

**GUIDELINES ON THE REMOVAL OF  
ASBESTOS MATERIALS IN BUILDINGS**

**OCCUPATIONAL SAFETY and HEALTH DIVISION  
MINISTRY OF MANPOWER**

<b>CONTENTS</b>	<b>Pg No</b>
Introduction	1
Sources Of Asbestos	1
Health Effects	1
Identification And Notification	1
Medical Examinations	2
Engineering and Work Practice Controls	
Preparation and Demarcation Of Asbestos Work Area	2
Isolation of Asbestos Work Area	3
Safe Work Procedures	3
Wet Methods	
Personal Protective Equipment	4
Respirators	
Protective Clothing	
Washing/Changing Facilities	5
Housekeeping	5
Waste Disposal	5
Transportation of Asbestos Waste	6

### ***Figures***

Figure 1: Room Preparation

Figure 2: Enclosure For Ceiling Work

Figure 3: Cleaning Up With HEPA-Filtered Vacuum

Figure 4: Worker Placing Asbestos Waste In Container

### ***Appendices***

Appendix I - Notification Form For Process Involving Asbestos

Appendix II - List Of Asbestos Analysing Laboratories

Appendix III - List Of Companies Dealing With Industrial Vacuum Cleaners  
(With High-Efficiency Particulate Air Filters)

Appendix IV - Threshold Limit Values For Asbestos

Appendix V - Application Form For Written Permission To Dispose Of Toxic  
Industrial Wastes At Semakau Landfill

Appendix VI - List Of Companies To Contact For Disposal Of Asbestos  
Waste At Semakau Landfill

## **INTRODUCTION**

The use of asbestos in buildings has been banned by the National Environment Agency since 1989. However, many old buildings in Singapore contain asbestos or have asbestos-containing materials. Special precautions are needed in the removal, repair, dismantling, demolition, renovation, maintenance and alteration of structures in buildings containing asbestos. These guidelines are prepared by the Occupational Safety and Health Division, Ministry of Manpower, for the guidance of those who undertake such work.

## **SOURCES OF ASBESTOS**

Asbestos has in the past been widely used in a variety of building materials including floor tiles, ceiling tiles, asbestos-cement pipes or sheets, refuse chutes and fire-resistant structures. It may also be present in pipe lagging or heat insulation materials and in cladding or sprayed-on materials located on beams and between walls.

The potential for an asbestos-containing product to release respirable fibres depends largely on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to release fibres. The fibrous sprayed-on materials used for fireproofing, insulation or sound proofing are considered to be friable, and they readily release airborne fibres if disturbed. Materials such as vinyl-asbestos floor tiles and roofing corrugated sheets are considered non-friable if intact and generally do not emit airborne fibres unless subjected to sanding, sawing or other aggressive operations. Asbestos-cement pipes or sheets can liberate airborne fibres if the materials are cut or sawed, or if they are broken.

## **HEALTH EFFECTS**

Asbestos fibres enter the body by inhalation of airborne dust or by ingestion, and can become embedded in the tissues of the respiratory or digestive systems. Exposure to asbestos dust can cause numerous disabling or fatal diseases. Inhaling or ingesting fibres from contaminated clothing or skin can also result in such diseases. Among these diseases are asbestosis (scarring and fibrosis of the lung tissues), lung cancer, mesothelioma - a cancer of the thin membrane lining of the chest and abdomen, and gastrointestinal cancer. The symptoms of these diseases generally do not appear for 20 or more years after initial exposure.

## **IDENTIFICATION AND NOTIFICATION**

The presence of asbestos materials may be indicated in the original building plans or specifications. It is advisable to check these before work is carried out on a building.

The Factories (Asbestos) Regulations, 1980 require, among other things, any person who undertakes work involving asbestos to notify the Chief Inspector of Factories at least 28 days before the commencement of such work. The Notification Form is in Appendix I.

The Factories (Asbestos) (Amendment) Regulations, 1989 require, inter alia, occupiers, contractors or employers to check if materials to be used or handled contain asbestos. If necessary, they have to send those materials suspected of containing

asbestos for analysis. A list of laboratories that provide such analysis is given in Appendix II.

## **MEDICAL EXAMINATIONS**

Workers who have to handle or be exposed to asbestos in their work should have a medical examination conducted by a Designated Factory Doctor before they start such work. The medical examination should include a large-size chest X-ray examination, unless they have had one within the past 12 months. This is required under the Factories (Medical Examinations) Regulations.

A copy of the Summary Report on these X-ray examinations and a list of asbestos workers should be forwarded to:

Occupational Safety & Health Division  
Ministry of Manpower  
18 Havelock Road #03-02  
Singapore 059764

The chest X-ray films and original reports should be kept for at least 5 years by the employer and produced for inspection at any time.

Employers of asbestos workers who have resigned or left their employment should inform the Occupational Safety and Health Division.

## **ENGINEERING AND WORK PRACTICE CONTROLS**

### **Preparation And Demarcation Of Asbestos Work Area**

- An asbestos work area should be established within which there is expected to be exposure to airborne asbestos fibres during the asbestos removal work.
- Only persons who are directly involved in asbestos removal work should be allowed to enter the asbestos work area.
- Barriers or barricades should be erected to prevent unauthorised persons entering the asbestos work area.
- All movable objects, e.g., furniture, should be removed from the asbestos work area to prevent these from being contaminated with asbestos. Immovable objects should be covered completely with impermeable polyethylene sheeting. If objects have already been contaminated, they should be thoroughly cleaned with an industrial vacuum cleaner equipped with a High Efficiency Particulate Air (HEPA) filter or wet wiped before they are removed or covered.
- There should be no eating, drinking or smoking in the asbestos work area.
- Warning signs should be displayed at each asbestos work area, and posted at all approaches to the asbestos work area. Where necessary, signs should bear pictures and graphics, or be written in appropriate language so that all persons understand them. These signs should bear the following information:

**Asbestos Work Area  
Authorised Personnel Only  
Do Not Inhale Dust  
Respirators And Protective Clothing Required**

- Any ventilation system serving the asbestos work area should be disabled and the ventilation ducts leading to and from the asbestos work area should be sealed.

### **Isolation Of Asbestos Work Area**

- Where walls, floors and ceilings do not completely enclose the asbestos work area, the asbestos work area should be isolated from the surrounding environment by means of impermeable polyethylene sheeting or other suitable materials.
- The polyethylene sheeting should be secured to the ceiling and floor using adhesive tape.
- For major asbestos removal work, the isolated asbestos work area should be maintained at a negative pressure of at least 5 Pascals, and supplied with an air exchange rate of at least 4 air changes every hour. Air that is removed from the asbestos work area should pass through a High Efficiency Particulate Air (HEPA) filter.
- On completion of the asbestos removal work, the polyethylene sheeting should be cleaned either by vacuuming or damp wiping, after which it should be placed in a dust-tight, appropriately-labelled container.

### **Safe Work Procedures**

- Except for the removal of screws, power-operated tools should not be used to remove asbestos-containing material (unless they are incorporated with dust suppression or dust extraction attachments with a High Efficiency Particulate Air [HEPA] filter).
- Compressed air tools should not be used to remove asbestos-containing materials (unless they are used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air).
- Asbestos-containing sheets or panels should be removed with minimal breakage. The removed sheets or panels should be lowered to the ground to minimise dust generation.

### **Wet Methods**

- Wet methods should be used where feasible to ensure that asbestos fibres do not become airborne.
- A wetting agent, e.g., water or poly vinyl acetate, should be applied by means of an airless sprayer to the entire surface and depth of the asbestos-containing materials.
- The water spray should be directed at the point of removal or breakage of the asbestos-containing materials.

- Wetting should be done at the beginning of the asbestos removal work as well as continually throughout the duration of the removal work.
- High pressure water or other fluids should not be used to clean up or remove asbestos dust from any surface.
- The removed asbestos-containing materials should also be wetted until disposal. These materials should not be left lying about the site where they may be crushed.

## **Personal Protective Equipment**

### ***Respirators***

- Workers carrying out asbestos removal or any persons entering the asbestos work area should wear a respirator with a High Efficiency Particulate Air (HEPA) filter.
- Respirators should be properly maintained and regularly cleaned. The filters should be changed whenever an increase in breathing resistance is detected.
- Every asbestos worker should be instructed and trained in the use of respirators.
- Workers wearing respirators should be allowed to wash their faces and respirator facepieces whenever necessary to prevent skin irritation. This should be done outside the asbestos work area.
- Respirators should be issued to workers on a personal basis. The respirators should be tested for correct size and fit.

### ***Protective Clothing***

- Water-proof coveralls or similar full-body protective clothing including snug fitting wrist, ankle and neck cuffs, head coverings, gloves and foot coverings should be worn by all asbestos workers. Such protective clothing should not have pockets and should be made of a material which does not readily retain or permit penetration of asbestos fibres.
- Where there is a possibility of eye irritation, goggles should also be worn.
- On completion of the asbestos removal work, the work clothing should be vacuumed or wet wiped before removal to minimise the dispersion of asbestos fibres. Blowing or shaking should not be allowed to remove asbestos fibres from work clothing.
- The removed work clothing should be stored in closed, labelled containers that prevent the dispersion of the asbestos fibres into the surrounding environment.
- The removed work clothing should either be disposed of or washed on-site. No worker should be allowed to bring his work clothing home for laundering.
- Contaminated work clothing taken out of change rooms or the asbestos work area should be transported in sealed impermeable bags, or other closed impermeable containers. These containers should be appropriately labelled.

## **Washing / Changing Facilities**

- Change rooms should be provided for workers to remove asbestos-contaminated work clothing. This room should be supplied with impermeable, labelled bags and containers for the containment and disposal of contaminated work clothing and equipment.
- Shower facilities should be provided for workers to wash themselves and change into street clothing after the asbestos removal work.
- The change room and shower room should be contiguous, and isolated from each other by a double curtain of polyethylene sheeting or other suitable material. They should be located as near as practicable to the asbestos work area.
- Laundering of contaminated clothing should be done so as to minimise the release of airborne asbestos fibres.
- Laundries engaged in the cleaning of protective clothing should be informed of the precautions needed to prevent exposure to asbestos fibres, and warned against shaking or brushing prior to laundering.

## **Housekeeping**

- During and after the asbestos removal work, the asbestos work area and all other asbestos-contaminated surfaces should be kept as free as possible from accumulations of asbestos-containing waste or dust by the use of industrial vacuum cleaners equipped with High Efficiency Particulate Air (HEPA) filters or by wet cleaning methods.
- Compressed air should not be used to clean surfaces contaminated by asbestos.
- Dry sweeping should not be carried out to clean any area or surface contaminated with asbestos.

## **Waste Disposal**

- Asbestos waste, debris, bags, containers, equipment and asbestos-contaminated clothing and sheeting consigned for disposal should be collected into sealed, labelled, impermeable bags or other closed, labelled, impermeable containers.
- Warning labels should be affixed to all containers of asbestos-containing material. These labels should contain the following information:

**Asbestos Material  
Do Not Inhale Dust**

- All bags or containers of asbestos-containing material should be consolidated and stored in a designated asbestos waste area. This area should be distinguished from other areas by means of warning labels.
- An application for written permission to dispose of the asbestos waste should be made to the Ministry of the Environment. The application form is given in Appendix III.

### **Transportation Of Asbestos Waste**

- Containers of asbestos waste should be loaded onto the transport vehicle in a careful manner so as to prevent damage to the containers.
- The vehicles used to transport containers of asbestos waste should have enclosed compartments or canvas sheets to prevent damage to the containers and also to prevent fibre release.
- Transportation of large quantities of asbestos waste should be in a 20 m<sup>3</sup> “roll-off” box in which the asbestos waste should be sealed.
- Compactors should not be used as they may cause rupture to the containers of asbestos waste.
- At the disposal site, the asbestos waste should be off-loaded into an excavated pit to avoid dust generation and release of asbestos fibres.
- The Ministry of the Environment should be consulted on the proper disposal and transportation of asbestos materials.

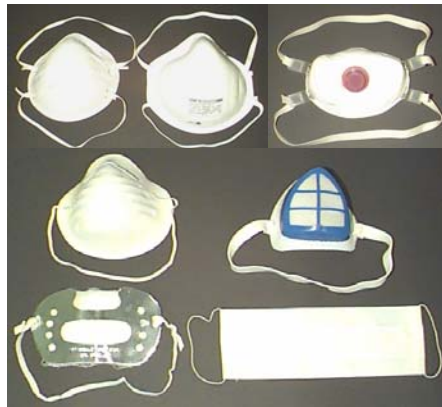




## EXAMPLES OF IMPROPER WORK PRACTICES AND CONDITIONS ON ASBESTOS REMOVAL



*The incorrect type of respirator for protection against asbestos dusts.*



*No warning signage is displayed at the asbestos work area*



*A portion of wall material removed for analysis by laboratory to determine the presence of asbestos*



*Exposed surface or opening (e.g. hole) is **not** sealed/covered after sample-taking. Asbestos fibres, if any, may be emitted into the air if the material is disturbed*



### **WARNING:**

**Stop Work Order can be issued and legal action can be taken against the demolition company or contractor if any of the above occurs. If removal of asbestos material is done within a factory premises, legal action can also be taken against the factory occupier.**



*Poor housekeeping — Asbestos debris is not immediately collected into impermeable bags or other impermeable containers. Some debris are not cleared, but are left lying around the ground.*

Note: Asbestos-containing sheets or panels should be removed with minimal breakage. The removed sheets or panels should be carefully lowered to the ground to avoid breakage, so as to minimise dust generation.

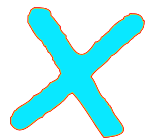
**WARNING:**

**Stop Work Order can be issued and legal action can be taken against the demolition company or contractor if any of the above occurs. If removal of asbestos material is done within a factory premises, legal action can also be taken against the factory occupier.**



*Leakages:- Plastic sheets are not properly secured. Hence, asbestos fibres generated during the removal work can escape into the outer atmosphere.*

Note: On completion of the asbestos removal work, the canvas sheets should be cleaned either by vacuuming or damp wiping prior to dismantling, after which they should be placed in dust-tight, appropriately-labelled container(s) for disposal.



**WARNING:**

**Stop Work Order can be issued and legal action can be taken against the demolition company or contractor if any of the above occurs. If removal of asbestos material is done within a factory premises, legal action can also be taken against the factory occupier.**

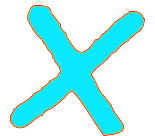


*Removed asbestos sheets are not covered/wrapped with impermeable sheeting*



*Asbestos sheets are not properly covered prior to wrapping.*

(Note: The asbestos sheets should be properly covered temporarily if there is insufficient time to wrap all of them with impermeable sheeting.)



*Uncovered asbestos sheets are placed close to the non-asbestos wastes.*

(Note: Asbestos sheets should be properly covered. In addition, asbestos and non-asbestos wastes should be placed far apart.)



*Fragments of asbestos sheet are used as weight to prevent the canvas sheet from being flipped over by the wind*

Note: On completion of the asbestos removal work, the canvas sheets should be cleaned either by vacuuming or damp wiping, after which they should be placed in dust-tight, appropriately-labeled container(s) for disposal.

**WARNING:**

**Stop Work Order can be issued and legal action can be taken against the demolition company or contractor if any of the above occurs. If removal of asbestos material is done within a factory premises, legal action can also be taken against the factory occupier.**



*Disposal bags containing asbestos debris are not affixed with warning labels. In addition, one of the bags is torn.*

Note: The torn bag of debris (including the bag) should be immediately placed into another new disposal bag, after removing the protruding fragment. Not advisable to shift the debris out from the torn bag and into a new bag.



*Disposal bags containing asbestos debris are not tied and affixed with warning labels.*



*Personal protective appliances are not properly kept when not in use.*



**WARNING:**

**Stop Work Order can be issued and legal action can be taken against the demolition company or contractor if any of the above occurs. If removal of asbestos material is done within a factory premises, legal action can also be taken against the factory occupier.**

## EXAMPLES OF PROPER WORK PRACTICES AND CONDITIONS



*Warning sign displayed at the asbestos work area*



*Removed asbestos sheets are wrapped with polyethylene sheeting and labelled prior to disposal*



*Warning label affixed on disposal bag containing asbestos waste.*





*Asbestos sheets are wrapped with polyethylene sheeting and the asbestos fragments are collected into impermeable disposal bags. Both the wrapped asbestos sheets and disposal bags are affixed with warning labels.*

*Barriers are erected to isolate the asbestos waste. Warning signs are displayed on the barriers.*







*Windows and entrances to asbestos work areas are properly sealed with plastic sheets. The entrance openings are properly closed after entry or exit by worker(s).*



Note: On completion of the asbestos removal work, the canvas sheets should be cleaned either by vacuuming or damp wiping prior to dismantling, after which they should be placed in dust-tight, appropriately-labelled container(s) for disposal.



*Isolated changing room with shower facilities is provided for the workers to remove asbestos-contaminated work clothing. The room is supplied with impermeable, labelled bags and containers for the containment and disposal of contaminated work clothing and equipment. Asbestos particulate is removed from the wastewater by means of a suitable filter fixed at the outlet of the discharge pipe prior to release into the sewage drain. Alternatively, the asbestos-containing wastewater could be collected in a suitable container and disposed as asbestos waste.*



Spray-bottle with water can be used to wet the joints of screws, bolts or nuts (which secure the asbestos sheets) prior to removal. This is to prevent asbestos fibres from becoming airborne during removal.



Fit test

*Worker is provided with proper respirator (with high-efficiency particulate filters). Fit test is conducted to ensure that the respirator provided is of correct size and fit on the day of purchase. In addition, the worker has been instructed and trained in the use of the respirator.*



## IMPROPER WORK PRACTICE



*Incorrect work practice — Unnecessary breaking of asbestos sheets into fragments could result in asbestos dust generation. In addition, the sheets are not wetted prior to breaking.*

**Note:**

Asbestos removal work is done in an open area in this case.

## PROPER WORK PRACTICE



Wooden board  
(Support base for  
breaking asbestos  
sheets)



*Breaking of asbestos sheet is done inside a tent. Water is applied at the point of breakage of the sheet throughout the whole breaking process. The pieces of asbestos fragment are immediately collected into a disposal bag. Suitable personal protective appliances are used during all asbestos-handling tasks.*

**Note:** Breaking of asbestos sheets should be avoided unless it is necessary (e.g. The asbestos sheet accidentally dropped onto the ground during removal from the roof and broke into fragments. It is thus not practical to wrap the broken pieces. In addition, the broken pieces are too big to be contained in the disposal bag.) Breaking of large asbestos sheets into smaller pieces should never be done in an open space.

Note: On completion of the asbestos removal work, the canvas sheets and metal frames of the tent and the wooden board should be cleaned either by vacuuming or damp wiping prior to dismantling. The canvas sheets

*Guidelines On The Removal Of Asbestos Materials In Buildings*

---

are then placed in dust-tight, appropriately-labelled container(s) and the wooden board is wrapped with plastic sheeting for disposal. The metal frames are washed again for re-use.

**PROPER WORK PRACTICE**



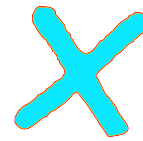
*Asbestos removal work is done inside an enclosed/sealed workplace. Wetting of the asbestos-containing materials is done throughout the asbestos removal work. Water is applied by means of an airless sprayer to the entire surface and depth of the materials. The water spray is especially directed at the point of removal or breakage of the materials. The removed asbestos-containing materials are kept wet until disposal. (High pressure water or other fluids should not be used.) Asbestos materials is collected into a disposal bag on the same day after removal, and not be postponed until the next day. Suitable personal protective appliances are used during all asbestos-handling tasks.*

**Note:** Breaking of large asbestos sheets into smaller pieces may only be allowed in a confined and enclosed space with restricted movement or conveying of the large sheets. It should not be done in an open space.

### **IMPROPER WORK PRACTICE**



*Disposal chute containing asbestos debris is not properly covered. In addition, there is no warning labels affixed on the chute.*



### **PROPER WORK PRACTICE**



*Disposal chute is properly covered and affixed with warning labels*



## **REMOVAL OF ASBESTOS MATERIAL – THINGS TO NOTE**

To facilitate the notification process, please submit the following documents with two copies of the notification form (Appendix 1) :

1. Specifications / receipt of types of respirators and cartridges purchased
2. Respirators fit test certificate of workers
3. Specifications / receipt of work clothing purchased
4. Register of persons employed
5. Medical summary report
6. X-ray summary report
7. Work procedures, diagrams of shower areas and structure to be removed etc

Work involving asbestos must be notified 28 days prior to commencement. Please make sure that the forms are filled up correctly. Incomplete forms will not be processed.

SAMPLE

*Appendix I*

**THE FACTORIES ACT  
(ACT 6)**

**THE FACTORIES (ASBESTOS) REGULATIONS, 1980  
(REGULATION 5)**

**NOTIFICATION OF PROCESS INVOLVING ASBESTOS**

The notice shall be completed in **DUPLICATE** by the person undertaking or about to undertake in a factory, a process involving asbestos, in pursuant to Regulation 5 of the Factories (Asbestos) Regulations, 1980, and forwarded to the Chief Inspector of Factories, Ministry of Manpower, 18, Havelock Road #05-01, Singapore 059764.

---

Name and Address of person undertaking or about to undertake a process involving asbestos:

Tel No: 67894561

ABC PTE LTD, 27 Henderson Industrial Park,  
Singapore 123456

Fax No: 67894562

---

Address of place where process involving asbestos is being undertaken or about to be undertaken:

Tel No: 61234567

XYZ PRIMARY SCHOOL, 5 BEDOK ROAD,  
SINGAPORE 456123

Fax No: 61234568

---

No. of workers employed in the process: 10

---

How asbestos is used (brief description of process):

Asbestos roof sheets, wall panels, roof panels, pipe lagging

---

Type(s) of asbestos used: White / Blue / Red asbestos (Chrysotile, Amosite, Crocidolite)

---

Duration of Process (if process is temporary):

Commencement Date:

\_\_\_\_\_ 1\_\_ Months \_\_2\_\_\_\_\_ Days

---

I hereby certify that, to the best of my knowledge, the particulars given above are correct.

---

Date

---

Name, Designation and Signature of Person  
Undertaking the Process





**THE FACTORIES ACT  
(ACT 6)**

**THE FACTORIES (ASBESTOS) REGULATIONS, 1980  
(REGULATION 5)**

**NOTIFICATION OF PROCESS INVOLVING ASBESTOS**

The notice shall be completed in DUPLICATE by the person undertaking or about to undertake in a factory, a process involving asbestos, in pursuant to Regulation 5 of the Factories (Asbestos) Regulations, 1980, and forwarded to the Chief Inspector of Factories, Ministry of Manpower, 18, Havelock Road #05-01, Singapore 059764.

---

Name and Address of person undertaking or about to undertake a process involving asbestos:

Tel No:

Fax No:

---

Address of place where process involving asbestos is being undertaken or about to be undertaken:

Tel No:

Fax No:

---

No. of workers employed in the process:

---

How asbestos is used (brief description of process):

---

Type(s) of asbestos used:

---

Duration of Process (if process is temporary):

\_\_\_\_\_ Months \_\_\_\_\_ Days

Commencement Date:

---

I hereby certify that, to the best of my knowledge, the particulars given above are correct.

---

Date

---

Name, Designation and Signature of Person Undertaking the Process

**Appendix II**

**LIST OF ASBESTOS ANALYSING LABORATORIES**

- |   |   |                                    |
|---|---|------------------------------------|
| 1 | Analytical Laboratory (S) Pte Ltd<br>134 Genting Lane<br>Singapore 349580   | Tel : 6746 0886<br>Fax : 6746 3830 |
| 2 | Department of Community, Occupational<br>and Family Medicine<br>National University of Singapore<br>Faculty of Medicine MD3<br>16 Medical Drive<br>Singapore 117597 | Tel : 6874 4999<br>Fax : 6779 1489 |
| 3 | SETSCO Services Pte Ltd<br>18 Teban Gardens Crescent<br>Singapore 608925  | Tel : 6566 7777<br>Fax : 6566 7718 |
| 4 | SGS Testing & Control Services<br>Singapore (Pte) Ltd<br>Blk 26 Ayer Rajah Crescent<br>#03-07<br>Singapore 139944   | Tel : 6778 1550<br>Fax : 6779 0527 |

**Note:** This list is not exhaustive and will be updated from time to time. Inclusion of companies in this list does not in any way imply recommendation on the part by the Ministry of Manpower (MOM) of their services. MOM expressly disclaims all responsibilities and liabilities of every kind and nature.

**Appendix III**

**LIST OF COMPANIES DEALING WITH INDUSTRIAL VACUUM CLEANERS (WITH HIGH-EFFICIENCY PARTICULATE AIR FILTERS) & DUST EXTRACTING SYSTEMS**

- |    |  |                                  |
|----|--|----------------------------------|
| 1. | Atoz Performance Pte Ltd<br>11 Kallang Place #06-02<br>Singapore 339155                  | Tel: 6299 1966<br>Fax: 6295 0207 |
| 2. | Klenco (S) Pte Ltd<br>18 Gul Crescent<br>Singapore 629527                                | Tel: 6862 3388<br>Fax: 6861 7575 |
| 3. | Nilfisk-Advance Pte Ltd<br>22 Woodlands Industrial Park E1<br>#02-00<br>Singapore 757740 | Tel: 6365 3395<br>Fax: 6368 4110 |
| 4. | Performance Janitorial Supplies Pte Ltd<br>7 Kallang Place<br>#05-08<br>Singapore 339153 | Tel: 6296 8886<br>Fax: 6292 0065 |

**Note: This list is not exhaustive and will be updated from time to time. Inclusion of companies in this list does not in any way imply recommendation on the part by the Ministry of Manpower (MOM) of their services. MOM expressly disclaims all responsibilities and liabilities of every kind and nature.**

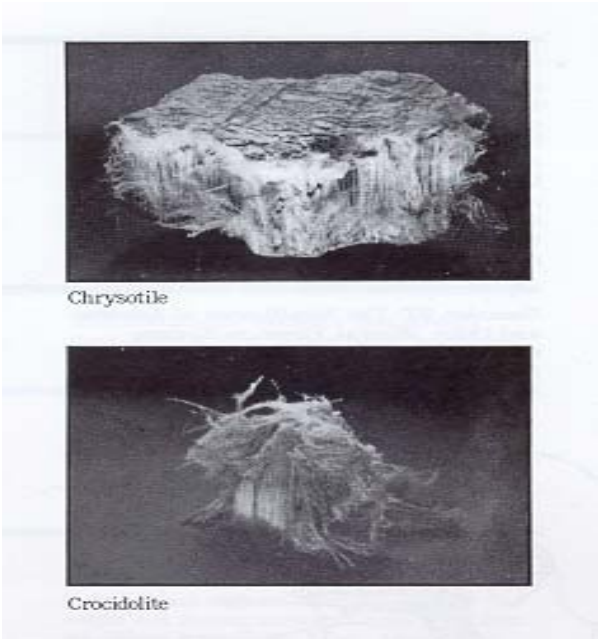
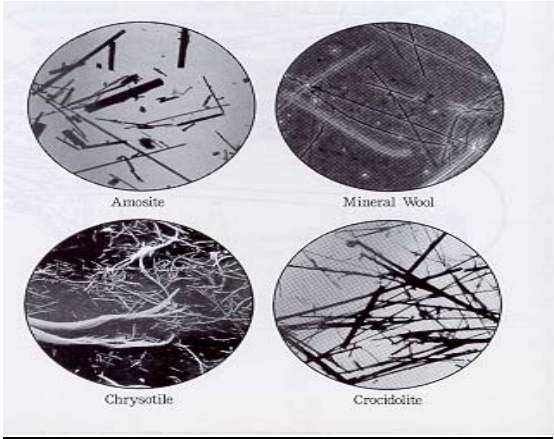
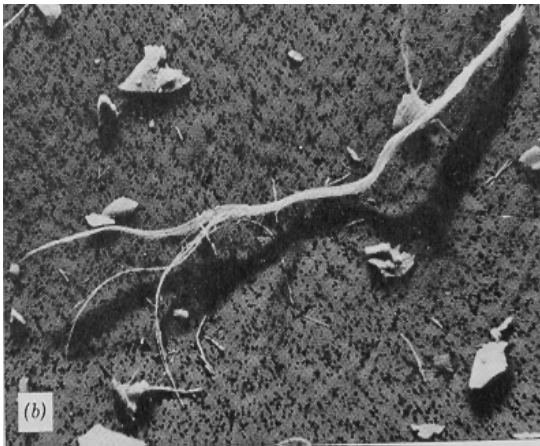
***Appendix IV***

**THRESHOLD LIMIT VALUES FOR ASBESTOS**

**All forms of Asbestos**

**0.1 fibres/cc**





**Appendix V**

**APPLICATION OF WRITTEN PERMISSION TO DISPOSE OF TOXIC INDUSTRIAL WASTES AT SEMAKAU LANDFILL**

1 Name of generator:

\_\_\_\_\_

2 Address:

\_\_\_\_\_

3 Waste to be disposed of:

\_\_\_\_\_

4 Process from which the waste is being generated:

\_\_\_\_\_

5 Site Address (asbestos waste only):

\_\_\_\_\_

6 Type of container used:

\_\_\_\_\_

7 Is this a one-time disposal? \* Yes / No

a) If Yes, state quantity: \_\_\_\_\_

b) If No, what is the frequency and quantity to be disposed of during each disposal?

i) \_\_\_\_\_ times per \* month / year

ii) \_\_\_\_\_ metric tonnes per disposal

---

---

I, \_\_\_\_\_, \_\_\_\_\_  
(Name of Declarant) (Designation)

\_\_\_\_\_ hereby declares that the above  
(Name of Generator)

waste has been treated/tested to comply with the EPA Leaching Test Standard and rendered safe to be landfilled with other general wastes at Semakau Landfill.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Company's Stamp

\* Please delete accordingly.



**Appendix VI**

**LIST OF COMPANIES TO CONTACT FOR DISPOSAL OF ASBESTOS WASTE AT SEMAKAU LANDFILL**

<b>Company Name</b>	<b>Address</b>	<b>Telephone No.</b>
ECO Industrial Environmental Engineering Pte Ltd	23 Tuas View Circuit Singapore 637768	6863 3323
North Shipyard Pte Ltd	23 Tuas Crescent Singapore 638717	6862 2606
Purechem Onyx Pte Ltd	7 Tuas Avenue 10 Singapore 639131	68616668
Singaport Cleanseas Pte Ltd	2 Maritime Square #03-01 SPI Building Singapore 099255	6275 5868
YLS Steel Pte Ltd	30 Tuas South Avenue 8 Singapore 637653	6861 3183

Note: This list is not exhaustive and will be updated from time to time. Inclusion of companies in this list does not in any way imply recommendation on the part by the Ministry of Manpower of their services. The Ministry expressly disclaims all responsibilities and liabilities of every kind and nature.

Updated on 27<sup>th</sup> January 2005

## **AIR-PURIFYING & SUPPLIED - AIR RESPIRATORS**

NOTE:-

1. Always choose a respirator which satisfies the standards of the approving authorities of the country of origin such as NIOSH/MSHA (USA), CEN (Europe), AS/NZS (Australia/New Zealand) and JIS (Japan), etc.
2. The **Non-powered Air-Purifying Respirators** and **Powered Air Purifying Respirators** **do not** provide protection against the following atmospheres:-
  - a) Atmosphere containing less than 19.5% oxygen;
  - b) Atmosphere with unknown air contaminants or concentrations;
  - c) Atmosphere Immediately Dangerous to Life and Health (IDLH);
  - d) **Atmosphere with levels exceeding the maximum-use concentration established by the approving authorities of the country of origin.**
3. Use Supplied-Air Respirators (Airline Respirators or Self-contained Breathing Apparatus [SCBA] ) for chemical vapours/gases which do not have adequate warning properties or which cannot be removed by any available cartridge/canister filters. However, **Airline Respirators alone are NOT to be used in oxygen-deficient atmospheres, IDLH or emergency situations.**
4. **Use only SCBA or Full-face Airline Respirators (Positive pressure) with Escape SCBA or Helmet/Hood Continuous Flow Airline Respirators with Escape SCBA for oxygen-deficient atmospheres, IDLH or emergency situations.**
5. **Always check with the manufacturers/vendors on the appropriate type of respirators to be used.**





Half-face Air-purifying  
Respirator with Cartridge filters



Full-face Air-purifying  
Respirator with Cartridge filters



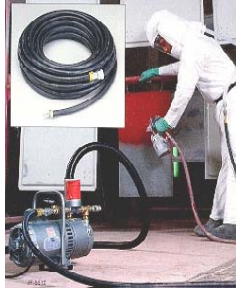
Full-face Air-purifying  
Respirator with Gas-canister filter



Powered Air-purifying  
Respirator



Airline Respirator



Self-contained Breathing Apparatus



Connects to  
compressor

Airline Respirator with Escape SCBA

### **MECHANICAL-FILTER ELEMENT**

A mechanical-filter element provides protection against particulate matter such as dusts, mists, or metal-fumes. This type of element "filters" particulate matter by physically trapping it in the fibrous filter material,

In addition, the wool-felt filters possess an electrostatic charge that increases filter efficiency by electrostatically attracting the particles to the fibres. Although mechanical filters become more efficient as they are used, they should be changed when breathing resistance becomes excessive.

### **CHEMICAL-CARTRIDGE ELEMENTS**

Chemical-cartridge elements are filled with a specially treated activated-carbon with a very high absorption capacity. Gases and vapours passing through the chemical cartridges are attracted and held to the surface of the carbon. In the case of acid and alkaline gases, a chemical reaction and/or absorption occurs.

Unlike mechanical-filters, chemical cartridges do not become more efficient with use. Their absorption capacity is limited; thus when wearers detect any taste, odour, or irritation, they should leave the contaminated area and change the cartridges.

**CLASSIFICATIONS OF FILTERS, CARTRIDGES & CANISTERS FOR AIR-PURIFYING RESPIRATORS UNDER EUROPEAN (CEN) & AUSTRALIAN/NEW ZEALAND (AS/NZS) STANDARDS**

CARTRIDGE/CANISTER/FILTER TYPES	USE FOR
Type 'A' Cartridge/Canister	Vapours of Organic-solvents with high boiling point ( > 65°C ) such as Trichloroethylene (TCE), Perchloroethylene/Tetrachloroethylene (PCE), Toluene, Xylene, Hexane, etc.
Type 'AX' Cartridge/Canister	Vapours of Organic-solvents with low boiling point ( ≤ 65°C ) such as Acetaldehyde, Butane, Ethyl formate, Vinyl chloride, etc. Note: 'AX' Gas Filter shall be used only for protection against a single contaminant, and <b>NOT</b> against mixtures of low boiling compounds and other organic compounds. This is to prevent desorption effect.
Type 'B' Cartridge/Canister	Certain inorganic gases and vapours, such as Chlorine, Formaldehyde, Hydrogen sulfide, Hydrogen cyanide, etc. Excluding Carbon monoxide.
Type 'E' Cartridge/Canister	Sulfur dioxide, Hydrogen chloride, and other acid gases and vapours.
Type 'G' Cartridge/Canister	Certain organic compounds with vapour pressures less than 1.3 Pa (0.01 mmHg) at 25°C. (Under AS/NZS standard)
Type 'K' Cartridge/Canister	Ammonia, Methylamine and organic ammonia derivatives.
Type 'CO' Cartridge/Canister	Carbon monoxide gas.
Type 'Hg' Cartridge/Canister	Metallic mercury vapour.
Type 'MB' Cartridge/Canister	Methyl bromide. (Under AS/NZS standard)
Type 'NO' Cartridge/Canister	Nitrous fumes and Oxides of nitrogen, such as Nitric Oxide, Nitrogen dioxide, etc.
Type 'P1' Particulate Prefilter	Solid particles of inert substances. Can be used alone or together with Vapours or Gases cartridges.
Type 'P2' Particulate Prefilter	Solid and liquid particles of harmful substances. Can be used alone or together with Vapours or Gases cartridges.
Type 'P3' Particulate Prefilter/Cartridge	(1) Solid and liquid particles of toxic and very toxic substances. (2) Radionuclides, Radon daughters and Asbestos-containing dusts and mists.
Paint-Spray Prefilter ( Usually type 'P1' )	Use together with Organic-Vapours cartridge for <b>SPRAY-PAINTING</b> .
Pesticide Filter/Prefilter ( Usually type 'P1' )	Use alone for <b>dry-powdered PESTICIDES</b> or together with Organic-Vapour cartridge for protection against <b>solvent-based PESTICIDES</b> . <b>NOT</b> for use against <b>FUMIGANTS</b> .

CLASSIFICATIONS OF FILTERS, CARTRIDGES & CANISTERS FOR AIR-PURIFYING RESPIRATORS UNDER AMERICAN (NIOSH) STANDARD

CARTRIDGE/CANISTER/FILTER TYPES	USE FOR
Organic-Vapour Cartridge/Canister	Vapours of Organic-solvents such as Trichloroethylene (TCE), Perchloroethylene/Tetrachloroethylene (PCE), Toluene, Xylene, Hexane, etc.
Acid-Gas Cartridge/Canister	Chlorine, Hydrogen chloride, and Sulfur dioxide.
Organic-Vapour/Acid-Gas Cartridge/Canister	For Organic-vapours and Acid-gases.
Ammonia/Methylamine Cartridge/Canister	Ammonia and Methylamine gases.
Formaldehyde Cartridge/Canister	Formaldehyde vapour.
Mercury Vapour/Chlorine Cartridge/Canister	Metallic Mercury-vapour and Chlorine-gas.
Multi-Gas-and-Vapour Cartridge	Organic-vapours, Acid-gases, Ammonia, Methylamine, Formaldehyde and Chlorine. Recommended for use in atmospheres where various types of gases and vapours are present. <b>NOT for mercury vapour.</b>
N95, R95 and P95 Particulate Prefilter	Provide 95% filtering efficiency against dusts, mists and fumes of inert and harmful substances.
N97, R97 and P97 Particulate Prefilter	Provide 99% filtering efficiency against dusts, mists and fumes of inert and harmful substances
N100, R100 and P100 Particulate Prefilter/Cartridge	Provide 99.97% filtering efficiency against:- (1) Dusts, mists, and fumes of toxic and very toxic substances. (2) Radionuclides, Radon daughters and Asbestos-containing dusts and mists.
Paint-Spray Prefilter	Use together with Organic-Vapours cartridge for <b>SPRAY-PAINTING</b> .
Pesticide Filter/Prefilter	Use alone for <b>dry-powdered PESTICIDES</b> or together with Organic-Vapour cartridge for protection against <b>solvent-based PESTICIDES</b> . <b>NOT</b> for use against <b>FUMIGANTS</b> .

Note: 'R' and 'P' series particulate filters are used in environments with oil particles present in the air.



## **WARNING**



Do not use :-

- (i) Particulate filters to protect against Gases/Vapours;  
or
- (ii) Vapour/Gas filters to protect against dusts/particulates;  
or
- (iii) Vapour filters to protect against Gases; or
- (iv) Gas filters to protect against Vapours.**

**\* For protection against particulates, gases and vapours, use combination filters.**



## FIT CHECK FOR RESPIRATORS

This should be done every time a respirator is used.



### **NEGATIVE PRESSURE FIT CHECK**

- (1) Close off the inlet openings of the cartridges or filters by covering with the palms, so that air cannot pass.
- (2) Breathe **in** gently so that the face piece collapses slightly, and hold the breath for 10 seconds.
- (3) If the face piece remains slightly collapsed and no inward leakage is detected, the fit is good.



### **POSITIVE PRESSURE FIT CHECK**

- (1) Close off the exhalation valve by covering with the palms, so that air cannot pass.
- (2) Breathe **out** gently so that slight positive pressure can be built up inside the face piece.
- (3) If there is no outward leakages from the edges of the face piece, the fit is good.

**NOTE:**

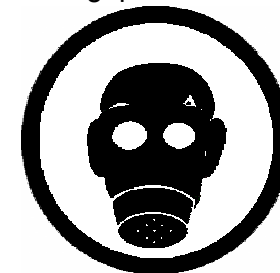
If leakage is present, re-adjust the strap and facepiece and repeat the test.

**LIST OF RESPIRATOR SUPPLIERS**  
**(WITH FIT-TEST & TRAINING )**

Note: This list is not exhaustive and will be updated from time to time. Inclusion of companies in this list does not in any way imply recommendation on the part by the Ministry of Manpower of their services. The Ministry expressly disclaims all responsibilities and liabilities of every kind and nature.

**The supplier will issue a Certificate to the respirator-wearer who has undergone the fit- test and training**

- |   |   |   |  |
|---|---|---|--|
| <p>1. 3M Singapore Pte Ltd<br/>9 Tagore Lane<br/>Singapore 787472</p> <p>2. Draeger Services South East Asia<br/>67 Ayer Rajah Crescent #06-03<br/>Singapore 139950</p> <p>3. Gas &amp; Safety Technology<br/>315 Outram Road #06-01<br/>Tan Boon Liat Building<br/>Singapore 169074</p> <p>4. Lee Seng Heng<br/>1Penjuru Close<br/>Singapore 629733</p> <p>5. Lee Hung Scientific Pte. Ltd<br/>50 Bt. Batok St. 23<br/>unit# 05-10/11/12/13/14<br/>Singapore 659578</p> <p>6. MSA S.E. Asia Pte Ltd<br/>51 Ayer Rajah Crescent #02-03<br/>Singapore 139948</p> | <p>Tel: 64548611<br/>Fax: 64568953</p> <p>Tel: 68729288<br/>Fax: 67732033</p> <p>Tel: 62240862<br/>Fax: 62224436</p> <p>Tel: 62653172<br/>Fax: 62658080</p> <p>Tel: 65606900<br/>Fax: 65676909</p> <p>Tel: 67761633<br/>Fax: 67782529</p> | <p>7. Noah Agencies 'N' Marine<br/>Services Pte Ltd<br/>43 Kian Tech Drive<br/>Singapore 628856</p> <p>8. PDS International Pte Ltd<br/>10 Pandan Cresment #05-03/04<br/>UE Techpark<br/>Singapore 158466</p> <p>9. Pacific Royce (S) Pte Ltd<br/>61 Kaki Bukit Ave 1 #03-06<br/>Shun Li Ind Park<br/>Singapore 417943</p> <p>10. QMT Industrial &amp; Safety Pte Ltd<br/>8A Ruby Lane<br/>Singapore 328279</p> <p>11. QSS Safety Products<br/>239 Ubi Avenue 4<br/>Intrepid Warehouse<br/>Singapore 408821</p> <p>12. Ray Scientific<br/>151 Ubi Avenue 4<br/>Henson Warehouse<br/>Singapore 408779</p> <p>13. Ready Oilfield Safety &amp;<br/>Services Pte Ltd<br/>60 Hillview Terrace<br/>Singapore 669275</p> | <p>Tel: 62660788<br/>Fax: 62661042</p> <p>Tel: 62767366<br/>Fax: 62765080</p> <p>Tel: 67496998<br/>Fax: 67496289</p> <p>Tel: 62956896<br/>Fax: 62956297</p> <p>Tel: 67452966<br/>Fax: 68412966</p> <p>Tel: 67641526<br/>Fax: 67669481</p> <p>Tel: 67648477<br/>Fax: 67648227</p> |
|---|---|---|--|



**REGISTER OF PERSONS EMPLOYED IN WORK INVOLVING EXPOSURE TO ASBESTOS**

Name of Factory: \_\_\_\_\_ Tel No: \_\_\_\_\_

Address of Factory: \_\_\_\_\_ Fax No: \_\_\_\_\_

**PLEASE WRITE IN BLOCK LETTERS**

Name	NRIC/FIN No.	Sex	Date of Birth	Address	Department / Section	Work involving Exposure to asbestos		Involved in Previous Renovation or other work* with asbestos	
						Date Started	Date Stopped	Yes or No	If yes, the total period of exposure (years or months)

\*Whether in same company or other companies.

**THE FACTORIES ACT, (CHAPTER 104)**  
**THE FACTORIES (MEDICAL EXAMINATIONS) REGULATIONS**  
**Regulation 8(2)**  
**SUMMARY REPORT FORM**

Factory : \_\_\_\_\_ Tel: \_\_\_\_\_

Address of factory : \_\_\_\_\_ Fax: \_\_\_\_\_

Hazard : \_\_\_\_\_ Total no. of exposed workers : \_\_\_\_\_

No. of workers examined : \_\_\_\_\_

No. with normal results : \_\_\_\_\_

No. with abnormal results : \_\_\_\_\_

a. Occupational : \_\_\_\_\_

b. Not Occupational : \_\_\_\_\_

No. of workers recommended for suspension: \_\_\_\_\_

**FOR NOISE HAZARD ONLY:**

1. Person(s) performing the audiometric tests is/are as follows:-

*Name*

*NRIC*

2. Number of workers examined who are using hearing protectors during noise exposure: \_\_\_\_\_

**FOR LEAD, CADMIUM, MERCURY, MANGANESE, ARSENIC, TRICHLOROETHYLENE AND PERCHLOROETHYLENE ONLY:**

*The laboratory conducting the analysis \*does/does not participate in the following proficiency testing scheme for the relevant chemical: \*DSS/NEQAS/Robens Institute/Danish EQAS/NIOSH/*

*Others: (Specify) \_\_\_\_\_*

I certify that the information given above is correct. Further, I confirm that the medical examinations were conducted in accordance with the Guidelines for Designated Factory Doctors. In the case of audiometric tests, these were done in a proper booth or test environment and conducted by persons who have undergone a course of training in audiometric screening approved by Chief Inspector of Factories. All workers were counselled on the importance of wearing hearing protectors when exposed to excessive noise.

Details of the workers with abnormal results are attached.

Name of Designated Factory Doctor: \_\_\_\_\_ DFD Reg. No: \_\_\_\_\_

Name & Address of Practice: \_\_\_\_\_

\_\_\_\_\_ Tel No: \_\_\_\_\_ Fax No: \_\_\_\_\_

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\*Delete as appropriate Please ensure all items in the form are completed. Incomplete forms will be returned.

Checklist for Removal of Asbestos  
Occupational Safety and Health Division  
Ministry of Manpower

**1. Before starting work**

- Read the Guidelines on the Removal of Asbestos Materials in Buildings, issued by the Ministry of Manpower (MOM).
- Notify MOM at least 28 days before commencement of work by submitting the Notification Form provided in Appendix 1 of the Guidelines
- Send workers for a large-size chest X-ray & medical examinations to be conducted by a Designated Factory Doctor (DFD). Please refer to the list of DFD attached.
- Submit a copy of summary report on the X-ray examinations to MOM.
- Submit to MOM the receipts and descriptions of the personal protective alliances such as respirators, gloves, protective clothing etc, used.
- Apply for written permission to the National Environment Agency (NEA) for asbestos disposal using Appendix V.
- Consult ENV for proper disposal of asbestos materials. A list of disposal companies is given in Appendix VI.

**2. Preparatory work**

- Erect barriers or barricades to prevent unauthorised persons entering the asbestos work area.
- Display warning signs at the work area
- Remove all movable objects form the work area.
- Cover immovable objects with impermeable polyethylene sheeting
- Disable ventilation system serving the work area.
- Use polyethylene sheeting to isolate work area.
- Provide suitable respirators for workers and test for correct size and fit.
- Provide changing and shower rooms for workers to remove the contaminated clothing and wash themselves after the removal work.

**3. During work and on completion of work**

- If possible, wet the asbestos materials before removal to suppress the release of asbestos fibres.
- Ensure the asbestos materials are removed with minimal breakage.
- Wet and wrap/cover the asbestos sheets before they are hoisted down from the roof by crane. (For roof removal only)
- Collect asbestos waste and debris in sealed, impermeable bags or containers immediately after removal.

- Affix warning labels on all bags or containers containing asbestos materials.
- Vacuum or damp-wipe the polyethylene sheeting before removal.
- Use industrial vacuum cleaners (a list of suppliers is provided in Appendix III) or wet cleaning methods to remove the remaining asbestos dust.
- Dispose asbestos materials in accordance with ENV's procedures.

#### **4. Post removal work**

- Vacuum or damp-wipe the work clothing before removal.
- Dispose or wash on-site the contaminated work clothing.
- Transport contaminated work clothing out of the changing rooms or work area in sealed impermeable and labelled bags.
- Inform the laundries engaged in cleaning of the precautions needed to protect against exposure to asbestos dust.