Purpose

The purpose of this program is to protect health and to prevent injury to personnel engaged in abrasive blasting operations and to others working in the vicinity by:

- Controlling dusts which are dispersed during abrasive blasting.
- Providing an adequate amount of clean air to personnel.
- Protecting personnel from injury from flying particles or from moving equipment.

This program applies to all operations where an abrasive is forcibly applied to a surface by pneumatic or hydraulic pressure or by centrifugal force. It does not apply to steam blasting, or steam-cleaning, or hydraulic cleaning methods where this work is done without the aid of abrasives.

Administrative Duties

The Training and Compliance has overall responsibility for coordinating safety and health programs for Trinity Medical Management ("Trinity")]. He/she is the person having overall responsibility for the Abrasive Blasting Safety Program. The TCM will review and update the program, as necessary. Copies of the written program may be obtained in the Operations office.

Selection of Abrasives & Equipment

Each type of abrasive and each type of equipment has its particular advantages in producing the quality of work desired, and the selection will depend on the specific requirements of the user. With properly designed equipment and proper operation and maintenance all types of abrasives and equipment can be used safely. However, abrasives which create the minimum hazard should be used wherever feasible.

Definitions

Abrasive. A solid granular substance used in an abrasive blasting operation.

Abrasive blasting. The forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

Abrasive-blasting respirator. A respirator constructed so that it covers the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive.

Air-line respirator. A device consisting of a face-piece, helmet, or hood to which clean air is supplied to the wearer through a small-diameter hose from a compressed air source.

Blast cleaning barrel. A complete enclosure which rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray.

Blast cleaning room. A complete enclosure in which blasting operations are performed and where the operator works inside of the room to operate the blasting nozzle and direct the flow of the abrasive material.

Blasting cabinet. An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

Clean air. Air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time.

Dust collector. A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.

Exhaust ventilation system. A system for removing contaminated air from a space, comprising two or more of the following elements; (a) enclosure or hood, (b) duct work, (c) dust collecting equipment, (d) exhauster, and (e) discharge stack.

Particulate-filter respirator. An air purifying respirator, commonly referred to as a dust respirator, which removes most of the dust or fume from the air passing through the device.

Respirable dust. Airborne dust in sizes capable of passing through the upper respiratory system to reach the lower lung passages.

Rotary blast cleaning table. An enclosure where the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays.

Dust Hazards from Abrasive Blasting

Dust Sources

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. The composition and toxicity of the dust from these sources must be considered in making an evaluation of the potential health hazards.

Types of Abrasives

A large variety of solid materials may be used as abrasives, with qualities varying from hard deep-cutting to soft polishing. These include;

- mineral grains, either synthetic or natural such as silica or garnet,
- metallic shot or grit, generally of steel or chilled cast iron, and

- organic abrasives, such as ground corncobs or walnut shells.

Silica sand is the most hazardous mineral abrasive commonly used and its use should be limited wherever possible. The potential hazard from steel or iron dust is considered to be minimal. Readily combustible organic abrasives may be pulverized fine enough to be capable of forming explosive mixtures with air.

Types of Coatings

A surface coating formed during the fabrication of a part, or a protective coating applied after fabrication, will be removed and dispersed as a dust by abrasive blasting. The type of coating should be known to make a proper evaluation of the potential hazard.

Silica sand is frequently imbedded in the surface of castings and may be pulverized by blast cleaning. Coatings containing toxic metals will add to the potential seriousness of the dust exposures. Examples of such coatings are anti-fouling paints containing mercury, lead paints on structural steel, cadmium plating, and lead deposits on pistons of internal combustion engines. Plastic or resin coatings may be decomposed by abrasive blasting and form irritating by-products.

Wet Abrasive Blasting

Wet methods will tend to keep dust exposures minimal, but dispersed droplets and dried residues may become airborne and create potential exposures.

Concentrations of Contaminants

Whenever hazardous substances such as dusts, fumes, mists, vapors, or gases exist or are produced in the course of construction work, their concentrations should not exceed the limits specified in 1926.55(a). When ventilation is used as an engineering control method, the system will be installed and operated according to the requirements of the applicable OSHA regulations.

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Static Electricity & Explosive Mixtures

Organic abrasives which are combustible will 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 electric wiring, will 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 91-1961), and Subpart S of this part. The blast nozzle will be bonded and grounded to prevent the build up 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. NFPA 68-1954.

Use of Combustible Abrasives

Organic abrasives which are combustible must be used only in automatic systems because the fine dust produced presents a potential fire and explosion hazard. Where flammable or explosive dust mixtures may be present, the construction of the equipment, including the exhaust system and all electric wiring must conform to the requirements of American National Standard Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z 33.1-1961 (NFPA 91-1961). The blast nozzle must 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 must 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, NFPA 68-1954.

Note: See the latest versions of NFPA-91, NFPA-68 and ANSI Z33.1 for current information on the construction of abrasive blasting equipment and enclosures.

Blast Cleaning Enclosures

Blast cleaning enclosures include rotary blast cleaning tables, blast cleaning barrels and drums, abrasive blasting cabinets, blast cleaning rooms, abrasive separators, and similar enclosures. Blast cleaning enclosures must 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. All air inlets and access openings must be baffled or so arranged that by the combination of inward air flow and baffling the escape of abrasive or dust particles into an adjacent work area will be minimized, and visible spurts of dust will not be observed. The rate of exhaust must be sufficient to provide prompt clearance of the dust-laden air within the enclosure after blasting stops.

Before the enclosure is opened, the blast must be turned off and the exhaust system must be run for a sufficient period of time to remove the airborne dust particles within the enclosure. Safety glass protected by screening must be used in observation windows, where hard deep-cutting abrasives are used. Slit abrasive-resistant baffles must be installed in multiple sets at all small access openings where dust might escape, and must be inspected regularly and replaced when needed. Doors must be flanged and tight when closed. Doors on blast-cleaning rooms must be operable from both inside and outside, except where there is a small operator access door, the large work access door may be closed or opened from the outside only.

Construction & Maintenance of the Exhaust Ventilation Systems

The construction, installation, inspection, and maintenance of exhaust systems must 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.

Note: See the latest versions of ANSI Z9.2 and ANSI Z33.1 for current information on the installation, inspection and maintenance of exhaust systems.

When dust leaks are noted, repairs must be made. The static pressure drop at the exhaust ducts leading from the equipment must be checked when the installation is completed and periodically thereafter to assure continued satisfactory operation. Whenever an appreciable change in the pressure drop indicates a partial blockage, the system must be cleaned and returned to normal operating conditions. In installations where the abrasive is recirculated, an abrasive separator must be provided to remove fines from the spent abrasives. The air exhausted from blast cleaning equipment must be discharged through dust collecting equipment. Dust collectors must be set up so that the accumulated dust can be emptied and removed without contaminating other working areas.

Note: Disposal of waste. The fine dust from dry collectors should be emptied into and transported in enclosed containers to prevent dispersal of the fines, or discharged into a sluice with some method to assure wetting of the dust.

Personal Protective Equipment

Trinity uses only respirators certified by NIOSH under 42 CFR part 84 for protecting employees from dusts produced during abrasive-blasting operations. Abrasive-blasting respirators must be worn by all abrasive-blasting operators in the following situations:

- When working inside of blast cleaning rooms, or
- when using silica sand in manual blasting operations except where the nozzle and blast are physically separated from the operator in an exhaust ventilated enclosure, or
- where concentrations of toxic dusts dispersed by the abrasive blasting may exceed the limits set in the OSHA regulation except where the nozzle and blast are physically separated from the operator in an exhaust-ventilated enclosure.

Properly fitted particulate-filter respirators, commonly referred to as dust-filter respirators, may be used for short, intermittent, or occasional dust exposures such as clean-up, dumping of dust collectors, or unloading shipments of sand at a receiving point when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means.

Dust-filter respirators may also be used to protect the operator of outside (outdoor) abrasive-blasting operations where nonsilica abrasives are used on materials having low toxicity. Dust-filter respirators used must be certified by NIOSH under 42 CFR Part 84 for protection against

the specific type of dust encountered. Dust-filter respirators must be properly fitted as required. Dust-filter respirators must not be used for continuous protection where silica sand is used as the blasting abrasive, or when toxic materials are blasted.

A respiratory protection program as defined and described in 1926.103, will be established wherever it is necessary to use respiratory protective equipment. The written program must contain specific work-site procedures where respirators or CE blasting hoods/helmets are required to protect the health of the worker.

Operators must be equipped with heavy canvas or leather gloves and aprons or equivalent protection to protect them from the impact of abrasives. Safety shoes must be worn where there is a hazard of foot injury. Equipment for protection of the eyes and face must be supplied to the operator and to other personnel working near abrasive blasting operations when the respirator design does not provide such protection. Personal protective clothing, equipment and their use must comply with 1926.102.

Air Supply & Air Compressors

The air for abrasive-blasting respirators must be free of harmful quantities of dusts, mists, or noxious gases, and must meet the requirements for supplied-air quality and use as specified in 29 CFR 1910.134(i).

Operational Procedures & General Safety

Dusts must not be permitted to accumulate on the floor or on ledges outside of an abrasive blasting enclosure, and dust spills must be cleaned up promptly, preferable by vacuum cleaning.

> Note: Removal of dust accumulations from ledges and other dust catching surfaces should be done with a vacuum cleaner during a time when the plant is not in operation. The cleaning operator should wear a respirator approved for the existing conditions.

Aisles and walkways must be kept clear of steel shot or similar abrasive which may create a slipping hazard.

> Note: Pressurized tanks for abrasive supply. If a pressurized tank is used for an abrasive supply, it should be tied in with the manual control of the nozzle and the relief valve or opening on the tank should be located so as to be safely vented.

Blast cleaning nozzle must be equipped with an operating valve which must be held open manually.

A support must be provided on which the nozzle may be mounted when it is not in use.

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

Note: If taken directly from the outside of the building, the air entering a blast cleaning room through the air supply inlets should be tempered during cold weather.

Ventilation

The applicable minimum requirements as specified in the applicable OSHA regulations relating to ventilation must be followed. Blast cleaning enclosures must be exhaust-ventilated so that a continuous inward flow of air is maintained at all openings in the enclosure during blasting. Although the performance of the equipment will be the final criterion, the exhaust ventilation must:

- Keep the escape of dust from the enclosure to a minimum;
- Maintain a reasonable visibility in blast cleaning rooms and cabinets; and
- Provide for rapid clearance of the dust laden air within the enclosure to permit the enclosure to be opened.

Recommended Blast Enclosure Air Velocities

Because of the wide variety of conditions, it is not possible to set rigid standards for rates of exhaust or for control velocities that will be suited to all types of enclosures and all types of work. In general, the use of free silica abrasives and the generation of toxic dusts in abrasive blasting require higher control velocities. With well designed equipment and excellent labyrinth baffling at openings it is possible to prevent the escape of abrasives and dust with lower control velocities.

Experience has indicated that optimum air velocities into blasting enclosures are needed to minimize the escape of dust from these enclosures. These recommended air velocities are as follows:

- Blast cleaning cabinet. The recommended inward air velocity at the hand openings is a minimum of 500 feet per minute (fpm) calculated on the free opening without the curtains. This high control velocity is needed because the operator's working position is close to the openings.
- Rotary blast cleaning tables. The access openings should be baffled with multiple slit-baffle curtains. The recommended inward air velocity at the access opening is 200 to 250 fpm calculated on the free opening without the curtains.
- Blast cleaning rooms. In blast cleaning rooms, the air inlets should be well baffled to prevent the escape of abrasive and the recommended inward air velocity at the air inlets is a minimum of 300 fpm.
- Abrasive separators, bucket elevators, and other accessory abrasive handling systems. The recommended inward air velocity at all openings is 200 to 250 fpm.

Note: For further information see the following references: Recommended Industrial Ventilation Guidelines - NIOSH 1976 Industrial Ventilation a Manual of Recommendation Practices - ACGIH latest edition.