

*ENVIRONMENTAL
CODE OF PRACTICE
FOR
ABRASIVE BLASTING*

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1. INTRODUCTION

This Code of Practice contains guidelines developed by the Department of Environment and Labour, Environment Branch, regarding nonpermanent (mobile) external abrasive blast cleaning operations for Newfoundland and Labrador. Permanent abrasive blast cleaning operations are required to have a Certificate of Approval for their operation.

These guidelines have been developed to reduce environmental damage, possible health hazards and nuisance created during abrasive blasting. Individuals and/or companies involved in abrasive blast cleaning operations can refer to these guidelines to gain a better understanding of what the Department of Environment and Labour, Environment Branch, expects for environmentally responsible abrasive blast cleaning operations.

2. DEFINITIONS

Abrasive means any material used in an abrasive blasting operation including, but not limited to, sand, slag, steel shot, garnet or walnut shells.

Abrasive Blasting entails the forceful direction of abrasives against the surfaces of parts or products for the purpose of cleaning or preparing the surface for subsequent finishing.

Noise can be defined simply as unwanted sound. Sound is any pressure variation that the human ear can detect.

Nonpermanent Abrasive Blasting Operations, are operations that move to different job locations to perform abrasive blast cleaning, or operations where abrasive blasting is performed irregularly at one fixed location, and the Department does not issue a Certificate of Approval for the type of operation; (ie: autobody shops).

Permanent Abrasive Blasting Operations, are operations where abrasive blasting is performed at one fixed location as part of the normal daily business activity, and are operations the Department would issue a Certificate of Approval to.

Silica Dust is dust of respirable particle size (having a diameter of less than 10 μm) and composed substantially of uncombined silica (Silicon Dioxide SiO_2).

Wet Abrasive Blasting is abrasive blasting using a combination of water, abrasives and air to remove rust, steel, paint and ionic materials from a surface.

3. EFFECTS

These guidelines are intended to provide environmental protection during the removal or repair of protective coatings on any structure. These guidelines may be applied to any situation where dust, debris, or any other contaminants resulting from surface preparation or coating removal operations may cause any of the following:

Harmful Effects Or Nuisance To Humans:

Dust particles

During blast cleaning operations, the abrasives and the surface coating on the material being blasted are shattered and will form dust particles of various sizes. Larger particles will settle to the ground and accumulate. Smaller particles including respirable dust, if uncontrolled, remain suspended in the air for longer periods of time. This nuisance dust can cause irritation to the eyes, skin, and respiratory tract.

Free silica

Silica in contact with skin, eyes, and throat can cause temporary irritation. Inhalation of silica dust can result in a lung disease called silicosis. Particles less than 10 microns in diameter can travel beyond the nose and throat. This free silica accumulates in the lungs causing fibrous tissue to develop around the dust particles. This fibrous tissue is not as elastic as regular lung tissue and can slow down or prevent the diffusion of oxygen into the lungs. In severe cases, fibrous tissue can hinder the flow of blood in vessels of the lung causing the heart to enlarge in an effort to pump more blood. Death can result from cardiopulmonary effects of chronic silicosis.

Lead from paint chips

Many structures in Newfoundland and Labrador have been coated with paints containing lead. Unlike many other metals that are necessary as nutrients in low concentrations, lead serves no known biological function. Lead is a heavy metal and, when absorbed into the body at certain doses, can be toxic. During abrasive blasting procedures, lead can enter the air, be inhaled and eventually be absorbed through the lungs and upper respiratory tract. Absorption of lead through the digestive system is also possible if it enters the mouth and is ingested. Lead is a cumulative poison and can be distributed throughout the body. Some of the lead is filtered and excreted, but some remains in the blood and tissues. The lead stored in tissues can slowly cause irreversible damage, first to individual cells, then to organs and whole body systems. Lead poisoning can cause mental impairment in young children and long term exposure may result in damage to the blood forming, nervous, urinary, and reproductive systems.

Noise

In residential or business areas, abrasive blasting procedures can be very disturbing. The loud operation can cause partial hearing loss, interrupt concentration at work or disrupt sleep at night.

Harmful Effects on Aquatic Resources:

Water pollution

Dust and debris particles from the structural surface and the spent abrasive can enter nearby water, thus contaminating the water in that area. This can have a negative impact on water quality, fish, and fish habitat.

Impacts on fish

Liquid paints, primers, solvents, degreasers and rust inhibitors may be toxic or lethal to fish. Sublethal effects such as impaired swimming ability, reduced growth rate, and reproductive failure may also be present. These sublethal effects are harder to detect.

Heavy metals can leach out of the paint flakes and bioaccumulate in aquatic organisms affecting their survival and limiting their use for human consumption.

Paint flakes can enter the gills of fish and cause bleeding and respiratory problems, leaving the fish susceptible to disease.

Deposition of dust particles or paint flakes can bury gravel smothering eggs, fish food organisms and aquatic plants. This reduces their ability to grow and reproduce, therefore limiting food available for fish.

Harmful Effects To The Surrounding Environment:

Soil contamination

Lead particles accumulate on the soil and can linger for thousands of years, causing contamination in the surrounding area. High concentrations could lead to problems with soil fertility and decomposition of materials. Also, lead can be taken up by vegetation; however, how much lead taken up depends on the plant species. Lead concentration can build up through the food chain resulting in higher levels of lead leading to poisoning in humans.

Other problems

When abrasive blasting is carried out without precautions to prevent dust from escaping, there is a danger of dust contamination of surrounding equipment. Motors, bearings, and other moving parts are in danger of being damaged by the abrasive dust.

Build up of dust and debris from the abrasive blasting operation can result in an unsightly area associated with the process.

Lead particles can be swept around the ground and may stick to the bottom of shoes. The lead particles can then be brought into the home and contaminate floors and carpets. This

would allow the lead to have close contact with small children since they spend a lot of time playing on the floor.

Wind can resuspend the dust particles, allowing them to become available for inhalation by humans animals.

Surface runoff from rainfall can carry lead particles into lakes and rivers contaminating water bodies. This can be more severe where there are large impervious areas such as roads and parking lots which do not allow water and other particles to be transported down through the ground.

4. APPLICABLE LEGISLATION

The following legislation can be considered applicable when conducting abrasive blasting operations in the Province of Newfoundland.

Federal:

Canadian Fisheries Act

Section 35. (1) No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.

Section 36. (3) . . . no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

Provincial:

Environment Act

Section 9. Subject to the regulations, a municipal authority or person shall not discharge or deposit material of any kind into a body of water or on a shore or bank of a body of water or in a place that may cause pollution or impair the quality of water for a beneficial use.

Section 11.1, Subsection 1. Where a person or municipal authority intends to operate or operates works in the province, the works shall not be operated unless that operation of the works has been approved, in writing, by the minister.

Section 12, Subsection 1. The minister may, on receiving a report from his or her officials or from the commission or a local advisory commission that a condition exists which is causing or is likely to cause pollution of the air, soil or a body of water, make an order to protect the environment from that condition and to prevent, restrict or prohibit an activity

which in the minister's opinion is giving rise to or is likely to give rise to that condition and may make an order stopping works or operations, in this and the next succeeding section referred to as a "stopping order", either permanently or for a period that is specified in the order.

Section 12, Subsection 2. The minister shall serve on the owner or person in charge of the works or the operations affected by the stopping order a copy of the order and a statement showing the reasons for the making of the order, and upon receipt of that copy and statement, the owner or person in charge of the works or operations shall ensure that the works or operations are stopped.

Waste Material Disposal Act

Section 17, Subsection 1, Paragraph a. A person shall not deposit, pour, dump, empty or otherwise dispose of waste material upon land whether or not developed land or land covered by water or in a building or structure that is not a waste disposal site for which a certificate has been granted unless disposed of in a receptacle or container placed or located specifically for purposes of collection.

Newfoundland Occupational Health and Safety Act

Section 27, Silica Regulations. See Appendix B.

Air Pollution Control Regulations

Section 4, subsection 4. A person shall not discharge or release an air contaminant into the atmosphere except as permitted by the Schedules to these regulations.

The Environmental Control Water and Sewage Regulations

Section 3. A person discharging sewage and other materials into a body of water, public sewer or a sewer leading to a public sewer shall comply with the standards, conditions and provisions prescribed in these regulations for the constituents, contents or description of the sewage or other discharged materials.

5. GUIDELINES

- * All abrasive blasting must be carried out in an approved abrasive blasting enclosure and conform to all regulations set out by the Occupational Health and Safety Division of the Department of Environment and Labour.
- * All abrasive blasting outside shall be enclosed to prevent dust and dust particles from contaminating the area. All outdoor abrasive blasting areas shall be kept free of spent abrasive to prevent windblown particles from entering the air.

- * The spent abrasive material must be cleaned out of the working area at least once a day. If heavy abrasive blasting, with high accumulations of dust occurs, the area may need to be cleaned on a more regular basis. Any spills must be cleaned immediately and disposed of properly.
- * Wet abrasive blasting is a preferred method when dealing with worker safety and the environment. Water added to the abrasive decreases the amount of dust created. Care must be taken due to the accumulation of water on the floor area.
- * If wet abrasive blasting is carried out, only a partial enclosure is required. However, all material generated from abrasive blasting, including water, must be collected.
- * Material generated from abrasive blasting is to be disposed of according to the criteria established in Section 7.
- * Releases of water, including water released to groundwater, are to conform with the criteria established in Section 8.
- * In residential areas, noise disturbances should be kept under control. Table 5.1 gives recommended guidelines for noise control in a residential area or near a public institution.

Table 5.1 Guidelines for noise control.

| LOCATION | RESTRICTIONS |
|---|---|
| > 1 km from residential area | No restrictions |
| < 1 km but < 200m from a residential area | Prohibited Sundays and statutory holidays Prohibited between 19:00 one day and 7:00 the next day |
| < 200 m from residential area | Barriers/enclosures required to reduce noise levels to 53 dBA above background, at residential property line. |

- * Personal protective equipment, including respirators, ear protection, and protective clothing, should be worn by all persons in or around the abrasive blasting enclosure. For specific guidance on worker safety and health should be available through the local office of the Occupational Health and Safety Division.

- * Due to problems associated with silica dust, the amount of free silica contained in an abrasive must not exceed 1%.

6. TYPES OF ENCLOSURES

Ground covering

A ground covering is to be used to collect debris from all manual scraping and chipping of surfaces. See Figure 1.

Partial enclosure

A partial enclosure is to be used when the abrasive blasting procedure is carried out at a distance of at least 200 m from any residential area or water course. The abrasive blasting area is partially enclosed with a tarp on the floor to collect spent debris and partial side enclosures to prevent particles from being blown around. The sides of the enclosure shall be as high as the area which is being worked on. See Figure 2.

Full enclosure

A full enclosure is to be used when the abrasive blasting is to be carried out within 200 m of a residence or watercourse. The abrasive blasting area is enclosed on all sides including the top of the area. A tarp on the floor is used to collect the spent abrasive. See Figure 3.

Full enclosure with negative pressure

A full enclosure with negative pressure is to be used when escape of all or any materials or debris from the operations must be prevented. The abrasive blasting area is an area which is sealed tight on all joints and entryways to prevent any leakage of dust. It utilizes negative pressure from forced airflow along with dust collectors. See Figure 4.

Table 6.1 lists appropriate enclosure requirements to be utilized during the removal of surface coatings, depending on location.

TYPES OF ENCLOSURES

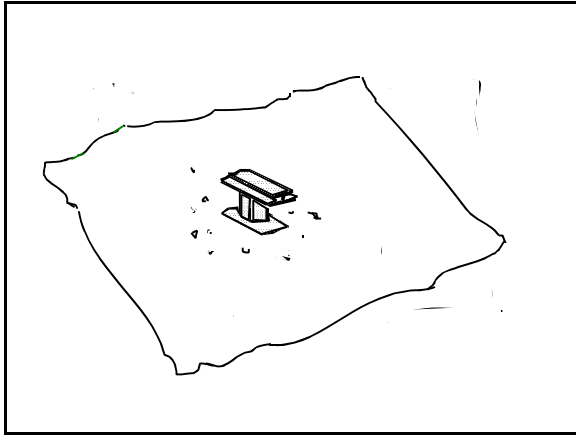


Figure 1. Ground Cover with ground sheet used under working area to collect debris.

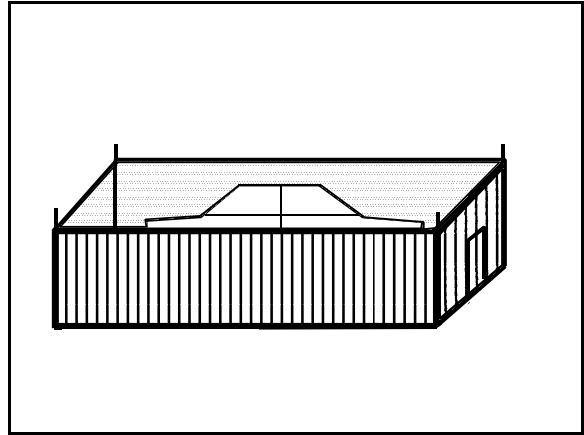


Figure 2. Partial Enclosure with ground and sides of working area enclosed.

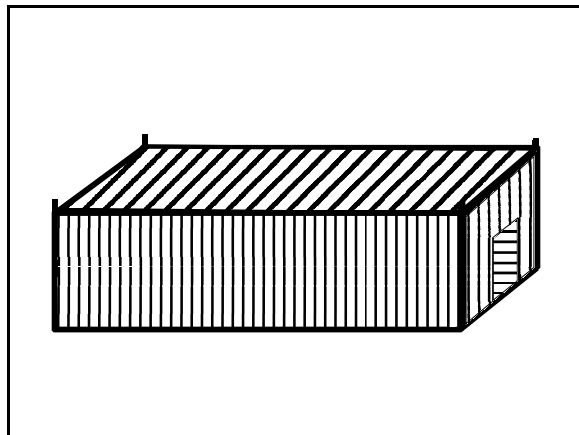


Figure 3. Full Enclosure with ground, sides, and top of working area enclosed.

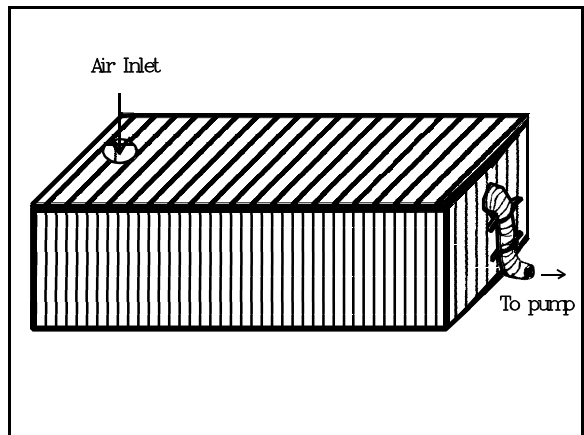


Figure 4. Full Enclosure with Negative Pressure having all sides enclosed and sealed. Air is pulled out of enclosure and there is a dust collector on the exhaust vent.

Table 6.1 Enclosure requirements for removal of protective coatings

| LOCATION | TYPES OF OPERATION | |
|--|--------------------|---------------------------------------|
| | MANUAL CLEANING | BLAST CLEANING |
| No residence/watercourse within 200 m. | Floor Covering | Partial Enclosure |
| Residence/watercourse >100 m but <200 m | Floor Covering | Full Enclosure |
| Residence/watercourse <100m | Partial Enclosure | Full Enclosure With Negative Pressure |
| Public Institution, Water Supply or Public Recreation Area <300m | Partial Enclosure | Site Specific Assessment |

7. HANDLING OF SPENT ABRASIVE AND OTHER WASTE PRODUCED ON SITE

Spent abrasive along with waste generated, must be contained in covered containers with appropriate visible labels until proper disposal is determined. This wet or dry waste material must be defined as a nonhazardous waste or hazardous waste and disposed of in the appropriate manner.

Nonhazardous Waste

The spent abrasive and waste material is considered a nonhazardous waste if, after conducting the leachate extraction procedures as defined in the Provincial Guidelines for Leachate Testing and Acid Generation, it produces a leachate in which the concentration of all the contaminants in Schedule 1 are equal to or less than that listed in Schedule 1. As a nonhazardous waste, the spent abrasive blasting and other waste material shall be transported from the project to an approved waste disposal site.

Hazardous Waste

The spent abrasive and waste material is considered a hazardous waste if, after conducting the leachate extraction procedures as defined in the Provincial Guidelines for Leachate Testing and Acid Generation, it produces a leachate containing any of the contaminants in Schedule 1 with a concentration greater than the concentration listed in Schedule 1. The company is to dispose of the material as a hazardous waste. For more information on the disposal of hazardous waste contact the Newfoundland Department of Environment and Labour.

Transportation of hazardous waste must be carried out according to the Federal Transportation of Dangerous Goods Act and the Newfoundland Transportation of Dangerous Goods Act.

8. RELEASES OF WATER

Water generated by abrasive blasting can be released to the environment provided it has been demonstrated the water complies with the appropriate Schedule of the *Environmental Control Water and Sewage Regulations, 1996*. Schedule A applies to all releases of water; except when water is discharged to a public sewer, in which case schedule B applies. Before water is released, a grab sample is to be obtained and analysed for the suspended solids, pH, lead, cadmium and chromium. Provided analysis show the maximum content for the mentioned constituents, is less than column 2 of the applicable Schedule, the water can be discharged. If any one of the constituents tested for exceeds the maximum content, the water should be treated to reduce to reduce the maximum content too less than column 2 of the applicable Schedule, or disposed of in a manner suitable to the Department.

9. PROVISIONS FOR UPDATE

As techniques and methods develop that provide improved environmental protection, this set of abrasive blasting guidelines will be updated accordingly.

APPENDIX A

The schedule provided does list all the contaminants appearing in the Schedule of the Provincial Guidelines for Leachate Testing and Acid Generation. Only those contaminants applicable to abrasive blasting are listed here. When performing leachate test, analysis of leachate need only be analysed for the condiments listed in the below schedule.

SCHEDULE 1 (Edited Schedule)

Leachate Quality Criteria

| Code Number | Contaminant | Concentration in Waste Extract (mg/L) |
|-------------|-------------|---------------------------------------|
| L 4 | Arsenic | 5.0 |
| L 5 | Barium | 100.0 |
| L 6 | Boron | 500.0 |
| L 7 | Cadmium | 0.5 |
| L 10 | Chromium | 5.0 |
| L 11 | Cyanide | 20.0 |
| L 17 | Lead | 5.0 |
| L 19 | Mercury | 0.1 |
| L 28 | Silver | 5.0 |

Reference: "Transportation of Dangerous Goods Act", 1992

APPENDIX B

Newfoundland Occupational Health and Safety Act
Silica Regulations

SILICA REGULATIONS

27. (1) *In this section*

- (a) *“blasting” means the cleaning, smoothing, roughening, or removal of part of the surface of any article by the use of an abrasive of a jet of sand, metal shot, or grit or other material propelled by compressed air or steam or by a wheel;*
- (b) *“blasting enclosure” means a chamber, barrel, cabinet or other enclosure designed for the purpose of blasting therein;*
- (c) *“blasting chamber” means a blasting enclosure into which workers enter;*
- (d) *“cleaning of castings” means, where done as an incidental or supplemental process in connection with the making of metal castings, the freeing of the castings from adherent sand or other substance, and includes the removal of cores and the general smoothing of the castings where such freeing is done, but does not include the freeing of castings from scale formed during annealing or heat treatment;*
- (e) *“sandblasting” means the process of projecting sand by means of compressed air or steam or by a wheel;*
- (f) *“silica flour” means the ground material produced by the milling of siliceous rocks or other siliceous substances including diatomite (Keiselguhr, diatomaceous earth);*
- (g) *“uncombined silica” means silica which is not combined chemically with any other element or compound;*
- (i) *“use of parting material” means the application of a material to a surface of a pattern or of a mould so as to facilitate the separation of the pattern from a mould or the separation of parts of the mould.*

- (2) *The provisions of this section apply wherever workers are employed in any silica process that is to say:*
- (a) *sandblasting*
 - (b) *the cleaning of castings*
 - (c) *the blasting, fettling, grinding or dressing of any surface containing silica, including the engraving or abrasive cleaning gravestones, buildings or structures of siliceous stones or rocks*
 - (d) *any process in which silica flour is used*
 - (e) *the manufacture of silica-containing refractory bricks or silica-containing substances and the dismantling or repair of the refractory lining of furnaces*
 - (f) *any process which the Chief Occupational Medical Officer has reason to believe creates a risk to the health of workers by silica dust.*
- (3) *An employer shall ensure that at every silica process except sand blasting as provided by subsection (10) the entry into the air of silica dust is prevented so far as is reasonably practicable by the provision of:*
- (a) *total or partial enclosure of the process, and/or*
 - (b) *efficient local exhaust ventilation, and/or*
 - (c) *jets or sprays of water or other suitable wetting agent; or*
 - (d) *by any other method deemed suitable by the Assistant Deputy Minister.*

- (4) *An employer shall ensure that*
- (a) *enclosure apparatus and exhaust ventilation equipment used or likely to be used to contain silica dust is maintained and is inspected at least once in every seven days and is certified by a competent person at least once in every calendar year.*
 - (b) *effective means is provided to collect silica dust removed by exhaust ventilation equipment and to prevent its re-entry into any workroom; and every filtering or settling device situated in a workroom is completely separated from the general air of that workroom in an enclosure ventilated to the open air.*
- (5) *Where it is not reasonably practicable to prevent the entry into the air of silica dust the employer shall provide for the isolation of the worker from the air containing silica dust.*
- (6) (a) *Where it is not reasonably practicable to prevent the entry into the air of silica dust, not practicable to isolate the worker from the air containing silica dust and for all cleaning and maintenance work, the employer shall provide for the use of each worker who may be exposed to silica dust.*
- (i) *approved respiratory protective equipment; and*
 - (ii) *protective clothing, meaning coveralls and headgear, which will when worn exclude silica dust and which will be maintained and cleaned in a safe manner.*
- (b) *No worker shall be required to perform work for which respiratory protective equipment and clothing is provided unless fully instructed in the need for and proper use of that equipment and clothing.*

- (7) (a) *An employer shall ensure that all places where silica dust may accumulate are regularly cleaned using vacuum methods wherever practicable.*
- (b) *An employer shall ensure that the standard for dust levels, does not exceed the Threshold Limit Value (TLV) established by the ACGIH.*
- (8) *Every worker who in the course of his employment is likely to be engaged in a silica process, shall be warned by the employer of the danger to his health of inhaling silica dust and the risk of injury is made greater by smoking.*
- (9) *Persons under the age of 18 shall not be employed in a silica process nor in any cleaning or maintenance work likely to involve exposure to silica dust except such work as is a recognized part of apprenticeship or comparable course of training.*
- (10) **Sandblasting**
- (a) *The employer shall ensure that*
- (i) *no sandblasting is done outside a blasting enclosure to any article which is practicable to introduce into a blasting enclosure;*
- (ii) *No sand or other substance containing more than one percent by weight of respirable dust is introduced into any blasting enclosure; (73/83)*
- (iii) *no sandblasting is done except with the written permission of the Officer and in accordance with such conditions and to such extent as he may prescribe; (73/83)*

(iv) *no sandblasting is done underground;*

(b) *Sandblasting shall not be undertaken nor performed by any employer, worker or self-employed person other than those registered for that purpose with the Division.*

(11) Abrasive Blasting

(a) *The employer shall ensure so far as is practicable that castings, gravestones, and other articles which are liable to give rise to silica dust by blasting are not blasted except in a blasting enclosure; and that no work is performed in a blasting enclosure except blasting and work immediately incidental thereto and the cleaning and repairing of the enclosure and of the plant and appliances situated therein.*

(b) The employer shall ensure that every blasting enclosure which is liable to contain silica dust is

(i) *constructed, operated and maintained to prevent the escape of dust, and*

(ii) *provided with an efficient dust extraction system, which is kept in continuous operation whenever the blasting enclosure is in use whether or not blasting is actually taking place, and in the case of a blasting chamber is in operation when any worker is inside the chamber, and*

(iii) *specially inspected by a competent person once in every week in which it is used for blasting; and the enclosure, the apparatus*

connected with it, and the ventilating plant associated with it is thoroughly examined and tested by a competent person once every month; and all results of required inspection, examinations and tests are recorded, and all defects remedied without avoidable delay, and

(iv) provided with efficient apparatus for separating so far as is practicable, the abrasive from other dust; and no such abrasive is again introduced into the blasting apparatus until it has been so separated.

(12)(a) The employer shall provide and maintain for workers who work in a blasting chamber, whether in blasting or other work, protective blasters' helmets supplied with clean and not cold air of not less than six cubic feet per minute, and such helmets shall be used by workers whenever they are in the blasting chamber.

(b) Suitable gauntlets and coveralls shall be provided for the use of, and shall be worn by, all workers while performing blasting or assisting at blasting and suitable provision shall be made for the storage, regular cleaning by vacuum, and maintenance in good condition of such gauntlets and coveralls.

(c) When any worker is engaged in the cleaning of any blasting apparatus or enclosure, ventilating or separating plant, or the surrounds thereof, all practical measures shall be taken to prevent the inhalation of silica dust or its dissemination into the air and all such cleaning shall be by vacume or hosing by water whenever practicable.

(13) Every employer shall ensure that silica flour

(a) is not manufactured except under the standards prescribed by the Division.

(b) not used for any purpose for which a less hazardous substance may be

substituted.

- (c) *is not used in the manufacture of scouring powder or abrasive soaps or as an abrasive in any process.*

(14) *Medical Surveillance*

- (a) *The employer shall arrange that every worker regularly engaged in a silica process shall be medically examined in accordance with the requirements if the Chief Occupational Medical Officer.*
- (b) *The employer shall not regularly employ a worker in a silica process unless the employer is satisfied that a medical certificate of fitness for such work has been issued to that worker within the preceding period of twelve months.*
- (c) *When the examining physician is satisfied by his examination that a worker is fit to be regularly engaged in a silica process he shall issue a certificate of fitness on the form as described in Schedule I provided by the Department. These certificates shall be issued to the employer by a serial number for identification purposes by the Division.*
- (d) *The employer shall keep at the place of employment to be readily available to an officer, a log recording the name of every worker referred for medical examination.*
- (e) *The examining physician shall record in the log the date and nature of the certificate he issues to each worker he has medically examined.*