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Attached is the slightly revised version of the guideline for silica abrasive blasting. On it I have highlighted the measures that are required because silica is present. My impression is that going to a non-silica grit does not buy significant relief in terms of activities. Many of the items identified are just part of doing the job in 1987. We just don't often see them all written down in one place!

Please advise if and when it would be desirable to issue such guidance. As usual, earlier the better especially if locations are putting programs in place (minimize recreating the wheel). Again, this document is a tool from which locations would develop or review their own procedures.

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HEALTH AND SAFETY WORKPRACTICE GUIDELINE FOR ABRASIVE BLASTING INSIDE VESSELS AND TANKS WITH SILICA

I GENERAL

1. Each location conducting abrasive blasting with grit containing silica should establish local health and safety procedures for its use. This is particularly important where the abrasive blasting is to be conducted inside confined spaces such as vessels, or tanks.

} most locations
have
procedures

The following outline illustrates some of the factors to be considered in establishing a local program.

2. While abrasive blasting in itself involves potential exposure to a variety of health and safety hazards, additional precautionary measure should be considered where silica containing grits are used. Abrasive grits containing more than 1% free silica are considered relevant to this discussion e.g. "Starblast".

3. The permissible exposure limit (PEL) associated with the use of silica containing grits is a primarily a function of the % silica present. For example, the pel for a grit containing 5% free silica would be:

For "respirable" dust exposure

$$\frac{10 \text{ mg/m}^3}{\text{-----}} = 1.4 \text{ mg/m}^3$$

$$\% \text{SiO}_2 + 2$$

This can be compared to a 5 mg/m³ limit associated with respirable "nuisance dust".

4. Due to the lower permissible exposure limits associated with silica, assuring compliance with the pel during abrasive blasting activities requires additional considerations for the integrity of the blasting hood, filtration systems on compressors used for breathing air and exposure to downwind personnel.

} low impact
stuff

5. Where blasting is conducted inside vessels high dust levels should be assumed. With regard to downwind exposure potential, studies have shown that exposure during (pure) silica sandblasting can occur for significant distances, e.g. 150+ feet.

6. While skin contact and ingestion of silica are not relevant routes of entry, appropriate hygienic procedures should be adopted to minimize gross contamination of skin and

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street clothing. This is particularly important if toxic metals are known to be present (e.g. nickel, chromium, lead, etc.).

II TRAINING REQUIREMENTS

1. Employees who engage in silica blasting operations should be trained in the specific health hazards associated with silica and the required procedures for safe blasting. Where contractor employees are used, training is the responsibility of the contractor employer.

} Training
required
Regardless

Whether or not this training has been accomplished should be ascertained by Shell.

III PROCEDURES FOR ABRASIVE BLASTING INSIDE VESSELS

1. A pre-job orientation should be conducted with any contractor to be used

2. Warning signs and Isolation of the work area:

As a minimum, the blasting area is to be roped off or otherwise barricaded so as to isolate the immediate work area. Signs containing the following warning or its equivalent should be posted:

Caution - Silica Sandblasting
INHALATION HAZARD
Respiratory Protection Required

} A different
sign

Note: Where the silica content is < 1% , the sign in use should refer to abrasive blasting rather than silica sandblasting.

The purpose of isolating the work area is to preclude pedestrian traffic from entering the restricted area without using respiratory protection.

3. Air compressors used to supply breathing air are to be located and maintained upwind of any dust emission sources. Requirements for air compressors include:

- An exhaust stack to be separated from the intake (8ft minimum).
- A particulate filter maintained in-line between the compressor and respirator
- Carbon monoxide measurements to be performed monthly on

} all basic
stuff
nothing that
should not be
in place
already

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each compressor used for breathing air or at least once during each different sandblasting job.

4. Hearing protection should be worn at all times during sandblasting and as may be required where noise levels exceed 90 dbA. Hearing protection requirements may be more restrictive if the work shift is longer than 8 hours.

5. Where necessary to protect adjacent work areas, filters should be installed on vessel ventilation coppus blowers to minimize airborne dust levels outside the vessel.

OPTIONS

- SCHEDULE work OFF hours
- ISOLATE AREA
- TURN blowers OFF?
- DEFLECT EXHAUST

6. Where applicable, the safety permit issued should state the required procedures. A copy of the required procedures should be provided to the contractor.

III RESPIRATORY PROTECTIVE EQUIPMENT

1. A program meeting the minimum requirements of the OSHA Respiratory standard should be followed. This program should include:

a. Adequate cleaning of respiratory equipment. Generally blasting hoods used by a single employee should be cleaned at least weekly. Prior to each use the inside of each sandblasting hood is to be free of visible dust, and accumulation of dirt.

b. Fit testing of tight fitting (air purifying) respirators. Fit testing should not be conducted where facial hair exists between the sealing surface of the respirator and the face.

c. Blasters are to wear NIOSH approved airline hoods. Typically such hoods require a minimum airflow of 4 cfm. Air supplied equipment is also required of other personnel who enter vessels or tanks when blasting is underway. An air purifying dust mask may have to be worn under the airline hood of the blaster as supplemental protection when blasting is conducted inside vessels with poor ventilation.

d. Potmen, other ancillary personnel, and inspectors are to wear at least NIOSH approved air purifying respirators inside the restricted area. Air purifying respiratory protection is to be worn by employees removing spent grit from vessels.

e. For hot work environments, use of in-line air conditioning should be considered.

} required
anyway

} IF best protection
used, THIS may be
waived

IV Exposure Monitoring Requirements

a. Personnel and area monitoring should be conducted where necessary to verify the acceptability of the procedures put in place with regard to downwind personnel, placement of the barricade, exposure to the potman, etc.

} limited
impact on
MAINTENANCE

V Bulk Silica Analysis

1. As a minimum the material safety data sheet for the abrasive grit in use should be obtained prior to commencing work. Where necessary information on the estimated level of silica and toxic metals should be obtained from the supplier. This should be supplemented by an analysis by Shell or an outside laboratory periodically for verification purposes.

2. Duponts' Starblast is primarily composed of naturally occurring mineral staurolite. It is mined and shipped from a mineral deposit in Florida. The free silica content of their 1986 production averaged 2.5%.

VI Medical Surveillance

1. Shell employees should be included in the Shell Special Medical Surveillance program for Silica where exposures exceed 1/2 the permissible exposure limit for at least 30 days per year. This includes pulmonary function exams, chest xrays, and appropriate other medical tests to detect any early signs of pulmonary effects. The facility Industrial Hygienist should be consulted with regard to the minimum entrance criteria and exposure potential.

2. Contractor management should be advised of the silica medical surveillance program that Shell has in place for it's employees. Note: no specific OSHA standards presently require medical exams for silica exposure although they have been recommended by NIOSH.

} low impact
CYA MEASURE

VII Additional Information

1. Health and Safety Procedure Guidelines, No.508A on Sandblasting (issued July 1982) may be consulted for general safety considerations.

2. Abrasive Blasting Safety and Equipment Protection, a Dupont publication dated 5/2/85.

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