

Health Surveillance Proposal

Client: **ABC Company**

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Introduction

Workers at ABC Company are potentially exposed to hazardous substances. The hazardous substances of most concern are crystalline silica and manganese.

Health surveillance is one of the range of controls used to reduce the risk of health problems from exposure to hazardous substances. Health surveillance is only effective if it is part of an integrated occupational health and safety program. Other elements of such a program may include improving engineering controls, training, education, respirator selection and fit testing.

Purpose of health surveillance“***The purpose of health surveillance is to ensure that control measures are effective and to provide an opportunity to reinforce specific preventive measures and safe work practices.***”¹

Additionally, health surveillance should be able to detect early adverse health effects when intervention (removal from exposure) can prevent disease progression.

Finally, health surveillance is required to comply with occupational safety and health regulations.

Health effects of silica

Inhalation of respirable crystalline silica is responsible for the adverse health effects. The adverse health effects include:

- Silicosis
- Chronic bronchitis
- Lung cancer (higher risk in smokers)

Rheumatoid arthritis and scleroderma have been associated with silicosis. Silicosis increases the risk of tuberculosis.

There is no cure for these diseases. The only effective preventive measure is to reduce exposure. The current occupational exposure limit (TWA) in Australia is 0.1 mg/m³.² Keeping under this limit protects nearly all workers from developing adverse health effects. Note that as research progresses the occupational exposure limit continues to be revised downwards. A few years ago the exposure limit was 0.2 mg/m³. Therefore it is prudent to keep exposures as low as reasonably possible.

Health effects of manganese

Manganese, like iron is an essential trace element required for health. However, too much manganese causes adverse health effects. At work, exposure arises from inhalation of manganese containing dusts. Chronic exposure to manganese can damage the central nervous system leading to a condition called manganism.

In the early stages this condition manifests with subtle changes in cognition, behavior and motor performance. These changes are difficult to detect clinically.

In the late stage this condition presents similarly to Parkinson's disease but with a poor response to dopamine treatment.

There is no cure once manganism develops. The only effective preventive measure is to reduce exposure.

Regulations

The relevant *Occupational Safety And Health Regulations 1996*:

- 5.23. Health surveillance in relation to hazardous substances
- 5.24. Duties of appointed medical practitioners
- 5.25. Employers, main contractors and self-employed persons to take remedial action
- 5.26. Periods for which records to be kept by employers, main contractors and self-employed persons

The regulations outline when health surveillance is required, how it is conducted and the responsibilities of the employer and appointed medical practitioner.

Preliminary worksite assessment

Prior to the worksite assessment, ABC Company provided the following information for review: MSDS, job descriptions, process description and hygiene monitoring results dating back to 1998. The MSDS were reviewed to identify the hazardous substances of interest.

Product	Hazardous substance	Area used
Unimin Whatsit consumable group 1	Quartz (crystalline silica) proportion 20-50%	Whatsit making 1
Unimin Whatsit consumable group 2	Quartz proportion 5-15%	Whatsit making Q
Graded silica products	Silicon dioxide > 90%	Whatsit making 3
Unimin manganese dioxide	Manganese dioxide proportion 75-80%	Whatsit making F (additives)
Trichloroethylene stabilised	Trichloroethylene 100%	Maintenance

Our Occupational Physician conducted a worksite visit on the 24th March 2006 for the purpose of evaluating exposures. A broad overview of the Whatsit making process was

gained by a guided walk through. The following areas were visited: Whatsit Consumables shed, Whatsit making process, Whatsit dryer, Whatsit Cookers, packaging and yard.

It appears that highest exposure occurs when additives containing free silica and manganese are added to slugs by a Whatsit machine operator. Additives are only added intermittently when required for the type of Whatsit. Controls include an isolation curtain, local extraction hood and mandatory half-face dust mask. Additives were not being added during the site visit. Compliance with respiratory PPE is supposed to be good. It was also observed that there was no compliance with hearing protection.

Rain the night prior to the visit probably helped with dust suppression. Most areas visited had fine Whatsit consumable dust covering the floor and surfaces. Movement of material in the Whatsit consumable shed by bobcat and truck produced visible dust clouds. Dust clouds were not observed in other areas. Activities associated with dust exposure include housekeeping, cleaning, shoveling and emptying additives into the hopper.

Previous monitoring results

Monitoring results for dust and crystalline silica from 1998 to 2005 were reviewed. Sampling was targeted at 'worst case' working conditions. Sampling was conducted over 4 hours periods and extrapolated to 8 hr TWAs. The occupational exposure limit was adjusted for 12 hr shifts when needed. Most of the results were well below the occupational exposure limit for crystalline silica. The highest results were seen in the Whatsit machine operators followed by Whatsit consumable shed operators. A few results in these jobs did exceed the occupational exposure limit. There were also a few extremely high results (27-72mg/m³) caused by sample contamination.

No monitoring has been performed for manganese. Manganese is only added to the Whatsit making process on 3-4 days out of a 3 month period. Exposure is unlikely to exceed the occupational exposure limit.

Asbestos exists on-site in building material. An asbestos inspection is conducted on a regular basis. The asbestos is stable and does not pose an inhalation risk. Monitoring for air borne fibres has been conducted and no asbestos fibres have been detected.

Exposure groups

Potential Exposures Groups 2009				
	Silica	Manganese	Health surveillance	Highest monitoring results for crystalline silica mg/m ³
Whatsit consumable Truck Driver	√		Recommended	
Whatsit Truck Driver			No	
Whatsitmaking	√	√	Highly recommended	0.11, 0.29
Whatsit consumable shed Personnel	√		Highly recommended	0.05
Packaging	√		Recommended	0.02
Whatsit cooking	√		Recommended	0.03
Whatsit cooking Car Repair & Maintenance	√		Recommended	<0.01
Maintenance	√	√	Recommended	
Vehicle Maintenance				
Forklift Driver	*√		Optional	0.02
Yard	*√		Optional	<0.01
Laboratory	√	√	Recommended	
Safety, Health & Environment	√	√	Optional	
Engineering	√	√	Recommended	
Operations Office	*√	*√	Not required	

Risk assessment

Silica

Generally, the higher the exposure, the higher the risk of developing silica related disease. The highest potential exposure to respirable crystalline silica occurs when it is used as an additive in the Whatsit making process. Monitoring suggests that most exposures are well below the occupational exposure limit. Personal absorption is further reduced by use of an appropriate dust mask.

The Whatsit consumable shed is a visibly dusty area. However, the measured fraction of hazardous respirable crystalline silica is low. Respirable silica dust particles are very small (<10 micrometres diameter). The dust in the Whatsit consumable shed is largely composed of larger dust particles classified as nuisance dust.

There is still some uncertainty concerning the 'safe' occupational exposure limit.³ The standard has been reduced relatively recently in Australia from 0.2 to 0.1 mg/m³. The National Institute of Occupational Safety and Health in the United States goes further to recommend an exposure limit of 0.05 mg/m³. Therefore it is better to be conservative when selecting the target population for health surveillance.

Crystalline silica exposure is recognized to increase the risk of developing lung cancer. The risk is highest in workers who have developed silicosis and who also smoke. The risk in workers who do not have silicosis and do not smoke is not that clear but appears to be small.³ Current health surveillance methods are not sensitive enough to detect lung cancer for early intervention.

Smoking is an important factor that significantly increases the risk of developing silica related disease including lung cancer. Encouraging smoking cessation is an important part of the health surveillance program.

Overall it appears that the risk of developing silica related disease is low provided that current controls remain effective. Health surveillance is required as monitoring indicates that some workers' exposures are near or exceed the occupational exposure limit.

It is important to remember that disease is associated with cumulative exposure. When exposures are low disease may only manifest after decades of exposure and may manifest long after retirement. Therefore, evaluating exposure and education on controls are important aspects of the program.

Manganese

Manganese is primarily used as an additive when making certain Whatsit types. It is currently used infrequently – about 3-4 days over 3 months. Inhalation exposure can occur when the manganese is poured into the feeder and when the manganese is added to the slugs. Dust masks are mandatory when manganese exposure is possible.

There is conflicting evidence of neurobehavioral changes at exposures below the current recommended occupational exposure limits.⁴ Again, it is prudent to keep occupational exposures as low as reasonably possible. Most of the literature on manganese toxicity has been on workers with reasonably high continuous exposure such as smelter workers, miners and welders.⁵

The risk of manganism at ABC Company is very low. Health surveillance for manganese is purely optional but can be useful to set a baseline if it is expected that future exposures will become significant.

Health surveillance procedures

Silica medicals

Initial

The initial medical consists of:

1. Questionnaire
 - Exposure history including use of controls
 - Medical history
 - Standardized respiratory questionnaire
2. Spirometry
3. Chest x-ray (if going to be employed for >12 months or previous history of silica exposure)
4. Medical examination focusing on the respiratory system
5. Education and reinforcement of control use

Periodic

The periodic medical consists of:

1. Questionnaire
 - a. Exposure history including use of controls
 - b. Medical history
 - c. Standardised respiratory questionnaire
2. Spirometry
3. Chest x-ray
4. Medical examination focusing on the respiratory system
5. Education and reinforcement of control use

The periodicity of review depends on risk assessment of exposure. As a guide:

Most workers	5 yearly
Workers with > 10 years exposure to silica, particularly Whatsit machine op/Whatsit consumable shed personnel	2 – 3 yearly

Exit

On cessation of employment, exposed workers should have an exit medical consisting of:

1. Questionnaire
 - a. Exposure history including use of controls
 - b. Medical history
 - c. Standardised respiratory questionnaire
2. Spirometry
3. Chest x-ray if indicated
4. Medical examination focusing on the respiratory system

Spirometry

A single spirometer will be used for all tests. It must be calibrated daily before each period of testing. Testing will be conducted in accordance with Mine Health Surveillance guidelines. If a good quality test cannot be obtained the worker will need to return for further spirometric testing supervised by the appointed medical practitioner.

Chest x-ray

Standard PA view chest x-rays are performed. Interpretation must be conducted by an ILO reader familiar with silicosis.

Abnormal findings

If there are any abnormalities the worker will need to return for a comprehensive assessment by the appointed medical practitioner. If necessary, referral to the relevant specialist at the expense of the employer will be made.

Manganese medicals

At this stage, manganese exposure is unlikely to be high enough to pose a significant health risk. Health surveillance is optional. Obtaining baseline data may be useful if manganese use is likely to increase in the future.

Biological monitoring is not indicated for this program because of expected low exposures and difficulty in interpreting test results.

Initial

The initial medical consists of:

1. Supplemental questionnaire (additional to silica medical)
 - Exposure history including use of controls
 - Symptom checklist
2. Medical examination focusing on the neurological system including test of digit span
3. Education and reinforcement of control use

Periodic

The periodical medical consists of:

1. Questionnaire
 - a. Exposure history including use of controls
 - b. Symptom checklist
2. Medical examination focusing on the neurological system including test of digit span
3. Education and reinforcement of control use

The periodicity of review would typically be 5 yearly at current exposures.

Exit

On cessation of employment, exposed workers should have an exit medical consisting of:

1. Questionnaire
 - a. Exposure history including use of controls
 - b. Symptom checklist
2. Medical examination focusing on the neurological system including test of digit span

Abnormal findings

In its early stages, manganism is a very difficult diagnosis to make.

If there are any abnormalities the worker will need to return for a comprehensive assessment by the appointed medical practitioner. This may include investigations such as blood manganese testing. If necessary, referral to the relevant specialist at the expense of the employer will be made.

Asbestos medicals

Asbestos related disease often only becomes apparent many years after exposure. Important reasons for health surveillance include checking control use and addressing any worker's concerns about asbestos exposure.

Initial

The initial medical consists of:

1. Questionnaire
 - Exposure history including use of controls
 - Medical history
 - Standardized respiratory questionnaire
2. Spirometry
3. Baseline chest x-ray (if going to be employed for >12 months or previous history of asbestos exposure)
4. Medical examination focusing on the respiratory system
5. Education and reinforcement of control use

Periodic

The periodic medical consists of:

1. Questionnaire
 - d. Exposure history including use of controls
 - e. Medical history
 - f. Standardised respiratory questionnaire
2. Medical examination focusing on the respiratory system
3. Education and reinforcement of control use
4. If there is a clinical indication – chest x-ray and spirometry (this would be rare)

NOHSC standards recommend 2 yearly review.

Exit

On cessation of employment, exposed workers should have an exit medical consisting of:

1. Questionnaire
 - g. Exposure history including use of controls
 - h. Medical history
 - i. Standardised respiratory questionnaire
2. Medical examination focusing on the respiratory system
3. If there is a clinical indication – chest x-ray and spirometry (this would be rare)

Spirometry

A single spirometer will be used for all tests. It must be calibrated daily before each period of testing. Testing will be conducted in accordance with Mine Health Surveillance guidelines. If a good quality test cannot be obtained the worker will need to return for further spirometric testing supervised by the appointed medical practitioner.

Abnormal findings

If there are any abnormalities the worker will need to return for a comprehensive assessment by the appointed medical practitioner. If necessary, referral to the relevant specialist at the expense of the employer will be made.

Reporting to employer

Individual reporting

For each individual, the employer will receive a certificate stating whether the worker is fit to continue working, whether remedial action is required and whether further investigation is required. This certificate will be kept with the individual's on-site health record. The date, type of assessment and result will also be recorded on the summary sheet in the individual health record.

A copy of this certificate will be scanned and entered into the ABC Company OHS database.

Group reporting

The employer will receive a report on the outcome of the health surveillance based on de-identified group data.

Notification of Worksafe

If surveillance reveals significant exposure Worksafe must be notified by the appointed medical practitioner using the prescribed form as set out in the regulations.

Privacy and confidentiality

Health surveillance records are to be treated as confidential records. Release of identified information contained in the records to the employer or other parties will require the

informed and written consent of the worker involved. The employer has no right to access non-work related medical information.

De-identified group data will be used to report the result of health surveillance to the employer.

Data storage

During his employment, a worker's health surveillance record will consist of the relevant initial, periodic and exit medicals including any records of personal exposure (personal monitoring). These records are kept separate from employment and medical records. These records must be stored for 30 years from the time of last exposure.

Records are to be scanned and stored digitally on CD media. Individual records are to be stored as PDF files. Two copies will be made to reduce the risk of data loss. One copy will be stored at the ABC Company OHS department in a locked cabinet with access limited to the Occupational Health & Safety manager. One copy will be stored securely at CHP/OccuMED.

As technology evolves, old data will be translated and transferred to new formats and media as required to maintain accessibility.

Monitoring results

Monitoring results of personal exposure will be incorporated with the individual health surveillance records. Personal monitoring results will also be scanned and entered into the ABC Company OHS database.

Recall system

ABC Company is responsible for arranging recall for periodical health surveillance. The recall system will be based on the ABC Company OHS database system.

References

¹ NOHSC. Guidelines for health surveillance [NOHSC:7039(1995)]. 1995

² Hazardous Substances Information System. NOHSC. <http://www.nohsc.gov.au/applications/hsis/>

³ American Thoracic Society. Adverse effects of crystalline silica exposure. <http://www.thoracic.org/sections/publications/statements/pages/eoh/506.html>

⁴ Myers JE, Thompson ML, Ramushu S et al. The nervous system effects of occupational exposure on workers in a South African manganese smelter. *Neurotoxicology*. 2003 Dec;24(6):885-94.

⁵ Levy BS, Nassetta WJ. Neurologic effects of manganese in humans: a review. *Int J Occup Environ Health*. 2003 Apr-Jun;9(2):153-63.

Appendix 1 – Occupational Safety And Health Regulations 1996

Schedule 5.3 — Hazardous substances for which health surveillance is required

[Regulation 5.23(1)]

Hazardous Substance	Type of Health Surveillance
crystalline silica	<ul style="list-style-type: none">• Demography, occupational and medical history and health advice.• Completion of a standardized respiratory questionnaire.• Standardized respiratory function tests such as FEV₁, FVC and FEV₁/FVC.• Chest X-ray, full size PA view.• Records of personal exposure.