task.

5.12.3.4. Use exhaust ventilation systems in containment structures to capture dust. The construction, installation, inspection, and maintenance of exhaust systems shall conform to the principles and requirements set forth in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960, and ANSI Z33.1-1961

5.12.4. Permissible Exposure Limits – PEL

5.12.4.1. Exposure of employees to inhalation, ingestion, skin absorption, or contact with any material or substance at a concentration above those specified in the Threshold Limit Values of Airborne Contaminants for 1970 - American Conference of Governmental Industrial Hygienists, will be avoided.

5.12.4.2. The concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator or any other worker shall be kept below the levels specified in 1910.1000.

5.12.4.3. The blast nozzle will be bonded and grounded to prevent the buildup of static charges. Where flammable or explosive dust mixtures may be present, the abrasive blasting enclosure, the ducts, and the dust collector will be constructed with loose panels or explosion venting areas, located on sides away from any occupied area, to provide for pressure relief in case of explosion, following the principles set forth in the National Fire Protection Association Explosion Venting Guide.

5.12.5. Administrative Controls

5.12.5.1. Perform routine cleanup using wet methods or HEPA filtered vacuuming to minimize the accumulation of toxic dusts.

5.12.5.2. Compressed air will not be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.

5.12.5.3. Air for abrasive-blasting respirators must be free of harmful quantities of dusts, mists, or noxious gases and meet the requirements for supplied air quality.

5.12.5.4. Clean and decontaminate tarps and other equipment on the worksite.

5.12.5.5. Schedule blasting when the least number of workers are at the site.

5.12.5.6. Avoid blasting in windy conditions to prevent the spread of any hazardous materials. Personal Hygiene Practices

5.12.5.7. Prohibit eating, drinking, or using tobacco products in blasting areas.

5.12.5.8. Provide wash stations so workers can wash their hands and face routinely and before eating, drinking, or smoking.

5.12.5.9. Vacuum or remove contaminated work clothes before eating, drinking, or smoking.

5.12.5.10. Provide accommodations for end-of-shift showers and change areas with separate storage facilities for street clothes, protective clothing, and equipment.

5.12.5.11. Keep contaminated clothing and equipment out of the clean change area.

5.12.6. Personal Protective Equipment

5.12.6.1. The company is required to perform a hazard assessment of the worksite to determine the hazards employees are exposed to, or are likely to be exposed to, that will necessitate issuing PPE. From this assessment, the Company will identify any and all pieces of PPE that each employee will need in order to complete the task in a safe and healthful manner. Appropriate protection will be provided at no cost to all personnel working in the vicinity of abrasive blasting operations. This may include hearing, eye, face, head, hands, feet, and respiratory protection. Leather gloves must protect the forearm.

5.12.6.2. Equipment for the protection of eyes, face and body shall be supplied to the operator when the respirator design does not provide such protection and to any other personnel working in the vicinity of abrasive blasting operations. This equipment shall conform to the requirements of 1926.102 (Eye and Face Protection). Equipment for protection of the eyes and face shall be supplied to any other personnel working in the vicinity of abrasive blasting operations

5.12.6.3. Abrasive blasting creates high levels of noise that can cause substantial hearing loss. Hearing protection should be worn. Employers must administer a hearing conservation program as required by the OSHA.

5.12.7. Respirator Protection

5.12.7.1. All abrasive-blasting operators shall use abrasive-blasting respirators: when working inside of blast-cleaning rooms or, when using silica sand in manual blasting operations where the nozzle and blast are not physically separate from the operator in an exhaust ventilated enclosure or, where concentrations of toxic dust dispersed by the abrasive blasting may exceed the limits set in 1910.1000 and the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure.

5.12.7.2. An abrasive-blasting respirator must cover the wearer’s head, neck, and shoulders to protect the wearer from rebounding abrasive. Workers must use only respirators approved by NIOSH to provide protection from dusts produced during abrasive-blasting operations.

5.12.7.3. When not working in enclosed and confined spaces, or where abrasives containing less than one percent crystalline silica are used, abrasive blasters must be protected with Type CE abrasive blasting respirators or air-purifying respirators with HEPA filters.

5.12.7.4. The respirator selected should be based on the highest anticipated exposures as determined by an evaluation of the hazards to which employees will be exposed. As a minimum, respiratory protection for heavy metals and silica dusts requires an air-purifying respirator with HEPA filters. However, if workplace conditions for airborne contaminants, or their concentrations are highly variable or are not well understood, respiratory protection with a higher level of protection may be needed.

5.12.7.5. Appropriate respiratory protection must also be provided for other employees working in areas where concentrations of abrasive materials and dusts are present; and for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of abrasives.

5.12.7.6. When respirators are used, employers must establish a comprehensive respiratory protection program as required by the OSHA Respiratory Protection standard. (29 CFR 1910.134) Important elements of this standard include:

5.12.7.6.1. designating a program administrator;

5.12.7.6.2. evaluating workplace exposures;

5.12.7.6.3. selecting NIOSH-certified respirators;

5.12.7.6.4. medically evaluating employees to determine their ability to perform the work while wearing a respirator;

5.12.7.6.5. conducting respirator fit testing;

5.12.7.6.6. developing procedures for cleaning, inspecting, maintaining, and storing respirators;

5.12.7.6.7. training employees at least annually;

5.12.7.6.8. (8) evaluating the effectiveness of the respirator program on a regular basis.

6. Training

6.1. Provide training to abrasive blasters and support personnel on blasting health and safety hazards, how to use controls, personal hygiene practices, safe work practices and the use of PPE and respirators upon initial assignment and annually thereafter.

6.2. All training shall be documented.

6.3. Manufacturers are required to include appropriate health hazard information on the blasting materials on safety data sheets (SDS) as required under OSHA's Hazard Communication standard (29 CFR 1910.1200).

6.4. Obtain and read the manufacturer's SDS for health hazard information on the abrasive blasting material you are using.

7. Reference

7.1. OSHA 29 CFR § 1910.134 - Respiratory Protection.

7.2. OSHA 29 CFR § 1910.94 – Ventilation.

7.3. OSHA 29 CFR § 1926.57 – Ventilation

7.4. National Institute for Occupational Safety and Health (NIOSH)

7.5. American National Standards Institute

7.6. National Fire Protection Association