Ref: 550/05/95

LAMMA POWER STATION EXTENSION

ENVIRONMENTAL PERMIT NO. EP-071/2000/C

WASTE MANAGEMENT PLAN

September 2019

Revision 2

Generation Division
The Hongkong Electric Co., Ltd.
香港電燈有限公司

香港電燈有限公司
The Hongkong Electric Co., Ltd.

港燈
HK Electric

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499

ENVIRONMENTAL PERMIT NO. EP-071/2000/C

LAMMA POWER STATION EXTENSION ENVIRONMENTAL MONITORING & AUDIT PROGRAMME AT OPERATIONAL PHASE

Report Title	Waste Management Plan (Revision 2)
Date	27 September 2019
Certified by	(Mr. IP Tat-Yan, Environmental Team Leader)
Verified by	Mr. Y T Tang (AECOM Asia Company Limited, Independent Environmental Checker)

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1. INTRODUCTION

The Environmental Impact Assessment (EIA) for the construction and operation of a 1,800MW Gas-fired Power Station at Lamma Power Station Extension (LMX) has been completed and approved by the Environmental Protection Department (EPD) under the Environmental Impact Assessment Ordinance (EIAO) (AEIAR-010/1999, hereafter referred to as the approved EIA report). An Environmental Permit (EP-071/2000/C) has also been issued by EPD stipulating the environmental requirements pursuant to the construction and operation of Lamma Extension.

Condition 4.7 of the EP set out requirements with regard to the management of waste during operation of Lamma Extension as follows:-

The Permit holder shall deposit with the Director no later than three months prior to the commissioning of the first 300MW unit a Waste Management Plan for the operation of the Project(s). The Plan shall describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the operation of the Project(s) and shall take into account the recommendations in Section 8.5, Part B of the EIA Report.

The EIA report recommended that should proper waste management practice be implemented for operation of the project, there would be no unacceptable environmental impact. The first unit L9 has been in operation since 2006 and a Waste Management Plan (Revision 1) was deposited to EPD in May 2006 to fulfill the EP requirements. For the new units L10, L11 & L12 which are under construction and are scheduled for commercial operation in 2020, 2022 and 2023 respectively, Selective Catalytic Reduction (SCR) system will be featured for reducing the NOx emission. A review paper was submitted to EPD in April 2013 providing an overview for the SCR system. In accordance with EPD's letter of 14 June 2013, the adoption of SCR system would not constitute a material change under the EIAO and no variation to the existing EP was required. Nevertheless, the Waste Management Plan shall be updated taking consideration of the adoption of SCR system according to EPD's requirement as stipulated in the aforesaid letter of 16 June 2013.

This document sets out the Updated Waste Management Plan stipulating the arrangements for managing different categories of waste to be generated from operation of the Combined Cycle Units in the Lamma Extension including the SCR system with an objective as to minimize any potential impact to the environmental during operation of the unit.

2. LEGISLATIVE REQUIREMENTS AND STANDANDS

2.1 Specific Reports and Permit

- Environmental Impact Assessment of a 1,800MW Gas-Fired Power Station at Lamma Extension
- Environmental Permit No. EP-071/2000/C (thereafter called "the EP")
- Environmental Monitoring & Audit Manual (Operational Phase) for 1,800MW Gas-Fired Power Station at Lamma Extension (thereafter called "EM&A Manual").

2.2 Technical Memorandum

- Annex 7 of the Technical Memorandum on Environmental Impact Assessment Process (EIAOTM) under the EIAO (Cap. 499)

2.3 Legislation of the Hong Kong SAR

- Environmental Impact Assessment Ordinance (Cap 499)
- Factories and Industrial Undertakings (Asbestos) Regulation (Cap 59)
- Waste Disposal Ordinance (Cap 354)
- Waste Disposal (Amendment) Ordinance (Cap 354)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)
- Land (Miscellaneous Provision) Ordinance (Cap 28)
- Public Cleansing and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances Regulation
- Dumping at Sea Ordinance (Cap 466)

2.4 Code of Practice

- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes
- Code of Practice on the Handling, Transportation and Disposal of

Asbestos Waste

2.5 Lamma Operating Procedures

- DEWI/03 Handling Chemical Wastes
- DEWI/06 A Guideline for Working with Asbestos Containing Materials

3. RESPONSIBILITIES

3.1 General Manager (Generation)

- Ensure that the waste management is in compliance with the statutory requirements of HKSAR
- Ensure that adequate resources are provided for implementation of the Waste Management Plan

3.2 Environmental Team Leader

- Ensure the waste management works are being carried out in full compliance with the latest statutory requirements
- Implement the environmental monitoring work as required by the EP and EM&A Manual
- Collect information associated with the Waste Management Plan and compile for the monthly EM&A reports.

3.3 Section Heads

3.3.1 Chief Generation Chemist

- Review the Waste Management Plan and its associated procedures regularly and ensure that they are in full compliance with the latest statutory requirements
- Report to the General Manager (Generation) for any spillage and accidental disposal of waste, and any violation to the approved Waste Management Plan and its associated procedures
- Provide information and technical advice on supporting the waste management to other Sections

- Ensure that Material Safety Data Sheets (MSDS) are available for chemical wastes

- Coordinate the collection, storage and disposal of chemical wastes and sewage sludge.

3.3.2 Manager (Loss Prevention & Training)

- Ensure that employees are trained in handling and disposal of waste

- Ensure that proper Personnel Protection Equipment (PPE) is sourced for handling and disposal of waste.

3.3.3 Other Section Heads

- Ensure that relevant information and training on handling wastes are provided to his assistants.

- Ensure that suitable arrangements and facilities are in place for labeling, packaging, storage and disposal of chemical wastes

- Implement the contingency plan for handling accidental spillage of waste

- Monitor the operation and maintenance activities and ensure that they are in compliance with the Waste Management Plan

3.4 Engineer

- Implement routine procedures on handling wastes and ensure that wastes are labeled, package, stored and disposed of properly in accordance with the Waste Management Plan and its associated procedures.

- Carry out surveillance inspection and report any spillage and accidental disposal of waste

- Coordinate the handling of emergency cases, including chemical incidence and oil spillage

- The Engineer (Building Maintenance Team) shall coordinate the collection, storage and disposal of general wastes

3.5 Environmental Team

- Implement the environmental monitoring work as required by the

EM&A Manual

- Ensure the works are being carried out in away of full compliance with statutory requirements and the Waste Management Plan.

- Collect data associated with the Waste Management Plan for the monthly EM&A reports.

3.6 Independent Environmental Checker

A person or party nominated by HK Electric and is responsible for

- Auditing the implementation of Waste Management Plan independently

- Ensuring the waste handling works are undertaken in compliance with the conditions of the EP.

4. SPECIFIC CONSIDERATIONS FOR SCR SYSTEM

Operation of the SCR requires injection of ammonia in the flue gas path to undergo catalytic reaction with NOx to form water and nitrogen. Urea pellets will be adopted as reagent feedstock for conversion to gaseous ammonia for NOx removal in the SCR system in view that urea itself is not classified as a hazardous substance and is not regulated as dangerous goods in Hong Kong under the Dangerous Goods Ordinance (Cap 295). In addition, urea is not considered as chemical waste under the Waste Disposal (Chemical Waste) (General) Regulation Cap 354C and as such no special waste handling is required for the urea.

Based on the previous experience of a gas-fired power plant in Mainland for regeneration of the spent catalyst, the service life of the catalyst has been extended with 55% of its original design life. However, the catalyst performance will be lowered which is hardly to comply with the emission limit of 5mg/Nm^3 in Hong Kong. As such, regeneration of catalysts for the SCR system is currently considered undesirable.

For the spent SCR catalyst, it is consisted mainly of titanium oxide (TiO_2), tungsten oxide (WO_3), sulphur trioxide (SO_3), sodium oxide (Na_2O), potassium oxide (K_2O), silicon dioxide (SiO_2) and vanadium pentoxide (V_2O_5). Under the Guide for Chemical Waste Producers for the Waste Disposal (Chemical Waste) (General) Regulation Cap 354C, the chemicals that are present in the spent SCR catalyst, apart from vanadium pentoxide, will not be considered as chemical waste.

Vanadium pentoxide is listed under the Chemical Waste Code 66 (vanadium compounds) Part B, Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation. As such this will be declared as chemical waste to EPD

under the Chemical Waste Producer Registration that HK Electric already holds and the spent SCR catalysts would be disposed of at a licensed chemical waste disposal facility as part of the chemical waste stream.

5. PROCEDURE

5.1 IDENTIFICATION OF WASTE GENERATION ACTIVITIES

The operation of Lamma Power Station Extension involves the following waste generating activities: -

- Operations of the power generating units and their auxiliaries
- Plant maintenance on the power generating units and their auxiliaries

5.1.1 Wastes generated during operation

The chemicals mentioned in the EIA Part B Table 8.4a are not required by the combined cycle unit(s) at Lamma Extension during normal operation. There may be spilled or contaminated chemicals in the course of handling. Spilled or spent chemicals are collected and transported back to the existing Lamma Power Station for further processing (storage and disposal).

Effluent generated is diverted to the Effluent Treatment Plant of Lamma Power Station for treatment.

5.1.2 Wastes generated during maintenance

It is anticipated the following wastes may be generated:

- Construction Waste
- Waste lube oil
- Spent solvent
- Metal and gaskets (including packing material)
- Spent batteries
- Spent SCR catalysts

5.1.3 General Refuse & Sewage

Since the plant is basically unmanned, the amount of general refuse generated will be very little. All the refuse will be collected and transported back to the existing Lamma Power Station for further handling.

Sewage generated is diverted to the Sewage Treatment Plant of the existing Lamma Power Station for treatment.

5.2 WASTE MANAGEMENT

The overall objective of waste management is to minimize waste generation through avoidance and minimization, reuse of materials, recovery and recycling. The following practices are adopted as much as practicable to achieve this objective: -

5.2.1 Avoidance and Minimization

Minimization of waste through: -

- Selection or substitution of more durable materials
- Elimination of unnecessary materials
- Control of inventory
- Optimization of the maintenance strategy
- Better housekeeping

The combined cycle unit in Lamma Power Station Extension is designed for unmanned operation (fully automatic) and the production of sewage and general refuse are minimized through the following measures.

5.2.2 Reuse of Materials

Reuse of materials through: -

- Re-sell of material
- Reuse of steel structures for maintenance use
- Reuse of lubricants and consumables for other equipment of less stringent requirement
- Reuse of rain water for cultivation

5.2.3 Recovery and Recycling

Recovery and recycling through: -

- Collection of used paper and packaging for recycle
- Collection of used plastic for recycle
- Collection of used aluminum cans or other metal containers for recycle

5.3 WASTE TREATMENT AND DISPOSAL

The following procedures are adopted for the treatment and disposal of the wastes: -

5.3.1 Segregation of waste

If the maintenance work involves dismantling of asbestos-containing materials, the work shall follow relevant safety code of practice. Other wastes shall be segregated for further handling : -

- Construction waste
- Chemical waste
- Waste to be collected for reuse and recycle
- General refuse

5.3.2 Treatment and Disposal of Waste

5.3.2.1 Asbestos-containing waste

Waste materials that contain asbestos shall be specially packaged, labeled and handled in accordance with DEWI/06 "A Guideline for Working with Asbestos Containing Materials".

5.3.2.2 Construction waste

Construction waste shall be collected and delivered back to the existing Lamma Power Station for temporary storage. Construction waste is disposed of by licensed waste collector.

5.3.2.3 Chemical Waste

Detailed requirements for handling of chemical wastes shall refer to the Generation Working Instruction: DEWI/03 "Handling Chemical Wastes".

In general, handling, storage and disposal of chemical waste follows the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes briefly described below: -

(a) Container

Containers used for the storage of chemical wastes shall: -

- Be suitable for the substance they are holding, resistant to corrosion, maintained in a good conditions and securely closed;
- Have a capacity of less than 450l unless the specifications have been approved by EPD; and
- Display a label in English and Chinese

(b) Storage

Storage area for chemical wastes shall: -

- Be clearly labeled and used solely for the storage of chemical waste;
- Be enclosed on at least 3 sides;
- Have an impermeable floor and bunker, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
- Have adequate ventilation;
- Be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste if necessary); and
- Be arranged so that incompatible materials are adequately separated.

(c) Disposal

Disposal of chemical wastes shall: -

- Be via a licensed waste collector; and

- Be to a facility licensed to receive chemical wastes, such as the Chemicals Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or

- Be to a reuser of the waste, under approval from EPD.

5.3.2.4 Waste to be Collected for Reuse and Recycle

Metals, plastics and paper with high scrap value generated during maintenance will be sold out for recycling as much as practicable. Handling of other industrial waste such as packaging materials shall follow the procedure of General Refuse stated below.

5.3.2.5 General Refuse

General refuse generated on-site shall be stored in litter bin and transferred back to the Lamma Power Station for disposal by licensed contractor.

6. CONCLUSION

The EP for the Lamma Extension Project requires HK Electric to set out measures for waste management. The possible sources of waste in the operation of Lamma Extension have been reviewed which mainly include various maintenance waste materials, general refuses and sewage.

This document has formulated appropriate operational practices and precautionary measures for prevention of waste generation as well as the treatment methods of waste generated. With the recommended practices duly implemented, no impact on waste arising from operation of Lamma Extension is envisaged.

THE HONGKONG ELECTRIC CO., LTD.
香港電燈有限公司

GENERATION DIVISION - Divisional Work Instruction

Divisional Environmental Work Instruction Number : **DEWI/03**

Title	: Handling Chemical Wastes		
Language	: English		
Prepared/Revised by	: T.K.H. Cheung	Date First Issued	: 30 Oct 2001
Revision	: 8	Date Revised	: 03 Aug 2018
Review Party	: CGC	Effective Date	: 03 Aug 2018
Approved By	: GM(G)		

Rev. No.	Rev. Date	Item No.	Details of Revision
0	30/10/01		Original issue
1	15/11/02	1	Quoting EPD's statement that containers without paint residue are not chemical waste
		3.3	The word 'paint' is deleted from the clause
		3.9	Pax number revised
		6.1	The word 'paints' is deleted from the clause
		6.10	Item newly added
2	20/01/04	2.5	D,P&IT is changed to MSD
		3.9	Pax number revised
		6.1	Battery acid added
		6.2	Storage of battery acid as chemical waste added
		6.3	"Materials Handling Department to use the uncontaminated spent oils for Continuous Ship Unloader bucket chain lubrication" is added
		8.2	CHEM to be responsible for preparing the budget for disposal of chemical wastes
		Appendix 1	List of chemical wastes revised
3	17/11/05	6.10	Last sentence added
		7	Title of the reference ASI revised
		9. & 10	Newly added
4	27/04/06		General revision
5	29/08/08		General revision

Rev. No.	Rev. Date	Item No.	Details of Revision
6	24/05/13	1	Revised with minor enrichment
		2.2	Projects Division changed to Corporate Development Division
		3.6-3.9	Clauses relevant to storage relocated to Section 5
		5.3 & 7	Revised
		5.8-5.10	Relocated from Section 3
7	09/08/16	7	DEWI No. 11 title updated
8	03/08/18	2.3 & 5.9	SGC title changed to CGC due to title review in March 2018 GSS changed to BMT

CONTENTS

1. INTRODUCTION

Waste Disposal (Chemical Waste) (General) Regulation defines what should be regarded as chemical waste in "Schedule I" and mandates any person who produces or causes to produce chemical waste must register with the Environmental Protection Department (EPD), properly label and store it, and strictly requires engaging a licensed collector to remove and transport the waste for off-site disposal at licensed facilities.

Lamma Power Station (Generation Division) has been registered with EPD as a chemical waste producer. Chemical wastes generated in the operations and maintenance activities of our Division typically include:

- Spent batteries
- Paints*
- Spent organic solvents or cleaning fluids
- Spent lubricant and oils
- Spent oil filters/oily rags
- Sludge generated from the effluent/sewage treatment plants
- Spent energy-saving/mercury lamps/fluorescent tubes
- Asbestos-containing gaskets or materials (if any)
- Spent catalyst
- Other chemicals

Note (*): According to EPD, paint containers without paint residue are not classified as chemical waste.

The chemical waste may be stored temporarily in small quantities by individual Sections at a designated place and secured container in workshop or, in case of larger quantities, in the centralized Chemical Waste Store under the control of Chemistry Section (CHEM). CHEM shall coordinate subsequent off-site removal by licensed chemical waste collectors. As chemical wastes are the potential sources of land contamination and pollutants to waters, and are harmful to people and the environment, all employees should look for ways of avoiding and minimizing chemical waste in operations and maintenance, and take precautionary measures to avoid and contain leaks, spills and fire. The procedure as outlined in this instruction is part of the waste management plan of Generation Division, and must be cautiously followed.

2. RESPONSIBILITIES

2.1 Section Head shall ensure that anyone likely to handle chemical wastes within his/her Section is familiar with the chemical waste being handled as well as this work instruction. He/She shall make arrangements in his/her Section to avoid or minimize chemical waste, and the facilities and personal protective equipment (PPE) required for safe and environmental-acceptable handling the chemical waste. He/She shall designate a person to coordinate with CHEM for off-site disposal of chemical wastes.

2.2 CHEM shall coordinate the disposal of all chemical wastes in Generation Division. CHEM shall advise matters on the packaging, storage, labelling and disposal of chemical waste, and shall engage licensed chemical waste collectors for inspection (if required), sampling, transportation and disposal of chemical wastes. CHEM shall keep records of the chemical waste disposal such as trip-tickets for inspection by the Authorities or the concerned parties. CHEM shall arrange through Environmental Affairs Department of Corporate Development Division to handle matters concerning chemical wastes.

2.3 Building Maintenance Team (BMT) is responsible for on-site inland transportation of chemical wastes from the Chemical Waste Containers for the licensed chemical waste collectors to load on their barges. **<<<GSS changed to BMT**

3. PACKAGING

3.1 In general, chemical wastes should be stored in suitable containers and packaged in such a way as to prevent their escape/leakage.

3.2 Acid and alkaline chemicals should be stored in metal drums with plastic lining.

3.3 Spent lube oil and solvents can be stored in metal drums.

3.4 Solid chemical wastes shall be put in plastic bags and placed in metal drums.

3.5 All chemical waste containers shall be capped and stored upright.

4. LABELLING

4.1 CHEM shall ensure that chemical waste drums are properly labelled as stipulated in the requirements of the Chemical Wastes Regulation.

4.2 CHEM shall keep stock of the chemical waste labels for labelling the chemical waste containers as/if required.

5. STORAGE

5.1 The Chemical Waste Containers shall be properly designed and maintained according to the Code of Practice on the Packing, Handling and Storage of Chemical Wastes.

5.2 Chemical Waste Containers are the designated central place for storage of chemical wastes. For any chemical wastes of small quantities that might be generated and temporarily kept in the workplace, they must be properly stored in containers with proper chemical waste labels and shall have secondary containment drip trays to contain any spills or leaks of chemical waste in liquid form.

5.3 CHEM is the owner of the Chemical Waste Containers which shall be securely locked by CHEM. Contact CHEM (PAX 5518/5214) for access to the Chemical Wastes Containers.

5.4 All chemical waste drums in the Chemical Waste Containers should be properly secured to avoid spills or leaks, and managed for easy access so that samples can be taken if required. The drums shall be placed in such a way that they can be easily moved and taken away. The volume of liquid chemical wastes placed in the liquid chemical waste containers shall not exceed the design capacity for holding spills or leaks.

5.5 When a chemical waste container is nearly full, CHEM shall arrange licensed collectors to take away the chemical wastes as soon as possible (preferably within a month) so as to provide room for storing chemical wastes.

5.6 CHEM shall acquire empty chemical waste drums from a licensed chemical waste collector for holding chemical wastes if required.

5.7 A small quantity of chemical wastes can be kept in the work place. Where this is considered necessary, the producer section can approach CHEM for the necessary information and requirements.

5.8 Chemicals that are incompatible with each other (e.g. acid and alkali) shall be stored separately.

5.9 Chemical wastes should be transferred by BMT to the Chemical Waste Containers for storage. **<<<GSS changed to BMT**

5.10 Spent lube oils and solvents should be placed in the Chemical Waste Container(s) designated for liquid chemical waste, whereas solid chemical waste should be placed in the Chemical Waste Container(s) designated for storing solid chemical waste.

6. COLLECTION

6.1 Chemical waste shall be given to CHEM and be placed in the chemical waste stores. The collected solid wastes shall be handled by licensed collector.

6.2 Chemical waste collector may send barges to our site for collection. CHEM shall notify, as soon as the date of barge arrival is known.

6.3 CHEM shall provide the necessary information to the licensed chemical waste collectors and obtain a quotation from them before the disposal of chemical wastes. CHEM shall make arrangements with the licensed chemical waste collectors in case inspection and sampling of the chemical wastes is required.

6.4 CHEM shall verify the information of the EPD trip ticket provided by the licensed chemical waste collectors when they collect the chemical wastes. Copies of the trip tickets shall be filed by CHEM.

6.5 During the collection of chemical wastes by the contractor, CHEM shall monitor the progress and provide facilities including safety protective equipment for handling the wastes.

6.6 CHEM shall ensure that the individual(s) involved in handling chemical wastes or monitoring the collection of chemical wastes by contractor should be knowledgeable about the hazards of the chemical wastes and procedures for dealing with spillage chemicals.

7. HANDLING SPILLAGE OF CHEMICAL WASTES

Administration Standing Instruction (ASI) No. 42 - "Chemical Spillage Control and Emergency Evacuation Procedure" shall be followed for handling any spills or leaks of chemical wastes.

Any spills or release of chemical waste that has caused or the potential to cause contamination to land and waters must be reported according to the guidelines in Divisional Environmental Work Instruction (DEWI) No. 11 - "Environmental Incidents Reporting".

For safe handling of chemicals including chemical wastes, follow "Material Safety Data Sheet of the chemical", "Chemical Control Standard & Procedure (CCSP) No. 402 on Chemical Safety on Site (Part 4 Chapter 2)" and "Safety Code of Practice (SCOP) No. 87 on Handling Chemicals".

8. PAYMENT

8.1 CHEM shall arrange with Accounts Department to pay the charges for the disposal of chemical wastes.

8.2 CHEM is responsible for preparing the budget for disposal of chemical wastes. Generation of any abnormal volume of chemical waste should be reported to CHEM if foreseeable.

9. RECORD

CHEM shall keep the original trip tickets in preparation for inspection by EPD and other concerned parties.

/mct

Detail Distribution List **:** GEN

THE HONGKONG ELECTRIC CO., LTD.
香港電燈有限公司

GENERATION DIVISION - Divisional Work Instruction

Divisional Environmental Work Instruction Number : **DEWI/06**

Title	: A Guideline for Working with Asbestos Containing Materials		
Language	: English, Chinese		
Prepared/Revised by	: T.K.H. Cheung	Date First Issued	: 17 Sep 2002
Revision	: 4	Date Revised	: 03 Aug 2018
Review Party	: CGC	Effective Date	: 03 Aug 2018
Approved By	: GM(G)		

Rev. No.	Rev. Date	Item No.	Details of Revision
0	17/09/02		Original issue
1	27/04/06		General revision
2	15/06/11		General revision
3	18/05/15		Title revised General revision and at the same time combine this work instruction with SCOP/27 which has been made obsolete Chinese version newly added PD newly added Revised EPD contact updated Newly added
		Distribution List Appendices 2 & 6 Appendices 3 - 5 Appendix 7	
4	03/08/18		SGC and LPTM titles changed to CGC and SM(LP&T) respectively due to title review in March 2018

CONTENTS

1. INTRODUCTION

1.1 **Use of all types of asbestos containing materials (ACM) had been banned** after the Air Pollution Control (Amendment) Ordinance 2014 was effective on 4 April 2014. Works involving ACM are prohibited unless they are for the purpose of removal and disposal.

1.2 This work instruction aims at providing guidelines on the handling of exempted ACM (explained below) for their removal and disposal in Lamma Power Station. All working parties shall note that other types of ACM that exist in our system due to historical usages, cannot be handled on our own without assistance from external asbestos consultants.

1.3 Asbestos in dust form can cause adverse health effects causing asbestosis, lung cancer and mesothelioma. Handling of asbestos is governed by the following HKSAR ordinances and regulations:

(i) Factories and Industrial Undertakings (Asbestos) Regulation which aims at controlling the safe use and handling of Asbestos Containing Material (ACM) in order to protect the health of persons at work in industrial undertakings.

(ii) Air Pollution Control Ordinance (Chapter 311) which aims at protecting the environment from contamination by asbestos fibres.

(iii) Waste Disposal (Chemical Waste) (General) Regulation which aims at controlling the handling, transportation and disposal of asbestos waste.

Codes of practices have been published by Labour Department (LD) and Environmental Protection Department (EPD) to give detailed guidance on handling ACM and asbestos waste based on the above ordinances and regulations.

1.4 The statutory requirements are extracted below for quick reference:

Type of ACM to be Handled	Asbestos Investigation Report (AIR)/Asbestos Decontamination Plan (ADP)/Asbestos Abatement Plan (AAP)/Asbestos Management Plan (AMP)	Notification Requirement
"Exempted ACMs" – such as corrugated asbestos cement sheet; cement piping; cement building fabrics; resinated gasket; pump and valve gland packing; friction product; resilient floor covering, and asphalt roofing felt.	Submission of AIR, ADP, AAP, & AMP is exempted as granted by the Gazette No. 25/1997 – G.N.3021 and G.N.3022 (**Appendix 1**).	No notification is required.
Non-exempted ACMs including asbestos coating or asbestos insulation.	Employ a Registered Asbestos Consultant/ Registered Laboratory to identify the type of ACM and prepare the AIR, ADP, AAP & AMP. All the asbestos decontamination & abatement work shall be carried out by a registered asbestos contractor.	Submit the AIR, ADP, AAP & AMP to the EPD, at least 28 days prior to commencement of the asbestos abatement work. Labor Department – Submit a notification to the Commissioner for Labour Department at least 28 days prior to commencement of the asbestos decontamination/ abatement work.

1.5 If ACMs other than those exempted types have to be handled, all working parties shall consult the Chief Generation Chemist (CGC) for the coordination with external asbestos consultant and laboratory. The latest register of Asbestos Professionals is available via the following link: **<<<SGC title changed to CGC**

http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/reg_asbestos.html

1.6 Users of heat insulating materials, electrical insulating materials, acoustic insulating materials, gaskets, sealing materials, fire retardant materials, woven materials, etc. shall obtain Material Safety Data Sheet and product specifications from the supplier to confirm the absence of asbestos before the material is purchased. Contractors must not bring any unknown and/or unapproved materials into Lamma Power Station and apply these materials onto our system. Otherwise, the Contractors will be held legally and financially responsible for their subsequent removal of these materials.

2. PURPOSE

To provide general information and guidelines to the Management, employees, and others concerned with the storage, handling for removal and disposal of ACMs following the codes of practices established by LD and EPD in order to protect the health of workers and minimize the pollution of environment in handling ACMs and asbestos waste in Lamma Power Station.

3. SCOPE

This guideline applies to all workplaces within Lamma Power Station where ACMs and their wastes are removed, stored and handled for transporting off-site as asbestos waste.

4. RESPONSIBILITIES

4.1 **The Section Head** of the section responsible for the maintenance work involving ACMs shall ensure that:

4.1.1 Code of Practice of Safety and Health at Work with Asbestos issued by LD (Appendix 2) is followed.

4.1.2 For Exempted ACMs:

(i) Code of Practice on Asbestos Control – Safe Handling of Low Risk ACM issued by EPD (Appendix 3) is followed;

(ii) The worker involved in the work with asbestos:

(a) is properly trained with safety precautions for working with asbestos; and

(b) who is certified by a registered medical practitioner and has undergone a radiographic examination of his chest within 4 months immediately preceding the commencement of such employment; and

(c) who shall undergo a radiographic examination of his chest at intervals of not more than 12 months and is certified by a registered medical practitioner to be fit to continue to work with asbestos.

(iii) The health register for worker employed in working with asbestos should be kept for at least 5 years and made available for inspection by the Commissioner for Labour Department.

(iv) The completed checklist for work involving Exempted Asbestos Containing Materials (Appendix 7) should be kept for at least 5 years and made available for inspection by the Commissioner for Labour Department.

(v) Record of inspection, examination, performance testing and maintenance for all HEPA filter-equipped appliance in use should be kept for at least 2 years and made available for inspection by the Commissioner for Labour Department.

(vi) The Section Head of the section responsible for maintenance work involving exempted ACMs shall ensure that an updated list of qualified employees for such work is kept.

4.1.3 For Non-Exempted Asbestos-Containing Materials:

The AIR, ADP, AAP & AMP shall be properly prepared by the registered asbestos consultant and submitted to the EPD at least 28 days prior to commencement of the asbestos abatement work following the Code of Practice on Asbestos Control – Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan (Appendix 4) issued by EPD. Section Head shall consult the CGC prior to commencement of work on these ACMs. **<<<SGC title changed to CGC**

4.1.4 The asbestos wastes produced are properly dampened, packaged and be given to Chemistry Section for storage/disposal.

4.1.5 ACMs that are historically in place in the system shall be phased out progressively in line with maintenance work. Records of replacement shall be passed to the CGC. **<<<SGC title changed to CGC**

4.1.6 Supervise workers to conduct work on exempted ACMs properly.

4.2 **Senior Manager (Loss Prevention & Training) [SM(LP&T)]** shall: **<<<LPTM title changed to SM(LP&T)**

(i) Coordinate training for workers by qualified trainer on handling ACMs and asbestos wastes;

(ii) Keep the training records for at least two years; and

(iii) Keep a list of approved type of Personal Protective Clothing and Equipment for handling ACM.

4.3 **Chief Generation Chemist** shall: **<<<SGC title changed to CGC**

(i) Update the ordinances and regulations related to the handling of ACMs and asbestos wastes.

(ii) Work with the responsible maintenance section to phase out ACMs progressively.

(iii) Provide amended water (polyoxyethylene ester and polyoxyethylene ether mixture in water) and plastic bags and arrange licensed collector to collect and dispose of asbestos waste produced by the Station following the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by EPD (Appendix 5) as asbestos waste is classified as a chemical waste according to Waste Disposal (Chemical Waste) (General) Regulation.

(iv) Keep an inventory of ACMs of Lamma Power Station and records including trip tickets of ACMs collected by licenced collectors.

(v) Conduct, where necessary with the assistance of external consultant, assessment of work on exempted ACMs.

(vi) Co-ordinate with the CDD/Registered Asbestos Consultant to prepare the AIR, ADP, AAP and AMP when necessary.

4.4 **Workers** shall:

(i) Observe the safety precautions and the control measures set by the safety officer or a Registered Asbestos Consultant and follow Code of Practice of Safety and Health at Work with Asbestos issued by LD (Appendix 2).

(ii) Inform their supervisor any deficiency of the work process that can render ACMs friable and create a situation where fibers will be unlocked and released as airborne particles.

5. PROCEDURE

5.1 FOR HANDLING OF EXEMPTED ACMs

5.1.1 User Section and Workers shall note that exempted ACMs can liberate asbestos fibres under some conditions. Avoid drilling, grinding or burning these materials. Use non-powered hand tools such as hammer, handsaw, cutters, chisels etc. to remove residual materials from the equipment.

5.1.2 Prior to work, user Section shall complete the checklist for work involving Exempted Asbestos Containing Materials (Appendix 7). Then request Chemistry to perform an assessment on the handling of exempted ACMs where necessary using the form as shown in Appendix 6. Chemistry Section shall keep the forms available for inspection by external parties.

5.1.3 When removing exempted ACMs, Code of Practice of Safety and Health at Work with Asbestos issued by LD (Appendix 2) and Code of Practice on Asbestos Control – Safe Handling of Low Risk ACM issued by EPD (Appendix 3) should be followed.

5.1.4 All the removed exempted ACMs should be packed with two individual layers of transparent plastic bags/sheets with thickness of > 0.15 mm made of low-density polyethylene and completely sealed in goose-neck with adhesive tape. Inner sheet should be clearly labeled as asbestos waste with the dimensions of the label not less than 120 mm x 150 mm.

5.1.5 All the asbestos wastes shall be stored in a designated waste container under the control of Chemistry Section. Chemistry Section shall arrange licensed chemical waste collectors to collect and deliver the wastes to a disposal facility.

5.1.6 All personnel, tools, instrument and bagged wastes leaving the work area should be thoroughly decontaminated by dustless method such as HEPA vacuuming and wet wiping.

5.1.7 In case the exempted ACMs are in poor condition or have a high probability of becoming crumbled, pulverized, or reduced to powder by forces during the course of removal, procedure for handling of Non-exempted ACMs should be adopted.

5.2 FOR HANDLING OF NON-EXEMPTED ACMs

5.2.1 As the handling of Non-exempted ACMs involves notifications to the Authority prior to execution of the work, user Section shall discuss with Chemistry Section to establish a plan and procedure.

5.2.2 Code of Practice of Safety and Health at Work with Asbestos issued by LD (Appendix 2) and Code of Practice on Asbestos Control – Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan issued by EPD (Appendix 4) should be followed.

5.3 FOR HANDLING OF ASBESTOS WASTES

Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by EPD (Appendix 5) should be followed.

5.4 DISPOSAL/SELLING EQUIPMENT CONTAINING ACM

According to Air Pollution Control (Amendment) Ordinance 2014 effective from 4 April 2014, all import, transshipment, supply and use of all types of asbestos are banned. It is also an offence to supply, sell any product or machinery fitted with ACM. If it is required to do so, the ACM should be removed or replaced by non-asbestos materials by registered asbestos consultant employed by HK Electric.

5.5 DOCUMENTATION

The following records should be documented properly for the EPD/LD inspection.

(i) ACM work report should be filed to Win-CSMS by user section.

(ii) A copy of the ACM work report, method statement and checklist should be sent to CGC by user section. **<<<SGC title changed to CGC**

(iii) Health register for worker employed in working with asbestos should be kept by user section.

(iv) Record of inspection, examination, performance testing and maintenance for all HEPA filter-equipped appliance in use should be kept by user section.

(v) Training record for worker employed in working with asbestos and a list of approved Personal Protective Clothing and Equipment should be kept by Safety & Training Section.

(vi) Risk Assessment report for handling of ACM should be kept by Chemistry Section.

(vii) ACM Inventory and waste disposal record including trip tickets should be kept by Chemistry Section.

(viii) Asbestos Investigation Report, Asbestos Decontamination Plan, Asbestos Management Plan and Asbestos Abatement Plan shall be put at designated locations by the CGC. **<<<SGC title changed to CGC**

6 REFERENCE DOCUMENTS

6.1 LEGISLATION

(i) Air Pollution Control Ordinance, CAP 311 Sections 51, 69 – 80.

(ii) Air Pollution Control (Asbestos) (Administration) Regulation.

(iii) Waste Disposal (Chemical Waste) (General) Regulation.

(iv) Factories and Industrial Undertaking (Asbestos) Regulation.

(v) Air Pollution Control (Amendment) Ordinance 2014.

6.2 Code of Practice on Asbestos Control:

(i) Code of Practice on Asbestos Control: Safe Handling of Low-risk Asbestos Containing Material issued by EPD.

(ii) Code of Practice on Asbestos Control: Preparation of Asbestos Investigation Report, – Asbestos Management Plan and Asbestos Abatement Plan issued by EPD.

(iii) Code of Practice on Asbestos Control: Asbestos Work using Full Containment or Mini Containment Method issued by EPD.

(iv) Code of Practice on Asbestos Control: Asbestos Work using Glove Bag Method issued by EPD.

(v) Code of Practice on Safety and Health at Work with Asbestos issued by LD.

(vi) Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by EPD.

6.3 Gazette No. 25/1997 – G.N.3021 and G.N.3022 specifying the classes of work that plant owner is not required to appoint a registered asbestos contractor, and to submit an asbestos investigation report, or an asbestos abatement plan.

6.4 Registration of HK Electric as a Waste Producer on 1/3/1993 claiming that asbestos is one of the chemical wastes that can be produced in our Station.

6.5 Generic Asbestos Investigation Report on Asbestos Consultancy for HK Electric's Equipment issued by AECOM Asia Co. Ltd., June 2009.

7 ATTACHMENT

7.1 Gazette No. 25/1997 – G.N.3021 and G.N.3022 (Appendix 1).

7.2 Code of Practice of Safety and Health at Work with Asbestos issued by LD (Appendix 2).

7.3 Code of Practice on Asbestos Control – Safe Handling of Low Risk Asbestos Containing Materials issued by EPD (Appendix 3).

7.4 Code of Practice on Asbestos Control – Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan issued by EPD (Appendix 4).

7.5 Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by EPD (Appendix 5).

7.6 Risk Assessment Report for Handling of Exempted Asbestos Containing Materials (Appendix 6).

7.7 Checklist for Work Involving Exempted Asbestos Containing Materials (Appendix 7).

/mct

Detail Distribution List **:** GEN, PD

G.N. 3021

AIR POLLUTION CONTROL ORDINANCE (Chapter 311)

(Notice Published under section 69(3))

Pursuant to section 69(2) of the Air Pollution Control Ordinance, I hereby specify the following classes of work for which an owner is not required to submit an asbestos investigation report or an asbestos abatement plan under section 69(1) of the Ordinance:—

Class 1

Maintenance, repair, use, handling or abatement of:—

(1) non-woven non-friable asbestos gasket.
(2) asbestos gland packing material in pump, valve, engine and other mechanical plant items.
(3) non-friable asbestos friction products.
(4) corrugated asbestos cement sheet not within a fire site.
(5) asbestos cement watermains maintained by the Water Suppalies Department.
(6) asbestos blackboard.
(7) fuse box/switch box containing asbestos containing material.
(8) resilient floor covering not within a fire site, such as:—
    (*a*) vinyl asbestos floor tile;
    (*b*) sheet vinyl asbestos floor covering; and
    (*c*) bitumen asbestos roofing felt.

Class 2

Maintenance, repair, handling or abatement of the following materials installed in properties managed by the Hong Kong Housing Authority:—

(1) balcony asbestos cement grille panel.
(2) staircase asbestos cement grille panel.
(3) roof asbestos cement insulation tile.
(4) asbestos cement soil stack.
(5) asbestos cement refuse chute.
(6) laboratory asbestos bench-top.

Class 3

Storage or sale of asbestos containing material.

Class 4

Manufacturing process involving asbestos.

Class 5

Transport of asbestos containing material.

6 June 1997 Bowen LEUNG *Secretary for Planning, Environment and Lands*

G.N. 3022

AIR POLLUTION CONTROL ORDINANCE (Chapter 311)

(Notice Published under section 75(5))

Pursuant to section 75(4) of the Air Pollution Control Ordinance, I hereby specify the following classes of work for which an owner is not required to appoint a registered asbestos contractor to carry out the work:—

Class 1

Maintenance, repair, use, handling or abatement of:—

(1) non-woven non-friable asbestos gasket.
(2) asbestos gland packing material in pump, valve, engine and other mechanical plant items.
(3) non-friable asbestos friction products.

Class 2

Demolition work involving only resilient floor covering in a vacant building not within a fire site, such as:—

(1) vinyl asbestos floor tile;
(2) sheet vinyl asbestos floor covering; and
(3) bitumen asbestos roofing felt.

Class 3

Storage or sale of asbestos containing material.

Class 4

Manufacturing process involving asbestos.

Class 5

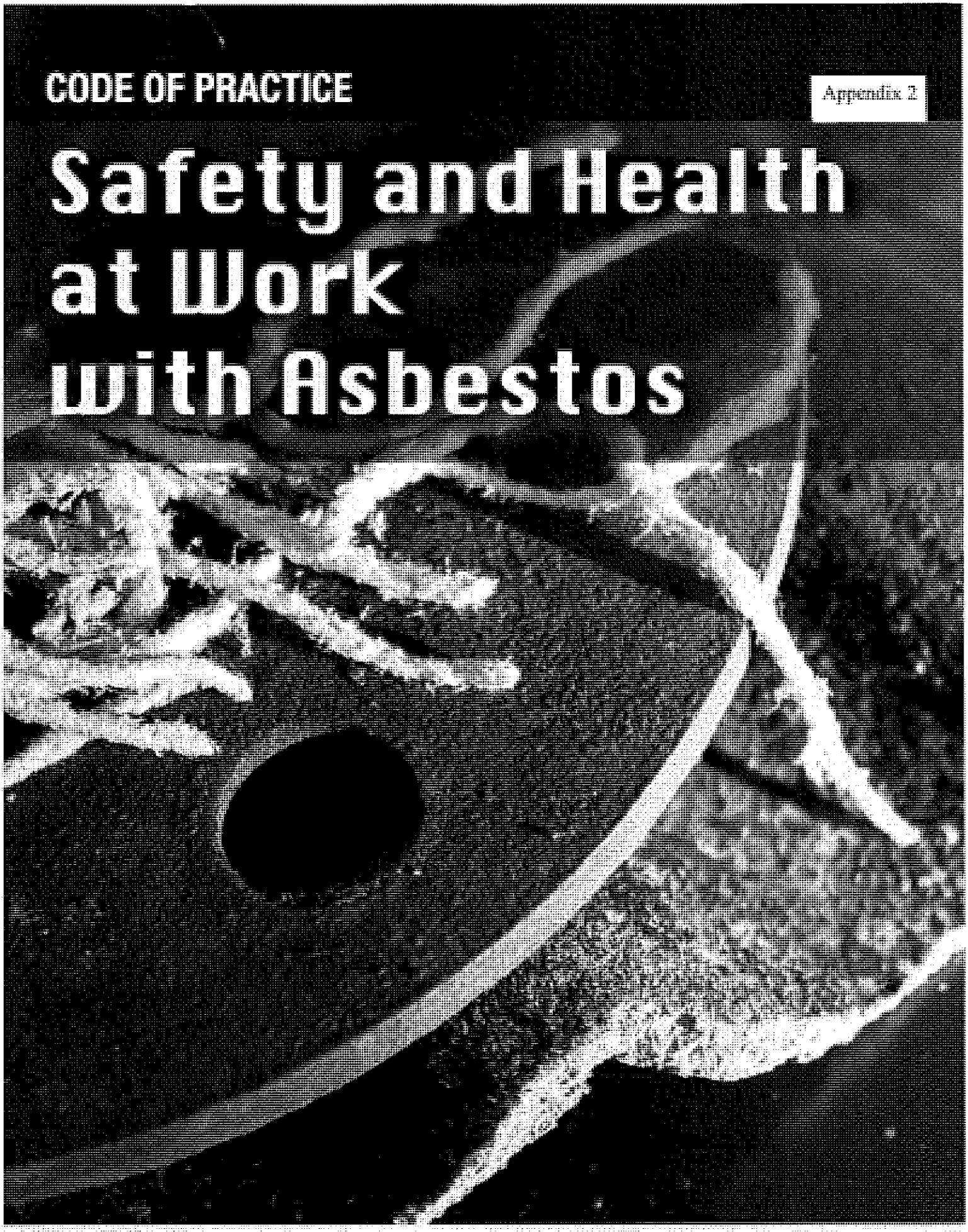
Transport of asbestos containing material.

6 June 1997 Bowen LEUNG *Secretary for Planning, Environment and Lands*

CODE OF PRACTICE

Appendix 2

Safety and Health at Work with Asbestos



Occupational Safety and Health Branch
Labour Department

DEWI/06 (01/2015)

CODE OF PRACTICE

Safety and Health at Work with Asbestos

Occupational Safety and Health Branch
Labour Department

This Code of Practice is prepared by the
Occupational Safety and Health Branch
Labour Department

First edition July 1998

Second edition October 2014

This Code of Practice has a special legal status. Although failure to observe any provision of this Code is not itself an offence, that failure may be taken by a court in criminal proceedings as a relevant factor in determining whether or not a person has breached the relevant safety and health legislation under the Factories and Industrial Undertakings Ordinance.

CONTENTS

LIST OF APPENDICES

Introduction

This Code of Practice on 'Safety and Health at Work with Asbestos' (hereinafter referred to as the COP) is an approved code of practice issued by the Commissioner for Labour under Section 7A(1) of the Factories and Industrial Undertakings Ordinance (Cap 59) for the purpose of providing practical guidance for the compliance with the provisions of the Factories and Industrial Undertakings (Asbestos) Regulation (hereinafter referred to as the Regulation).

Asbestos in dust form can cause adverse health effects. Removal of asbestos or materials containing asbestos in the workplace requires strict control to prevent serious occupational diseases—asbestosis, lung cancer and mesothelioma. The primary aim of the Regulation and the COP is to ensure the safe removal and disposal of asbestos and materials containing asbestos in order to protect the health of persons at work in industrial undertakings under the interpretation of the Factories and Industrial Undertakings Ordinance (Cap 59). It is important to note that compliance with the COP does not itself confer immunity from legal obligations in Hong Kong. Besides, statutory provisions referred to or cited in the COP are those in force as at 4 April 2014.

This COP has a special legal status. Although failure to observe any guideline given in the COP is not in itself an offence, that failure may be taken by a court in criminal proceedings as a relevant factor in determining whether or not a person has breached any of the provisions of the Regulation to which the guideline relates.

This COP provides guidelines on the necessary measures to protect workmen from exposure to asbestos dust at work in industrial undertakings. As far as protection of the environment from pollution by asbestos is concerned, the duty holder should refer to the Air Pollution Control Ordinance (Cap 311) (hereinafter referred to as APCO) and the corresponding codes of practice published by the Environmental Protection Department, which provide guidance on how to prepare an area for asbestos abatement, construction of work area enclosure, clearance of the area after completion of abatement work, etc. The duty holder should also refer to the Waste Disposal Ordinance

(Cap. 354) and the Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354 sub. leg. C) on the legislative requirements on handling, transportation and disposal of asbestos waste.

The layout of this COP is based on that of the Regulation which is reproduced according to Sections, followed by the corresponding practical guidance of the COP arranged in paragraphs.

PART I
PRELIMINARY

Section 1 Omitted as spent – E.R. 2 of 2014

THE REGULATION

Omitted as spent.

1. Omitted as spent.

Section 2 Interpretation

(1) In this Regulation, unless the context otherwise requires:-

"action level"（措施水平）means one of the following cumulative exposures to asbestos over a continuous 12-week period, namely -

(a) where the exposure is solely to chrysotile, 96 fibre-hours per millilitre of air; or

(b) where the exposure is to any other form of asbestos either alone or in mixtures including mixtures of chrysotile with any other form of asbestos, 48 fibre-hours per millilitre of air; or

(c) where both types of exposure occur separately during the 12-week period, a proportionate number of fibre-hours per millilitre of air;

"amphibole asbestos"（閃石類石棉） means any of the minerals crocidolite（青石棉）, amosite（鐵石棉）, fibrous actinolite（纖維狀陽起石）, fibrous anthophyllite（纖維狀直閃石）, fibrous tremolite（纖維狀透閃石的礦物）and any mixture containing any of those minerals;

"approved respiratory protective equipment"（認可呼吸防護設備）means any respiratory protective equipment approved by the Commissioner under Section 4;

"asbestos"（石棉） means chrysotile（溫石棉）and amphibole asbestos and any mixture containing any of those minerals;

"asbestos cement"（石棉水泥） means a material which is predominantly a mixture of cement and asbestos and which when in a dry state has a density greater than 1 tonne per cubic metre;

"asbestos coating"（石棉塗層） means a surface coating which contains asbestos;

"asbestos insulating board"（石棉絕緣板） means any sheet, tile or building board consisting of a mixture of asbestos and other material which mixture when in a dry state has a density greater than 500 kilograms per cubic metre;

"asbestos insulation"（石棉絕緣物） means any material containing asbestos and used for thermal, acoustic or other insulation purpose (including fire protection) except -

(a) asbestos cement or asbestos insulating board, or

(b) any article of bitumen, plastic, resin or rubber which contains asbestos and the thermal and acoustic properties of which are incidental to its main purposes;

"asbestos spraying"（石棉噴塗） means the application by spraying of any material containing asbestos to form a continuous surface coating;

"control limit"（控制限度） means one of the following concentrations of asbestos in the atmosphere of the industrial undertaking, namely-

(a) for chrysotile -

(i) 0.5 fibres per millilitre of air averaged over any continuous period of 4 hours;

(ii) 1.5 fibres per millilitre of air averaged over any continuous period of 10 minutes;

(b) for any other form of asbestos either alone or in mixtures including mixtures of chrysotile with any other form of asbestos -

(i) 0.2 fibres per millilitre of air averaged over any continuous period of 4 hours;

(ii) 0.6 fibres per millilitre of air averaged over any continuous period of 10 minutes;

"proprietor"（東主） means a proprietor of any industrial undertaking;

"protective clothing"（防護衣物） means clothing which is impervious to asbestos dust and which when worn can protect the body and personal clothing of the wearer from contamination by asbestos;

"work with asbestos coating or asbestos insulation"（石棉塗層或石棉絕緣物工作） includes any work in which asbestos coating or asbestos insulation is removed, repaired or disturbed.

(2) For the purpose of this Regulation -

(a) any reference to a workman being exposed to asbestos in an industrial undertaking shall be construed as a reference to the exposure of that workman to asbestos dust arising out of or in connection with any work with asbestos which is carried out in the industrial undertaking;

(b) in determining whether a workman is exposed to asbestos or whether the extent of exposure exceeds the action level or any control limit, no account shall be taken of any respiratory protective equipment that is being worn by the workman; and

(c) the method for measuring exposure of workman to asbestos in the atmosphere of the industrial undertaking shall be a method approved by the Commissioner.

2. For the purpose of the COP -

"amended water"（潤濕水劑）means the aqueous solution prepared by

diluting a wetting agent which is a mixture of 50% polyoxyethylene ester（聚氧化乙烯酯）and 50% polyoxyethylene ether（聚氧化乙烯醚）or equivalent, with water to a specific concentration in accordance with the manufacturer's instruction.

"competent person"（合資格人士), in relation to any duty to be performed in the COP, means a person who is

(a) appointed by the proprietor to perform the duty; and

(b) by reason of substantial training and practical experience, competent to perform the duty.

"heavy duty plastic sheeting"（耐用塑料布）means transparent plastic sheeting of not less than 0.15 mm in thickness made of low-density polyethylene.

"HEPA filter"（HEPA過濾器）means high efficiency particulate air filter（高效粒子空氣過濾器）capable of trapping and retaining 99.97 percent of the particulates with mass median aerodynamic equivalent diameter 0.3 μm or larger from the air flowing through the filter.

"young person"（青年）has the meaning assigned to it in the Employment Ordinance (Cap. 57).

Section 3 Application

This Regulation applies to all industrial undertakings in which any work with asbestos is carried out.

3. The Regulation is applicable to all activities involving work with asbestos or materials containing asbestos carried out in industrial undertakings, including removal or disposal of asbestos or materials containing asbestos.

Section 4 Approval of respiratory protective equipment, etc.

THE REGULATION

(1) For the purposes of this Regulation, the Commissioner may approve any respiratory protective equipment and shall publish in the Gazette the name or description of the respiratory protective equipment.

(2) The Commissioner may, by notice in the Gazette, revoke any approval given by him under subsection (1) in respect of any respiratory protective equipment.

(3) The Commissioner may also by notice in the Gazette set out the approved form for notification under section 6(4) and the approved method for measuring exposure to asbestos under section 15(1)(a), as well as the approved form of health register under section 17(3).

4. The Commissioner for Labour will from time to time approve respiratory protective equipment (hereinafter referred to as RPE) that can be used in asbestos process. Name or description of the approved RPE will be published in the Gazette. Only RPE with valid approval should be used in asbestos process. A proprietor who plans to carry out asbestos process should take into consideration the possible exposure of workmen to asbestos dust in the process and choose from the approved list the appropriate RPE for use in the process.

5. The Commissioner for Labour may revoke the approval given to any RPE when he considers that the equipment is no longer suitable for use in asbestos process. Name or description of the RPE for which approval is revoked will be published in the Gazette and a proprietor should stop using such RPE in asbestos process.

6. RPE is approved with all its components as integral parts. Substitution of parts of a RPE with parts from a different brand or type of respirator, or unauthorized modification would decrease or cause a total loss of protection to workman. Such substitution of parts and modification will invalidate the approval of the RPE.

PART II
IDENTIFICATION, ASSESSMENT AND NOTIFICATION

Section 5 Assessment of work

THE REGULATION

(1) A proprietor shall before carrying out any work which exposes or is liable to expose any workman to asbestos ensure that an adequate assessment of exposure or the likely exposure has been made by a person who by reason of his training and experience is competent to make that assessment.

(2) The assessment shall -

(a) (i) identify the type of asbestos to which any workman is or is liable to be exposed by analysis or otherwise; or

(ii) without performing the identification, assume that the asbestos involved is not chrysotile alone;

(b) determine the nature and degree of exposure or the likely exposure; and

(c) set out the steps that may be taken to prevent the exposure or to reduce it to the lowest level reasonably practicable.

(3) The proprietor shall keep a written record of the assessment and shall, on being requested by an occupational safety officer, produce the record for inspection.

(4) A proprietor shall ensure that a further assessment is made under subsection (1) when -

(a) there is reason to suspect that the existing assessment is no longer valid; or

(b) there is significant change in the work to which the existing assessment relates.

7. Before carrying out any work which exposes or is liable to expose any workman to asbestos, the proprietor is required to conduct an assessment on the exposure or the likely exposure. The assessment should cover workmen who are engaged in the work with asbestos and other workmen in the industrial undertaking who are not directly involved in the work but could be affected by the asbestos work due to, for example, proximity to the work. The proprietor shall ensure that the assessment is conducted by a competent person who has adequate knowledge of the type of work involved and of the available control measures. The person should have sufficient knowledge, skills and appropriate experience to evaluate the health and safety risks to workmen arising from the exposure to asbestos at work. That person may be a works manager, an occupational hygienist, a safety officer or an asbestos consultant registered under the APCO. Relevant professional bodies such as laboratories accredited for the relevant asbestos tests under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) may also assist with elements of an assessment when special expertise is required.

8. The purpose of the assessment is to provide basic information on the nature and degree of the exposure of workmen to asbestos dust, and for establishing appropriate control measures, safe work practices and procedures for preventing or minimizing the exposure. The assessment should appropriately cover :

(a) the type of work and the materials containing asbestos involved;

(b) the type of asbestos involved and results of analysis, or assume that it is a type of asbestos other than chrysotile or is a mixture of asbestos containing chrysotile;

(c) details of the expected exposure :

(i) frequency and duration of exposure to asbestos;

(ii) whether the exposure is liable to exceed the control limit and the number of workmen affected;

(iii) whether the exposure is liable to exceed the action level and the number of workmen affected;

(d) control measures (other than RPE) to be applied to prevent or reduce exposure to the lowest level reasonably practicable, e.g. suppression of dust at source, enclosure and mechanization, partial enclosure with dust extraction, wetting, etc.;

(e) the choice, provision and use of RPE and any other personal protective equipment;

(f) practices to be adopted including arrangements for prevention of spread of asbestos from the work area and arrangements for decontamination of workmen prior to entering asbestos-free areas;

(g) determination of any ongoing monitoring requirements;

(h) the procedures for removal of waste from the work area; and

(i) the procedures for dealing with emergencies.

9. The following sources of information can be used in performing the assessment :

(a) any relevant information available from the builder, owner or occupier of the premises or plant, or the manufacturer or supplier of the asbestos material;

(b) information from any previous monitoring exercise made on the same type of work or in relation to the same type of work;

(c) information about the performance of RPE and any other personal protective equipment from the manufacturer or supplier;

(d) guidelines on likely dust levels for various jobs outlined in the selection guide to approved RPE (Appendix VI) and guidance materials from other government departments such as Environmental Protection Department; and

(e) Asbestos Investigation Report and Asbestos Abatement Plan prepared in pursuance of APCO.

It is necessary to emphasize that the guidelines or guidance materials mentioned in (d) above are for reference only. Proprietors should exercise their due diligence to verify the actual situation whenever required.

10. Whether it is necessary to make an assessment for each individual job involving asbestos depends on the nature of the jobs as well as the location where the jobs are carried out. When the nature of the jobs is simple and involves the same process repeatedly carried out at the same location, a single assessment can be used to cover the jobs that are performed on different occasions. For any job involving asbestos being carried out at a different location, as in demolition, a separate assessment is required.

11. For asbestos abatement work, the Asbestos Investigation Report and Asbestos Abatement Plan required under APCO will be accepted as assessment under the Regulation if appropriate elements mentioned in paragraph 8 are included in the report or plan.

12. Section 5(4) also requires that an assessment shall be reviewed whenever there is evidence to suspect that the original assessment is no longer valid or where there has been a significant change in the work. Situations where re-assessment are required include :-

(a) change in the work method;

(b) change in the method of dust suppression or dust control;

(c) change related to the volume or rate of work;

(d) when the results of monitoring indicate inadequate control of exposure;

(e) when improved control measures become reasonably practicable.

13. A proprietor is required to maintain a written record of the assessment and a copy of the record should be kept at the location where the work with asbestos covered by it is conducted. The assessment record should be readily available to the enforcing officers for inspection.

Section 6 Notification

(1) Subject to subsection (2), before a proprietor begins to carry out work with asbestos coating or asbestos insulation or other asbestos work, he shall give the Commissioner not less than 28 days' notice, or such shorter notice as the Commissioner may agree to accept, of the work.

(2) Notification is not required in respect of work with asbestos other than work with asbestos coating and asbestos insulation if the extent of exposure of that asbestos work neither exceeds nor is liable to exceed the action level.

(3) Where there is a material change in the asbestos work which might affect the particulars notified under subsection (1), the proprietor shall, within 7 days after he becomes aware of the change, notify the Commissioner of that change.

(4) Notification under subsections (1) and (3) shall be in the approved form.

14. A proprietor is required to notify the Commissioner for Labour not less than 28 days, or such shorter notice as the Commissioner may agree to accept, before he commences to undertake

(a) work with asbestos coating or asbestos insulation; or

(b) other type of asbestos work in which the extent of exposure, as revealed by the assessment under Section 5, exceeds or is liable to exceed the appropriate action level.

15. Action level is the exposure to asbestos accumulated over a continuous 12-week period, and is expressed as fibre-hours per millilitre of air (fibre-hours/ml). If the assessment (Section 5) reveals that the exposure of any workman is liable to exceed the appropriate action level, the requirement on notification applies.

16. If the asbestos work is repeatedly carried out at different time periods at the same location, the proprietor is only required to notify the Commissioner for Labour not less than 28 days before the asbestos work at that location is first commenced, and notification each time before the work is carried out is not required. However, when there is significant change in the particulars of the asbestos work described in the notification, the proprietor is required to notify the Commissioner for Labour of that change within 7 days after he is aware of the change. In this case, significant change includes change in the date of commencement of the asbestos work and date of its completion, change in nature of the asbestos work and type of materials containing asbestos involved in the work.

17. Notification of asbestos work and notification of change in notified asbestos work shall be submitted in the form approved by the Commissioner for Labour (Appendix I). Regarding the 'Date of completion of asbestos work' column, if the asbestos work is in the form of a single project which is anticipated not being repeated at the same location in the near future, the proprietor should fill in the date of completion of the project into the column. However for any on-going process involving asbestos carried out at the same location, the proprietor can fill in wordings such as 'on-going process' to the column.

18. To decide whether or not the action level is liable to be exceeded it is first necessary to know what type of airborne fibre exposures are likely encountered. Types of exposure that should be taken into consideration are:

(a) exposure to chrysotile alone; or

(b) exposure to asbestos fibres other than chrysotile, either alone or in mixtures, including mixtures containing chrysotile.

Exposures can be estimated using available data or past experience of the process in question, but in case of doubt it will be necessary to verify the estimated exposures by measurement, using a method approved by the Commissioner for Labour (refer to Section 15).

Action level calculation

19. In case of single type of exposure throughout the working period, either (a) or (b) of paragraph 18, individual exposure is calculated by multiplying the airborne exposure in fibres/ml (f/ml) by the time in hours for which it lasts to give exposure in fibre-hours/ml. Cumulative exposure is calculated by adding together all the individual exposures over the 12-week period in question. If within any 12-week period this total exposure exceeds 96 fibre-hours/ml for chrysotile, or 48 fibre-hours/ml for all other form of asbestos, either alone or in mixtures, including mixtures containing chrysotile, then the action level has been exceeded. The followings are some examples of action level calculation applicable to single type of exposure:

(a) A workman is exposed to a uniform concentration of 0.1 f/ml for 6 hours in every working day. Over the 12-week period the cumulative exposure is:

0.1 x 6(hours) x 6(days) x 12(weeks) = 44 fibre-hours/ml

and is below the action level for chrysotile and also for all other forms of asbestos, including mixtures.

(b) A workman is exposed to mixture of asbestos including chrysotile at a concentration of 0.3 f/ml for 7 hours a day for a continuous period of 4 weeks. In the following 8 weeks, he is not exposed to any form of asbestos. Over the 12- week period the cumulative exposure is:

0.3 x 7(hours) x 6(days) x 4(weeks) = 51 fibre-hours/ml

and is above the action level for mixture including chrysotile.

20. In case of combined exposures where within the working period some of the exposures are due to chrysotile alone, and the rest to asbestos other than chrysotile or to mixtures including chrysotile, and one type of exposure can be clearly distinguished from the other, two methods of calculation can be used to decide whether or not the action level is exceeded:

(a) The action level is considered to be exceeded if

$$\frac{E_{chry}}{AL_{chry}} + \frac{E_{amp}}{AL_{amp}} > 1$$

where E_{chry} = the cumulative exposure to chrysotile alone;

E_{amp} = the cumulative exposure to other form of asbestos either alone or in mixtures;

AL_{chry} = action level for chrysotile alone (96 fibre-hours/ml); and

AL_{amp} = action level for other form of asbestos either alone or in mixtures (48 fibre-hours/ml).

For example, a 20-hour exposure at 3 f/ml for chrysotile and a 6-hour exposure at 2 f/ml to any other form of asbestos other than chrysotile, either alone or in mixtures, including mixtures containing chrysotile, then the calculation becomes:

$$\frac{20 \times 3}{96} + \frac{6 \times 2}{48} = 0.875 < 1$$

As the result is less than one, the action level has not been exceeded.

(b) Alternatively, the exposure in fibre-hours/ml for asbestos other than chrysotile is multiplied by 2 (the ratio of the two action levels) and added to the exposure in fibre-hours/ml for chrysotile. If the resulting total is greater than 96 fibre-hours/ml, the action level is exceeded. Taking the same example as above, it would give a combined exposure of:

$$(20 \times 3) + 2(6 \times 2) = 60 + 24 = 84 \text{ fibre-hours/ml}$$

which is less than 96 fibre-hours/ml and therefore the action level has not been exceeded.

PART III
HYGIENE AND SAFETY REQUIREMENTS

Section 7 Prevention or reduction of exposure

THE REGULATION

(1) A proprietor shall -

(a) prevent the exposure of any workman to asbestos; or

(b) where it is not reasonably practicable to prevent exposure, reduce the exposure of any workman to asbestos to the lowest level reasonably practicable by measures other than the use of respiratory protective equipment.

(2) A proprietor shall in all circumstances -

(a) provide every workman who is or is liable to be exposed to asbestos with approved respiratory protective equipment that is suitable for the circumstances; and

(b) ensure the full and proper use by each workman of the respiratory protective equipment.

(3) Without prejudice to the generality of the requirement in subsection (2), where after taking the measures required in subsection (1) exposure of any workman to asbestos still exceeds or is liable to exceed the control limit, a proprietor shall ensure that the respiratory protective equipment provided under subsection (2) is capable of effectively reducing the concentration of asbestos in the air inhaled by the workman to below the control limit.

(4) A proprietor shall not provide respiratory protective equipment which has been used by another person for use by any workman unless the equipment has first been thoroughly cleaned and disinfected.

21. Diseases caused by asbestos are often serious and irreversible. Section 7 sets out the provision for a proprietor to take measures to ensure that health of workman will not be endangered by asbestos. The proprietor should in the first place avoid the need to remove materials containing asbestos if such material is in good condition. On the other hand, as work with asbestos or materials containing asbestos in industrial undertakings is prohibited under Sections 21C and 21D, asbestos-free substitutes should be used if the materials containing asbestos have to be removed. Moreover, under Sections 21A and 21B, spraying of asbestos and use of asbestos insulation for thermal, acoustic or other insulation (including fire protection) in industrial undertakings are prohibited.

22. Where removal of asbestos or materials containing asbestos cannot reasonably be avoided, proprietor must take measures to prevent workmen from exposure to asbestos dust. Work process should be designed such that asbestos dust will not be released into the atmosphere as far as reasonably practicable. When exposure to asbestos is inevitable, the exposure shall be reduced to the lowest level reasonably practicable by means of control measures and systems of work, while use of RPE shall only be a supplement to, and not in lieu of, control measures and systems of work.

Control Measures

23. Control measures include:-

(a) Suppression of dust at source — achievable as appropriate by wetting, by using dust suppressing materials or compounds, or by the application of vacuum/extraction techniques at the work-face.

(b) Total enclosure — dust-producing part of the process is localized and totally enclosed. The enclosure should be incorporated with dust extraction which is capable of removing the dust generated in the course of the process. The dust extraction system should incorporate HEPA filter. The filtration should be effective and reliable. The design of dust extraction system is a highly technical skill, and it is

recommended that such work be entrusted to specialists with sufficient professional knowledge.

(c) Partial enclosure — used together with dust extraction when total enclosure is not practicable. As with totally enclosed system, dust extraction used in association with hoods or partial enclosures must be capable of removing the dust that is generated in the course of the process and the filtration of air (by HEPA filter) must be effective and reliable so that no harmful asbestos dust will be emitted to the general environment or returned to the workplace.

Systems of work

24. In repairing industry, suitable systems of work include:-

(a) only using asbestos-free substitutes for repair work;

(b) isolating the process involving asbestos;

(c) limiting to a lowest possible number of exposed workmen;

(d) collecting and removing asbestos waste and debris as soon as they are produced from the work area in suitable container labelled in accordance with Section 19;

(e) ensuring immediate repair of damaged containers of asbestos waste or place it inside another suitable container; and

(f) ensuring cleanliness of premises and plant.

25. In demolition, activities may involve the removal of materials containing asbestos that were installed in the past. In these activities, exposure should be reduced as far as reasonably practicable by:

(a) removing materials containing asbestos before any other work begins;

(b) adopting work methods that minimize breakage, abrasion, sanding, grinding or cutting of materials containing asbestos;

(c) suppressing dust by wetting where appropriate;

(d) avoiding carrying out asbestos work together with other work in the same place at the same time;

(e) segregating the asbestos work area from other areas; and

(f) keeping the work area clean by promptly removing off-cuts, waste and debris.

26. The safe practices for removing the following commonly encountered materials containing asbestos are described in the appendices:

(a) asbestos-containing friction materials (Appendix II);

(b) asbestos cement products (Appendix III);

(c) asbestos coating and asbestos insulation (Appendix IV);

and safe practices for using the glove bag method in small scale short duration asbestos abatement work is described in Appendix V.

Respiratory Protective Equipment (RPE)

27. In addition to the control measures and systems of work described above, a proprietor is required to provide RPE to every workman who is or is liable to be exposed to asbestos. The following points should be observed in providing RPE:

(a) The RPE must be able to provide sufficient quantity of clean air to the wearer for breathing and the equipment must fit the wearer;

(b) The RPE must be of a type approved under Section 4; and

(c) The RPE is properly used by the workman (refer to Section 11).

28. In cases where the concentration of asbestos in the air exceeds the control limit despite of taking of all practicable control measures and safe system of work, the proprietor is required to ensure that RPE provided is capable of effectively reducing the concentration of asbestos in the air inhaled by the workman to a level below the control limit. It is important that under no circumstances should the concentration of asbestos in the air inhaled by a workman be above the relevant control limit.

29. In view of the difference in protection capability and restrictions in application of various types of RPE in the approved list under Section 4, a proprietor should select the appropriate RPE from the approved list for use in a particular asbestos work, making reference to the selection guide detailed in Appendix VI. Selection of RPE should be based on the maximum likely dust level of the particular job and not on the average dust concentration of the working day. To account for some unforeseeable worse conditions, RPE which can offer better protection should be selected to prevent excessive exposure to asbestos dust.

30. A proprietor should bear in mind that no RPE completely removes asbestos fibres from the inhaled air. For each type of RPE, the degree to which asbestos fibres are removed from inhaled air is known under test conditions (nominal protection). In situation where concentration of asbestos in the air exceeds any of the control limits, it is important that the RPE selected is capable of protecting the wearer from exposure above the control limit. The following factors should be taken into consideration in making selection:-

(a) the likely peak exposure to asbestos dust in air;

(b) the maximum use concentration (MUC) of a particular RPE (MUC is the concentration below which the RPE can offer adequate protection); RPE should be selected for exposures that are well within its limit of protection;

(c) the bulk asbestos content, the nature and condition of the material, and the work method;

(d) particular features of the wearer e.g. facial hair, glasses, facial contours, etc.

31. Disposable type respirator will distort after prolonged wearing. This type of respirator should be used for short duration work and should not be used in the main asbestos work. Activities in which disposable respirator may be used include pre-abatement inspection, preparation of abatement area where there is no risk of disturbance to asbestos materials, and removal of last layer of heavy duty plastic sheeting of the work area enclosure, handling of bagged asbestos waste outside work area, etc., where measurable concentration of asbestos is not detectable.

32. Non-disposable RPE is preferably issued on a personal basis and should be separately stored in suitable receptacle with name of the user clearly indicated on the receptacle. In case it is not practicable to issue RPE on a personal basis, the proprietor is required to ensure that the RPE after use by one workman is effectively cleaned and disinfected before it is used by another workman.

33. In view of the physical strain caused by the use of RPE, adequate rest breaks should be arranged to allow the workman to rest during use of RPE. A normal work/rest regime should be established depending on those factors such as the nature of the work and the type of equipment used.

Section 8 Prevention of spread of asbestos

THE REGULATION

A proprietor shall take such measures as may be necessary to prevent or, where this is not reasonably practicable, reduce to the lowest level reasonably practicable, the spread of asbestos from any place where work with asbestos is carried out, including providing in cases where there is risk of spread of asbestos dust in the use of changing and washing facilities, separate facilities for washing and changing of personal protective clothing, of personal clothing and of respiratory protective equipment.

34. A proprietor is required to take appropriate measures to prevent or reduce to the lowest level reasonably practicable the spread of asbestos from the asbestos work area to other areas of the workplace. This can primarily be achieved by restricting emission of asbestos dust from the asbestos work area, and preventing the carriage of asbestos from the asbestos work area by such means as air, water, equipment, tools, shoes and body of workman. Prevention of spread of asbestos can be achieved appropriately by:

(a) adopting appropriate system of work which aims to minimize workman's contact with asbestos, to minimize the possibility of spillage or accumulation of debris and to discourage careless, unduly hurried or untidy work;

(b) taking appropriate control measures such as carrying out work with asbestos under HEPA filter-equipped local exhaust ventilation;

(c) restricting access to the asbestos work area by the designation of a protective equipment zone, and ensuring that contaminated protective clothing and RPE are not worn outside the protective equipment zone;

(d) ensuring asbestos wastes, contaminated protective clothing and filters of RPE are suitably packed and labelled, and outside surfaces of the packages are adequately cleaned before being removed from asbestos work area for disposal;

(e) isolating air conditioning and ventilation systems serving the asbestos work area from all other such systems;

(f) constructing the appropriate work area enclosure to confine the asbestos work in an enclosed region, and maintaining the enclosure under negative pressure so that any leakage will result in clean air being drawn into the work area from outside;

(g) ensuring any piece of tools and equipment contaminated by asbestos is adequately cleaned or sealed inside polythene bags before being removed from asbestos work area for maintenance or servicing or other treatments; and

(h) providing appropriate washing and changing facilities for decontamination of the workmen.

Work Area Enclosure

35. Removal of the more hazardous types of asbestos materials, such as asbestos coating and asbestos insulation, which is liable to give rise to high dust levels should be conducted inside a work area enclosure. The work area enclosure is a physical barrier to enclose the asbestos work area. The enclosure should be constructed appropriately by:

(a) sealing floors and all openings to the work area including windows, doors, air vents, grilles, floor drains, pipe-ducts and conduits, etc., with heavy duty plastic sheeting; or

(b) erecting a floor to ceiling barrier of heavy duty plastic sheeting by installing the sheeting on the floors, walls, ceiling or on a temporary structure of timber frame which is erected for attachment of the plastic sheeting. All joints and edges

of the plastic sheeting should be overlapped and double tapped to ensure that the area is completely sealed off.

Access to or egress from the work area enclosure should be achieved through air-locks provided by the hygiene facilities or the transit facilities as appropriate (refer to Section 14). Regarding the construction and testing of the work area enclosure, the proprietor should also observe the requirements set out in the *Code of Practice on Asbestos Control - Asbestos Work Using Full Containment or Mini Containment Method* published by the Environmental Protection Department.

36. Appropriate HEPA filter-equipped air extraction equipment should be installed to provide a minimum of six air-changes per hour to the enclosure and to maintain a negative pressure inside the enclosure (1.5 to 4mm water gauge lower than that of the surrounding atmosphere). Where practicable, the point of discharge of the exhaust air to the outside of the containment should be distant from other working areas, air-conditioning inlets or air compressors for breathing purposes. Flexible ducting may have to be used to connect the discharge point of the equipment to the open air.

Decontamination of Workmen

37. Every workman involved in work with asbestos should observe a high standard of personal hygiene so as to reduce the risk of spreading asbestos contamination. After finishing work with asbestos, all workmen should decontaminate themselves. Decontamination may involve removal of any asbestos that may have deposited on the body with use of HEPA filter-equipped vacuum cleaner and/or by wet wiping followed by thorough decontamination in washing and changing facilities (refer to Section 14) which may involve washing of hands and face or a full body shower depending on the extent of contamination.

Section 9 Cleanliness of premises and plant

(1) A proprietor who carries out work with asbestos shall ensure that the premises or those part of the premises where the work is carried out and the plant used in connection with the work are kept in a clean state and as far as possible free from asbestos and, in particular, where work with asbestos has been completed the premises or those parts of the premises and the plant used in connection with the work are thoroughly cleaned.

(2) The cleaning required by subsection (1) shall be carried out -

(a) by means of vacuum cleaning equipment; or

(b) by such other method,

so designed, constructed and used that asbestos dust neither escapes nor is discharged into the air.

38. Before the commencement of removal of asbestos on a premises, all movable furniture, plant and fittings inside the area should be moved out of the area as far as reasonably practicable. The floors and walls of the work area and immovable items inside should be covered or sealed, as appropriate with heavy duty plastic sheeting to protect them from contamination by asbestos dust. In particular, rough or uneven surface on which dust accumulates rendering cleaning difficult should be covered with heavy duty plastic sheeting to prevent accumulation of asbestos dust. The plastic sheeting will collect off-cuts and coarse dust and will facilitate clean-up when the work is completed.

39. During removal of asbestos, particular attention should be paid to regular cleaning of the premises and plant so that deposits of asbestos-containing dust and debris do not accumulate in any part of the workplace. Cleaning of areas which may be contaminated with asbestos should be done as frequently as necessary to ensure cleanliness. In particular the

following should be cleaned at the minimum frequency given below:

(a) floor once per working day;

(b) external surface of plant once per working day; and

(c) washing and changing facilities once per working day.

Asbestos debris and spillage should not be allowed to remain on the floor or working surface but should be cleaned up as soon as possible and disposed of as asbestos waste according to the Waste Disposal Ordinance (Cap. 354) and the Waste Disposal (Chemical Waste)(General) Regulation (Cap. 354 sub. leg. C).

40. Method used for cleaning should not create risk to the cleaner or other persons or spread contamination. In order to prevent spread of asbestos fibres, HEPA filter-equipped vacuum cleaner should be used whenever practicable. Small amount of asbestos dust can be removed with a damp cloth, which should be placed in a suitable container and sealed before it dries out.

41. Dry manual brushing or sweeping should not be used to remove asbestos dust and debris. Likewise, compressed air should not be used for cleaning clothes or equipment as the dust will be blown into the air causing further contamination of the work environment.

42. After all materials containing asbestos have been removed and properly bagged, the entire work area should be thoroughly cleaned by using HEPA filter-equipped vacuum cleaner and/or by wet wiping. The cleaning should include all surfaces from which asbestos has been removed as well as exposed surfaces of the heavy duty plastic sheeting and all equipment which has been used inside the work area, followed by thorough visual inspection paying particular attention to ledges, rough surfaces and regions where access is restricted to ensure that all materials containing asbestos have been removed and no traces of asbestos debris or dust are present. When the visual inspection shows that the work area is sufficiently clean, exposed surfaces of the high duty plastic sheeting should be sprayed with a solution of polyvinyl acetate or similar water

based paint to encapsulate any residual asbestos dust on these surfaces to prevent them from release when the plastic sheeting is dismantled for disposal.

43. After clean-up, air monitoring should be conducted inside the work area to provide supporting evidence that the area has been sufficiently cleaned in accordance with the requirements set in the codes of practice on asbestos control published by the Environmental Protection Department. It should be stressed that air monitoring should not be used as a substitution to careful visual inspection. Careful visual inspection and air monitoring are two complementary techniques and both techniques should give clear results before the work area can be declared as sufficiently clean.

Section 10 Provision and cleaning of protective clothing

THE REGULATION

(1) A proprietor shall provide adequate and suitable protective clothing for use by any workman who is exposed to asbestos unless no asbestos is liable to be deposited on the body or personal clothing of the workman.

(2) A proprietor shall ensure that the protective clothing is either disposed of as asbestos waste within the meaning of the Waste Disposal Ordinance (Cap. 354) and the Waste Disposal (Chemical Waste)(General) Regulation (Cap. 354 sub. leg. C), or adequately cleaned at suitable intervals.

(3) The cleaning of protective clothing shall be carried out in a suitably equipped facility located on the premises where work with asbestos is being done or in a suitably equipped laundry elsewhere, and if protective clothing is to be removed from the person for cleaning or disposal, it shall be packed in a suitable container labelled in accordance with section 19(1).

(4) Where, as a result of failure or improper use of the protective clothing, asbestos is deposited on the personal clothing of a workman, then that personal clothing shall be treated in the manner prescribed in subsection (2) as if it were protective clothing and shall forthwith be handed over by the workmen concerned to the proprietor who shall be responsible for such treatment.

44. Protective clothing includes clothing and footwear worn to reduce contamination of the wearer's body or personal clothing by asbestos. The clothing should consist of one piece overall with an integral head covering. Footwear can be rubber boots, or disposable shoe covering worn over ordinary shoes. Rubber boots should be used when use of disposable shoe covering creates danger of slipping. Trousers of the overalls should be able to be worn outside of boots or shoe covering.

45. The protective clothing inclusive of the shoe covering should be made of material that is resistant to penetration by asbestos dust. Design of the clothing should be such that it will not allow asbestos dust to pass through like close fitting at neck, wrists and ankles. The clothing should preferably has a zipper at the front and should not have any external pockets, fasteners or other attachments that could trap asbestos dust.

46. Protective clothing should be suitable in size to fit and should be comfortably worn by the wearer. Appropriate administrative control or work practice should be arranged to reduce the physical stress imposed on the wearer caused by the protective clothing.

47. A proprietor is required to provide protective clothing to any workman whose body or clothes are liable to deposition of asbestos dust based on the assessment under Section 5, from which judgement about whether or not protective clothing is required for the work with asbestos is made. Assessment should start from the assumption that protective clothing will be necessary. Factors to be considered include:

(a) the nature of the process and method of work: whether it is carried out in the presence of engineering controls and, if so, the effectiveness of these controls in reducing the amount of asbestos dust in the workplace; whether the process includes removal of asbestos situated overhead; whether the work is performed outside in the open air, or inside a confined area; etc.;

(b) the material involved, e.g. whether the asbestos is in friable form or bonded in a matrix which makes fibre release unlikely;

(c) the known or expected airborne fibre concentration generated by the process, and whether the airborne fibres are short-lived and derived from a small, easily controlled source; and

(d) whether asbestos is liable to be deposited on clothing through contact, e.g. by rubbing against friable, wet or dusty materials.

48. Any visible deposit of asbestos fibre on clothing or body of a workman indicates that use of protective clothing is required. However asbestos can be deposited on clothing or body of workmen without being visible. In dismantling and removal of materials containing asbestos processes, it is likely that asbestos will be deposited on workman's clothing and body, and protective clothing is in general required.

49. Protective clothing can be of disposable or washable type. Protective clothing of the disposable type should always be used unless specific facilities equipped for the laundering of asbestos contaminated clothing are available.

50. Washable protective clothing should be washed clean and it is generally preferred that all laundering of contaminated clothing be done on-site in suitably equipped facilities. If this is not possible the laundering should be done elsewhere in suitably equipped facilities provided and operated by the proprietor.

51. Any type of protective clothing that has been worn inside asbestos work area should be regarded as being contaminated with asbestos. Contaminated protective clothing should be vacuum cleaned using a HEPA filter-equipped vacuum cleaner fitted with suitable attachment and/ or wet-wiped before the workman takes it off. It should be removed before the workman takes off RPE and leaves the working area. Where purposely built hygiene facilities are provided for the purpose of decontamination, the procedures in Appendix X should be followed in putting on and taking off protective clothing.

52. Contaminated protective clothing once removed should be sealed in dust-tight containers waiting for disposal or for cleaning. Protective clothing of the disposable type should be disposed of as asbestos waste (refer to paragraph 39). Washable protective clothing for despatch to laundry for cleaning should be thoroughly wetted when discarded by the workman and not allowed to dry out before it is washed. The clothing should

be despatched in a thoroughly wet state in impermeable container that is labelled in accordance with Section 19, and precautions should be taken to ensure that personnel at the laundry are not at risk from asbestos. Under no circumstances should the workman be allowed to take home asbestos contaminated clothing for laundering.

53. Personal clothes of workmen accidentally contaminated with asbestos should be treated in the manner as if these personal clothes were protective clothing. The workman shall handover his clothes, wetted and suitably packed, to the proprietor who shall be responsible for such treatment. The proprietor and the workman should agree among themselves as to how the contaminated personal clothes should be treated.

54. Notwithstanding the use of protective clothing, clothing worn underneath the protective clothing may still be contaminated through deficiencies or careless wearing of the protective clothing. In cases where the protective clothing cannot prevent contamination of underclothing, the proprietor should, if required, issue underclothing to the workmen. The underclothing should then be cleaned or disposed of in the same way as protective clothing.

55. In removing asbestos coating, asbestos insulation or other friable asbestos materials inside an enclosure, it is likely that underclothing will be contaminated. Workmen engaged in these processes should not wear any personal clothing underneath the protective clothing and if required, the proprietor should provide workmen with underclothing which should be cleaned or disposed of in the same way as protective clothing.

Section 11 Use and maintenance of control measures

THE REGULATION

A proprietor who provides any control measure, personal protective equipment or other thing or facility pursuant to this Regulation shall -

(a) ensure so far as is reasonably practicable that it is properly used or applied, as the case may be; and

(b) ensure that it is maintained in an efficient state, in efficient working order and in good repair.

56. A proprietor is required to make adequate arrangements to ensure that control measures, personal protective equipment, washing and changing facilities etc., are fully and properly used. The arrangements should include employment of competent persons as supervisors at the asbestos work site, and installation of viewing panels to enable effective supervision of the work in progress from outside the asbestos work area. Viewing panels should be positioned at strategic locations on the boundary of the asbestos work area and each should be at least 300mm x 450mm in size made from 3mm thick clear acrylic sheet.

57. A proprietor should draw up maintenance procedures, as appropriate, for all control measures and personal protective equipment. The procedures should include a list of control measures requiring maintenance; method and date of maintenance; and the person responsible for maintenance and remedying defects. Items requiring maintenance procedures include:

(a) local exhaust ventilation including exhaust hoods, duct work and dust-collectors;

(b) HEPA filter-equipped appliances — air extraction equipment and vacuum cleaner;

(c) washing and changing facilities;

(d) control measures to prevent the spread of contamination (including work area enclosure); and

(e) respiratory protective equipment (RPE).

Details about the use and maintenance of these items are respectively described in the following.

Local Exhaust Ventilation

58. Local exhaust ventilation should draw the airborne material away from the workman's breathing zone and entrain asbestos dust. It should be kept in use during the performance of asbestos work and for such time after the cessation of the work as is necessary to keep the air clear of asbestos fibres. Local exhaust ventilation system should be inspected weekly and thoroughly examined and tested at intervals of not more than six months.

Weekly inspection should ensure that:

(a) exhaust hoods are properly positioned in relation to the source of dust;

(b) exhaust hoods, duct-work, dust collectors and other parts are in working condition;

(c) there are no system leaks;

(d) all filter elements are leak-proof to dust; and

(e) dust collection unit is not overfilled and safe routine for emptying the collection unit has been carried out.

Examination and testing carried out every six months should be conducted by a ventilation engineer or other competent persons, and should ensure that:

(a) all system parts are in position and in working order;

(b) there are no air leak in any part of the system;

(c) all filter elements are effective; and

(d) the air flow is to the design specifications.

59. Record of inspection, examination and remedial measures carried out on exhaust ventilation system should be kept by the proprietor for a minimum of two years and should be readily available for inspection by the enforcing officers.

HEPA Filter-equipped Appliance-air extraction equipment and vacuum cleaner

60. In using air extraction equipment, the following measures should be taken:

(a) The exhaust from the equipment should not normally be discharged into the building in which they are located. Discharge ducting should where reasonably practicable be used to vent the extracted air to the outside atmosphere, distant from other work areas, air-conditioning inlets or air compressor for breathing purpose.

(b) The equipment should be turned on before the work starts, and should be left running continuously whilst the work area enclosure is in place, including times when personnel are not on site, until the cleanliness of the work area is proven to be satisfactory.

(c) The pre-filter of the equipment should be changed at least at the beginning and at the end of each working day. The fan of the equipment should be turned off when changing the pre-filter.

61. Every piece of HEPA filter-equipped appliances in use should be inspected at least weekly to ensure that there is no leakage and that the performance meets the manufacturer's specifications. HEPA filter-equipped appliances should also be examined and tested for performance in accordance with the following schedule as a minimum :

Air extraction equipment	- after each HEPA filter replacement; or - after every 400 hours of service of HEPA filter; or - after serving every 10 enclosures or work sites; or - whichever is sooner or at least annually.
Vacuum cleaner	- after each HEPA filter replacement; or - after serving every 10 work sites; or - whichever is sooner or at least annually.

Appliances should be clearly labelled to show their examination and testing status. A proprietor should ensure that examination and testing of HEPA filter-equipped appliances as well as labelling of examined and tested appliances are in accordance with the provisions set out in the *Code of Practice on Asbestos Control-Asbestos Work Using Full Containment or Mini Containment Method* published by the Environmental Protection Department.

62. Record of inspection, examination and performance testing, and maintenance including defects repaired should be kept by the proprietor for a minimum of two years and be readily available for inspection by the enforcing officers.

63. All repairs and servicing to HEPA filter-equipped appliances should be carried out inside an enclosure which is maintained under negative pressure and constructed with washing and changing facilities. Personal protective equipment, including disposable overall and full-face positive pressure powered respirator as a minimum, should always be used to protect maintenance personnel from exposure to asbestos dust. When removing HEPA filter-equipped appliances out of the workplace for off-site repairs and servicing, the provisions in Section 8 should be observed.

64. Warning labels in Chinese and English should be affixed to the outside of the air extraction equipment and vacuum cleaner according to Appendix VII.

Washing and Changing Facilities

65. Adequate lighting should be provided inside the washing and changing facilities. Light fittings should be easily cleaned and decontaminated.

66. Arrangements should be made for the facilities to be cleaned at least at the end of each working day. The daily cleaning should include the removal of all dust by vacuum cleaning and then thorough wash down or wet mopping of all exposed surfaces. Debris should not be allowed to accumulate but should be cleared and bagged for disposal as asbestos waste in accordance with the requirements of the Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354 sub. leg. C).

Work Area Enclosure

67. Before removal of asbestos commences, the integrity of the work area enclosure should be tested with the use of a non-toxic smoke generator. Thorough visual inspection of the work area enclosure and the air extraction equipment installed should be carried out at the beginning of each working shift.

68. Interior of the work area enclosure should be maintained under negative pressure throughout the work, including time intervals when personnel are not on site. Effectiveness of the enclosure and of the air extraction equipment in achieving the negative pressure should be checked, where necessary, by local smoke testing or other techniques for detecting leakage airflow. The pressure difference between the inside and outside of the work area enclosure should be continuously monitored at location suspected of having the lowest pressure differential with the use of a micromanometer.

69. Defects revealed during test and inspection of the work area enclosure should be remedied immediately. Records of test and inspection should be kept by the proprietor for a minimum of two years and be readily available for inspection by the enforcing officers.

Respiratory Protective Equipment (RPE)

70. No single RPE fits everyone. A proprietor should ensure proper fit of the RPE and face-seal (a close seal between the face and facepiece of the RPE) for individual workman who is required to wear RPE, such as by providing several brands of the appropriate type of RPE in various sizes and performing test to ensure fitness of the RPE to individual workman. Methods for the test are outlined in Appendix VI.

71. Routinely prior to each entry into the asbestos work area, the wearer of RPE equipped with a tight fitting facepiece must check the seal of the facepiece to ensure face-fit. This may be done by using the procedures recommended by the manufacturer, or using the negative or positive pressure face-fit test detailed in Appendix VIII.

72. Non-disposable RPE should be checked and cleaned before and after each time it is used. Defects should be repaired before the RPE can be used. Cleaning and maintenance of RPE should be carried out in an area free from asbestos contamination. Every workman should be instructed how to check that a piece of RPE has been maintained and is effective. Preferably a person is assigned to perform the daily cleaning and inspection of RPE.

73. RPE must be inspected for wear and tear and deterioration of components before and after each use. Special attention should be given to rubber or plastic parts that can deteriorate. The facepiece, especially the faceseal surface, headband, valves, connecting tube, fittings, and filters must be in good condition. Inspection of RPE must include checking of the tightness of the connections. For positive pressure supplied air respirator, a check on the air supply with use of air flow indicator should also be made before each use.

74. Repairs to RPE must be performed only by competent persons using parts specifically designed for the RPE. The manufacturer's instructions should be consulted for any repair, and no attempt should be made to repair or replace components or make adjustments or repairs beyond the manufacturer's recommendations.

75. Record of maintenance and repairs performed on RPE should be kept by the proprietor for a minimum of two years and be readily available for inspection by the enforcing officers.

Section 12 Protective equipment zone

(1) (a) Subject to subsection (2), a proprietor shall designate any area where work with asbestos is being carried out as protective equipment zone.

(b) In respect of the protective equipment zone, a proprietor shall -

(i) ensure that the area is clearly demarcated and identified by notices indicating that it is a protective equipment zone, that entry into it is limited to persons authorized by the proprietor and that any person who enters the area must wear suitable approved respiratory protective equipment and suitable protective clothing;

(ii) provide suitable approved respiratory protective equipment and suitable protective clothing for the use of every workman in the protective equipment zone; and

(iii) ensure that no person enters or remains in a protective equipment zone unless he is wearing suitable approved respiratory protective equipment and suitable protective clothing.

(2) Subsection (1) shall not apply where -

(a) (Repealed 1 of 2014 s. 9)

(b) the concentration of asbestos in the air from work with asbestos in the area does not exceed or is not liable to exceed any control limit.

THE REGULATION

(3) No person shall enter or remain in a protective equipment zone unless he is wearing suitable approved respiratory protective equipment and suitable protective clothing.

76. A proprietor is required to designate an area where removal of asbestos is being carried out as protective equipment zone unless the condition stated in Section 12(2) is satisfied. Protective equipment zone shall be demarcated with its boundary clearly defined.

77. Sufficient number of warning notices (per Appendix IX) should be displayed prominently at the approaches to, and along the boundary of the protective equipment zone. Adequate arrangements including the installation of sufficient number of viewing panels (refer to paragraph 56) along the boundary should be established by the proprietor to ensure that no person enters a protective equipment zone unless that person is authorized to do so and is wearing appropriate RPE and protective clothing.

78. Isolation of the protective equipment zone from the rest of the workplace in the form of a work area enclosure (refer to Section 8) is generally required when the work involves asbestos coating or asbestos insulation, or when the concentration of asbestos dust in the air exceeds or is liable to exceed the control limit.

Section 13 Prohibition of eating, drinking and smoking

(1) A proprietor shall take all reasonable steps to ensure that no workman eats, drinks or smokes in an area where work with asbestos is being carried out.

(2) A proprietor shall put up sufficient number of notices in prominent positions prohibiting eating, drinking and smoking in the area where work with asbestos is being carried out.

(3) No person shall eat, drink or smoke in the area where work with asbestos is being carried out.

79. A proprietor should instruct all workmen not to eat, drink or smoke in asbestos work area or the washing and changing facilities; or not to take food, drink or cigarettes into such areas. Sufficient notices should be put up in prominent places in and around asbestos work area to warn workmen of the prohibition of eating, drinking and smoking.

80. Where eating and drinking is required during working hours, a proprietor should designate a specific area for such purpose. The area should be situated away from the asbestos work area and entry to the eating and drinking area while wearing contaminated personal protective equipment or carrying equipment contaminated with asbestos is prohibited.

Section 14 Washing and changing facilities

THE REGULATION

(1) Where any workman in an industrial undertaking is exposed to asbestos, the proprietor shall provide for the use of the workman -

(a) adequate and suitable washing and changing facilities;

(b) where he is required to provide protective clothing, adequate and suitable facilities for the storage of -

(i) the protective clothing; and

(ii) personal clothing not worn during working hours; and

(c) where he is required to provide approved respiratory protective equipment, adequate and suitable facilities for storage of the equipment.

(2) The facilities provided for the storage of personal protective clothing, of personal clothing and of respiratory protective equipment shall be separated from each other and indicated in both English and Chinese.

(3) The proprietor shall ensure that the facilities provided for washing, changing and storage are fully and properly used.

81. A proprietor is required to provide washing and changing facilities for use by workmen who have been exposed to asbestos for the purpose of decontamination. The facilities should enable each workman to meet a high standard of personal hygiene so as to:

(a) minimize secondary exposure to asbestos from contaminated clothing, hands or face; and

(b) avoid the spread of asbestos contamination to clean areas.

82. The type and extent of washing and changing facilities should be related to the nature and degree of exposure as indicated by the assessment carried out under Section 5. In the following cases where

(a) the exposure exceeds or is liable to exceed the control limit; or

(b) the exposure is due to asbestos coating or asbestos insulation; or

(c) the work involves large scale removal of materials containing asbestos (the area involved is 15 square metres or more);

separate washing and changing facilities (hereinafter referred to as the hygiene facilities) solely used for the purpose of decontamination of workmen exposed to asbestos are required.

83. Where the exposure is not due to asbestos coating or asbestos insulation, and the exposure is low and infrequent, existing washing facilities on the premises may be shared by the asbestos workmen with other workmen who are not liable to such exposure. In this case, exposed workmen should clean any asbestos dust that may be found on their clothes and bodies as far as possible with the use of HEPA filter- equipped vacuum cleaner or by wet wiping before they leave the asbestos work area to go to the shared washing facilities.

84. The hygiene facilities can be a prefabricated unit or can be constructed on site using heavy duty plastic sheeting. The hygiene facilities should consist of three compartments:

(a) a clean changing room;

(b) a shower room; and

(c) a dirty changing room.

Each compartment should be separated by a curtained doorway consisting of a heavy duty plastic sheeting with a slit opening covered by a plastic flap which hangs and lifts in the direction of access.

85. The clean changing room is the area where workmen remove their street clothes and put on clean RPE and protective clothing. Mirrors should be provided in the room to assist workmen in putting on properly the headgear of the protective clothing and RPE.

86. The shower room should be contiguous with both the clean and dirty changing rooms so that workmen must pass through it when going from one changing room to the other. All workmen leaving the work area should thoroughly wash themselves in the shower room. Showers should be provided in the ratio of one for every six workmen as a minimum and size of the shower room should be at least 1m square and 2m headroom for every shower provided. The shower room should be equipped with the following:

(a) constant supply of hot and cold running water for the shower(s);

(b) tray of adequate size to collect the waste water from washing, which should be drained through a high efficiency filter before being discharged to drainage;

(c) soap, shampoo and other cleansing agents; nail brushes;

(d) individual towels for each workman; and

(e) hooks for hanging RPE and supports for the showers.

87. The dirty changing room is the area where workmen remove their protective clothing on leaving the work area, and where contaminated footwear and tools used in the work area are stored. Plastic bag properly supported should be provided in this room for the collection of contaminated clothing and filters of RPE. The naming of this room should not be taken to imply that this room can be maintained in a low standard of cleanliness.

88. The hygiene facilities should be constructed contiguous to the work area such that the workmen can enter the hygiene facilities directly after leaving the work area. Where this is not possible, appropriate facilities known as the transit facilities for the workmen to carry out preliminary decontamination before proceeding to the hygiene facilities installed elsewhere on site for thorough decontamination should be provided at the exit of the work area. The transit facilities (refer to Appendix XI) should also comprise three compartments as with hygiene facilities. No shower but water for cleaning and washing is provided in the middle compartment of the transit facilities. When transit facilities are used, the workmen should wear transit overalls, which is another set of protective clothing, for travelling between the transit facilities and the hygiene facilities. The transit overalls should be easily distinguishable from the working overalls (protective clothing worn in the work area), e.g. by use of different colours or by markings. The route which workmen take in travelling from transit facilities to the hygiene facilities should be selected to avoid them having to pass through other occupied areas as far as reasonably practicable.

89. Procedures for entering and leaving the work area through the hygiene facilities and through the transit facilities are detailed in Appendix X and Appendix XI respectively.

90. A proprietor should provide lockers with separate compartments for storage of personal belongings of the workmen, and for storage of clean protective clothing. These lockers should be labelled clearly in both Chinese and English. The lockers can be installed inside the clean changing room or in a convenient location next to the hygiene facilities.

91. Plastic bags which can be sealed, or containers with tight-fitting lids should be provided as receptacles for storage of RPE. RPE should be thoroughly dried before being sealed inside the receptacle which is marked with name of the workman to whom the RPE is issued. Receptacles holding RPE should be stored in a convenient, clean and sanitary place to protect the RPE from sunlight, excessive heat or cold, harmful chemicals and mechanical damage.

92. A separate 2-compartment debris port (consisting of a washing room and a clean room) should be constructed adjoining the work area for the removal of asbestos wastes as far as reasonably practicable. However, if this is not practicable, asbestos wastes may be moved out of the work area through the hygiene facilities or the transit facilities provided that the surfaces of the containers of the asbestos waste have been thoroughly cleaned as far as reasonably practicable to prevent secondary contamination of these facilities by asbestos dust.

Section 15 Air monitoring

(1) A proprietor shall ensure that -

(a) the exposure of any workman in an industrial undertaking to asbestos in the air is monitored by means of an approved method where such monitoring is appropriate for the protection of the health of the workman and whenever there is a substantial change in the working conditions rendering the findings of the previous air monitoring no longer valid; and

(b) the air monitoring required in paragraph (a) is carried out by a laboratory that is accredited for the relevant asbestos test by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) managed by the Commissioner for Innovation and Technology on behalf of the Government or by a scheme with which HOKLAS has a mutual recognition agreement.

(2) A record of any monitoring carried out in pursuance of subsection (1) shall be kept by the proprietor who shall, on being requested by an occupational safety officer, produce the record for inspection.

93. Air monitoring for asbestos removal process serves the following purposes:

(a) to determine the level of exposure of workmen to airborne asbestos dust in the course of work;

(b) to assure that the RPE chosen provides the appropriate degree of protection to the workmen; and

(c) to check the effectiveness of control measures adopted for reducing exposure of workmen to asbestos.

94. In general, there are two ways for carrying out air monitoring, namely static air sampling and personal air sampling. Static air sampling will be useful for checking effectiveness of the control measures or the cleanliness of work areas when work with asbestos has been completed. However, the result from static air sampling should not be regarded as indication of actual workman exposure.

95. Personal air sampling at the breathing zone of the workman in accordance with the method approved by the Commissioner for Labour published in the Gazette# shall be used for monitoring the exposure of the workmen to asbestos, and for determining whether the relevant control limit or action level is exceeded.

96. Personal air sampling should be conducted regularly during the course of the work, and whenever there is change in work condition or doubt as to the effectiveness of the control measures in protecting workmen from exposure to asbestos dust. The following guidelines are recommended frequency of personal air sampling for reference purposes:

(a) For asbestos removal work conducted in any industrial undertakings other than construction work, if the assessment under Section 5 indicates that the estimated level of the asbestos dust exceeds or is equal to half of the relevant control limit, personal air sampling should be conducted at the commencement of the asbestos work; while for cases where the estimated level is less than half of the relevant control limit, personal air sampling may be conducted within one year after commencement of the work. If the air monitoring reveals that the level of the asbestos dust:

(i) exceeds or is equal to half of the relevant control limit, subsequent personal air sampling should be conducted at least annually; or

(ii) is less than half of the relevant control limit, subsequent personal air sampling should be conducted at least once every three years.

(b) For construction work other than removal of asbestos coating or asbestos insulation, if the assessment under Section 5 reveals that the estimated level of the asbestos dust exceeds or is equal to half of the relevant control limit representative personal air sampling should be conducted at a frequency of no less than one sampling for every 4 workmen at the commencement of the work and subsequently every working day.

(c) For removal of asbestos coating or asbestos insulation, representative personal air sampling should be conducted at a frequency of no less than one sampling for every 4 workmen at the commencement of the work and subsequently every working day.

97. Where groups of workmen are doing the same type of work under similar conditions, personal air sampling may be carried out on a group basis. Individuals chosen for sampling should be selected randomly on those suspected to have the highest exposure to the asbestos dust. The number of individuals chosen for sampling should be of statistical significance.

98. If the assessment under Section 5 reveals that air monitoring is inappropriate, such as in cases where:

(a) exposure is known to be low and not likely to approach the relevant control limit;

(b) the work is intermittent and of short duration and adequate information is available to enable the provision of appropriate protective equipment; and

(c) the protective equipment provided is of such a standard that no foreseeable measurement result could indicate a need for equipment of a higher standard;

the assessment should be substantiated by information on the likely level of airborne asbestos. Sources for such information could be previous experience of the work or guidance issued by Labour Department (Appendix VI), Environmental Protection Department or other relevant organizations.

99. Since measurement of airborne asbestos fibres is a highly skilled process, air monitoring should only be carried out by competent persons from laboratories which are accredited for the relevant asbestos test by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) managed by the Commissioner for Innovation and Technology on behalf of the Government or by a scheme with which HOKLAS has a mutual recognition agreement.

100. Record of the air monitoring results should be kept by the proprietor for at least five years and shall be readily available for inspection by the enforcing officers.

101. Environmental air sampling during the removal of asbestos materials, and air sampling to check cleanliness of the areas after completion of the removal work are required by the Environmental Protection Department. The Environmental Protection Department should be consulted for the requirements in collecting these samples.

Note : A copy of the Gazette for approved method for measuring exposure to asbestos in air can be found in the website of the Labour Department at http://www.labour.gov.hk/eng/public/pdf/os/B/approved_method_asbestos.pdf

Section 16 Safety information, instruction and training

A proprietor shall -

(a) give every workman who is or is liable to be exposed to asbestos adequate information about risks of asbestos and the precautions that should be observed;

(b) ensure that every workman who works with asbestos is trained and instructed in-

(i) safety precautions for working with asbestos; and

(ii) the purpose, proper use and limitations of any control measure, personal protective equipment or other thing or facility provided in pursuance of this Regulation.

102. The purpose of information, instruction and training provided by a proprietor is to ensure that every workman who is liable to be exposed to asbestos is aware of the hazards of asbestos and of the measures to be observed in safe-guarding himself and others; and to ensure that every asbestos workman is equipped with the skills and knowledge required when using the control measures, personal protective equipment, safe practices and emergency procedures. Training and instruction should be provided prior to commencement of the removal of asbestos, and before a workman is engaged in removal of asbestos. Persons who need to be trained should include but not limited to:

(a) all workmen who are involved in removal of asbestos;

(b) all workmen who are required to work in or around the area of a workplace where asbestos removal work is being carried out; and

(c) supervisors of the workmen described above.

103. It is the responsibility of a proprietor to ensure that all workmen under his employment are properly instructed and trained. The proprietor may conduct the training himself if he is competent to do so or he may arrange for someone who possesses sufficient skill, knowledge and experience to provide the training.

104. A proprietor may send his workmen to attend training courses on asbestos organised by the Occupational Safety and Health Council, or the Construction Industry Council or equivalent organizations. However, attending these courses can only be regarded as part of the general training required under the Regulation. In supplement to these training courses, the proprietor should provide instruction and training specific to the particular situation.

105. The extent of training required depends on the level of risk of exposure to asbestos in a particular situation and the complexity of the control measures, work practices and procedures required to minimize the risk of exposure. It is necessary to tailor the training programme for particular work activity in commensurate with the risks of the activity. In general, information, instruction and training given to workmen should cover in appropriate details on:

(a) health hazard of asbestos, its effect and how it enters the body, and the increased risk of lung cancer for asbestos workmen who also smoke;

(b) importance of minimizing the creation of dust in the course of work and choosing the correct work method;

(c) control measures, personal protective equipment and work methods: how can they reduce hazard from asbestos and their limitations;

(d) proper use and maintenance of control measures;

(e) correct selection, proper use, cleaning, storage and maintenance of RPE and protective clothing with specific attention to the proper fit and face-fit test of RPE;

(f) work practices and procedures to be followed in the removal or disposal of asbestos;

(g) nature and reasons for air monitoring and the availability of the monitoring results;

(h) hygiene procedures and the importance of maintaining a high standard of personal hygiene;

(i) purposes of medical surveillance;

(j) procedures for reporting and correcting defects; and

(k) emergency procedures, e.g. in case of failure of control measures.

106. Refresher training should be given at least annually and whenever necessary to existing workmen to remind them of the precautions needed. Additional training should be provided when new work methods, plant or control measures are introduced.

107. In planning training programmes the language and literacy factors should be taken into consideration in determining the most suitable method. If the literacy level is low, verbal or highly graphic visual presentations should be used. The training provided should be practical and include hands-on training whenever appropriate. Training should also be evaluated to ensure that trainees have an adequate understanding of the matters covered.

108. Records of the training maintained by the proprietor should include:

(a) names of workmen receiving the training and the date of attendance;

(b) an outline of the course content; and

(c) names and positions of the persons providing the training.

The training record of each workman should be kept for at least two years, and should be readily available for inspection by the enforcing officers.

Section 17 Medical surveillance

(1) A proprietor shall not employ any person in working with asbestos unless that person has within the 4 months immediately preceding the commencement of such employment undergone a radiographic examination of his chest and is certified by a registered medical practitioner to be fit to do such work.

(2) A proprietor shall ensure that at intervals of not more than 12 months every person employed in working with asbestos -

(a) undergoes a radiographic examination of his chest; and

(b) is certified by a registered medical practitioner to be fit to continue to do such work.

(3) A proprietor who employs a person shall -

(a) maintain a health register in the approved form for every person employed in working with asbestos;

(b) keep the register for at least 5 years from the date of last entry by the proprietor and it shall be made available for inspection by the Commissioner when requested by him; and

(c) give a copy of the health register to the person covered by it upon termination of his employment.

(4) Every person employed or to be employed in working with asbestos shall within a reasonable time after being requested by the proprietor present himself to a registered medical practitioner for medical examination.

(5) The cost of any radiographic and medical examination undergone by any person under this Regulation shall be borne by the proprietor.

109. A satisfactory health and physical condition is important in considering whether someone is fit to work with asbestos in which use of RPE is required. Section 17(1) requires a proprietor to ensure that any person employed by him to work with asbestos has been medically examined by a registered medical practitioner and is certified by the medical practitioner with a certificate that the employee is fit to do such work within 4 months immediately preceding the commencement of the employment. The medical examination shall include chest X-ray.

110. A proprietor shall ensure that every workman under his employment in work with asbestos undergoes chest X-ray and medical examination at intervals not more than 12 months, and is certified by a registered medical practitioner to be fit to continue to do such work. In between medical examinations when a workman has any doubt as to his fitness in work with asbestos, he should inform the proprietor who should arrange for him to be medically examined as appropriate.

111. Section 17(3) requires a proprietor to maintain a health register in the approved form (Appendix XII) for every person employed by him to work with asbestos. Copy of the certificate issued by the medical practitioner should also be attached to the health register. A copy of the health register should be kept at the work location of the asbestos workman covered by it, and be readily available for inspection by the enforcing officers. Health register shall be retained by the proprietor for at least five years from the date of last entry in it. Upon termination of the employment of an asbestos workman, the proprietor shall provide the workman with copy of his own health register.

112. A proprietor should obtain a copy of the health register of a workman who claims to have been previously medically examined, and request the workman to undertake medical examination as appropriate in accordance with the Regulation before employing him as asbestos workman. If being requested, the workman shall present himself for the medical examination.

PART IV
STORAGE, DISTRIBUTION AND LABELLING

Section 18 Storage, distribution of loose asbestos and waste

THE REGULATION

A proprietor who undertakes work with asbestos shall ensure that no loose asbestos or waste which contains asbestos is -

(a) stored;

(b) received into or despatched from any place of work; or

(c) distributed, except in a totally enclosed distribution system, within any place of work,

unless it is in a suitable and sealed container clearly marked in accordance with section 19.

113. Receptacles for loose asbestos or asbestos waste should be so designed, constructed and maintained as to prevent dust and any of the content escaping out of the receptacles under stress and strain of normal handling.

114. Loose fibrous or dusty waste, or other asbestos waste in small fragments can be double-bagged in impermeable heavy duty plastic bags. The inner plastic bag should not be filled more than half-full and each bag should be capable of being securely sealed in goose-neck with adhesive tape. Air should be excluded from the bag as far as possible by means of vacuum before sealing.

115. Large pieces of rigid materials such as asbestos cement sheeting should not be broken or cut for disposal in plastic bags. They should be wrapped intact in two layers of heavy duty plastic sheeting. To avoid the plastic packaging from being damaged by sharp objects, the sharp ends should first be wrapped with heavy duty plastic sheeting and completely sealed with adhesive tape.

116. Alternatively, metal drums can be used for packing asbestos wastes such as roof tiles, as the heavy weight of these wastes and presence of sharp objects render plastic packaging not suitable. The metal drums should be fitted with full aperture type lids which should be secured with latch, lever or nut and bolt closures.

117. Waste material should be removed and packed promptly in order to avoid being trampled. Damage to asbestos material should be avoided as far as possible and in no circumstances should asbestos material be broken up so as to facilitate packing for disposal.

118. Practices for treating asbestos waste (including the requirements for the heavy duty plastic bags mentioned in paragraph 114 and the metal drums mentioned in paragraph 116) covered in the *Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste* published by the Environmental Protection Department should be observed by a proprietor as appropriate in treating asbestos wastes produced in industrial undertakings.

Section 19 Labelling of container and articles containing asbestos

THE REGULATION

(1) Where any asbestos is required to be put in a container that container shall have affixed to it a clear and visible label on which is written -

"DANGER — CONTAINS ASBESTOS
DO NOT INHALE DUST
危險 — 載有石棉
切勿吸入塵埃
(Follow Safety Instructions)
（遵從安全指示）".

(2) Any article which contains asbestos, being an article for use at work, shall be labelled as required in subsection (1). The labelling shall be effected by means of -

(a) an adhesive label firmly affixed to the article or its packaging;

(b) a tie-on label firmly attached to the article or its packaging; or

(c) direct printing onto the article or its packaging, as the case may be.

119. Section 19(1) requires plastic packaging and metal drums used for packing asbestos or asbestos wastes to be clearly and distinctly labelled. This Section also sets out the required wording of the label. All letters and characters of the label should be in bold type and should be at least 30 mm high. Colour of the letters and characters should be in distinct contrast to the background, e.g. black letters and characters against red background.

120. Under Section 19(2), warning labels should be affixed to articles for use at work if the articles contain asbestos. The label should be in the form as shown in Appendix XIII and it should be clear and distinctly visible, and should be effected in a conspicuous position of the article.

PART V
MISCELLANEOUS

Section 20 Employment of young persons

THE REGULATION

No proprietor shall employ any young person -

(a) in working with asbestos;

(b) in carrying out any cleaning in connection with work with asbestos.

121. Section 20 prohibits a proprietor in employing any young person in any work with asbestos, and in carrying out any related cleaning activities including:

(a) preliminary cleaning of and preparation for the work area where removal of asbestos is to be carried out;

(b) cleaning of washing and changing facilities in connection with removal of asbestos;

(c) cleaning up work area where removal of asbestos has been conducted;

(d) clearance of the work area after removal of asbestos has been completed.

Section 21 (Repealed 1 of 2014 s. 10)

Section 21A Ban on asbestos spraying

The proprietor of an industrial undertaking must not undertake asbestos spraying in the industrial undertaking.

Section 21B Ban on using asbestos insulation

The proprietor of an industrial undertaking must not use in the industrial undertaking asbestos insulation for thermal, acoustic or other insulation (including fire protection).

Section 21C Ban on working with amphibole asbestos

(1) The proprietor of an industrial undertaking must not carry out work with amphibole asbestos in the industrial undertaking.

(2) Subsection (1) does not prohibit the proprietor from removing or disposing of amphibole asbestos that was in use before 1 September 1997.

Section 21D Ban on working with chrysotile

(1) The proprietor of an industrial undertaking must not carry out work with chrysotile in the industrial undertaking.

(2) Subsection (1) does not prohibit the proprietor from removing or disposing of chrysotile that was in use before Part 3 of the Air Pollution Control (Amendment) Ordinance 2014 (1 of 2014) comes into operation*.

Note : * Operation Date : 4 April 2014

122. Section 21A prohibits spraying of asbestos or spraying of any material containing asbestos, while Section 21B prohibits use of asbestos insulation for thermal, acoustic and other insulation purposes and for fire protection not applied as a coating. Asbestos insulation includes pre-formed sections of pipe insulation, asbestos lagging and asbestos in-fill used for fire protection. However, asbestos insulation does not include asbestos cement products and asbestos insulation board. Also articles made of rubber, plastic, resin or bitumen, which also contain asbestos, such as vinyl floor tiles, electric cables, and roofing felts are not regarded as asbestos insulation as the insulating properties of such articles are incidental to their main purpose. Other asbestos products which may be used at high temperatures but have no insulation purpose such as gasket, washers and seals are also not taken as asbestos insulation.

123. Work with asbestos (chrysotile, crocidolite, amosite, fibrous actinolite, fibrous anthophyllite and fibrous tremolite) and products containing these asbestos is also prohibited under Sections 21C and 21D. However, a proprietor can undertake process for the removal and disposal of amphibole asbestos or materials containing this asbestos that were in use before 1 September 1997 provided that other provisions under the Regulation are observed. A proprietor can also undertake process for the removal and disposal of chrysotile or materials containing chrysotile that were in use before 4 April 2014 when Part 3 of the Air Pollution Control (Amendment) Ordinance 2014 (1 of 2014) came into operation provided that other provisions under the Regulation are observed.

PART VI
DUTIES OF WORKMEN AND OTHER PERSONS

Section 22 Responsibilities of any person

THE REGULATION

(1) Any workman in an industrial undertaking where work with asbestos is carried out shall-

(a) observe the safety precautions and the procedures set by the proprietor in respect of the asbestos work which have been made known to him in the industrial undertaking;

(b) make full and proper use of any control measure, personal protective equipment or other thing or facility provided in pursuance of this Regulation which have been made known to him in the industrial undertaking; and

(c) report forthwith to the proprietor any fault or defect in any such control measure, personal protective equipment or other thing or facility as provided in pursuance of this Regulation.

(2) The obligations set out in subsection (1)(a) and (b) shall apply also to any other person in the industrial undertaking.

PART VII
OFFENCES AND PENALTIES

Section 23 Offences by proprietors

THE REGULATION

(1) Any proprietor who fails to comply with section 5(1), (3) or (4), 6(1), (3) or (4), 7, 8, 9, 10, 11, 12(1), 13(1) or (2), 14, 15, 16, 17(1), (2), (3) or (5), 18, 19 or 20 commits an offence and is liable to a fine at level 5.

(2) A proprietor who, without reasonable excuse, fails to comply with section 21A, 21B, 21C or 21D commits an offence and is liable to a fine of $200,000 and to imprisonment for 6 months.

Section 24 Offences by workman

THE REGULATION

Any workman who fails to comply with section 10(4) or 22(1) commits an offence and is liable to a fine at level 3.

Section 25 Offences by any person

THE REGULATION

Any person who fails to comply with section 12(3), 13(3) or 22(2) commits an offence and is liable to a fine at level 3.

Section 26 Transitional

THE REGULATION

For assessment of work under section 5(1) where work with asbestos has been commenced before the coming into operation of this Regulation or within 28 days after that date, it shall be sufficient compliance with that section if the proprietor makes the assessment within 28 days after the date of coming into operation of this Regulation.

APPENDICES

Appendix I

工廠及工業經營(石棉)規例
Factories and Industrial Undertakings (Asbestos) Regulation

通知 (i) 石棉工作 [規例第6(4)條]
(ii) 改變已通知的石棉工作 [Section 6(4)]
Notification of (i) Asbestos Work
(ii) Change in Notified Asbestos Work

本表格乃由勞工處處長就工廠及工業經營(石棉)規例第6(4)條的需要而認可
Form approved by the Commissioner for Labour for the purposes of section 6(4) of the Factories and Industrial Undertakings (Asbestos) Regulation

* ☐ 通知石棉工作：須填寫第一部及第二部。
Notification of asbestos work: complete Part I and Part II

* ☐ 通知改變已通知的石棉工作：須填寫第一部及第三部。
Notification of change in notified asbestos work: complete Part I and Part III

第一部 Part I

(1) 工業經營名稱 Name of industrial undertaking		
(2) 註冊辦事處地址 Address of registered office		
(3) 東主/經理姓名 Name of proprietor/ Manager		(4)電話Tel. No.
(5) 工作場地地址(如與(2)相同可省略) Address of workplace (omit if same as (2))		(6)電話Tel. No.

第二部 Part II

(7) 工作場地負責人姓名 Name of responsible person at workplace		(8)職位Position	(9)電話Tel. No.
(10) 石棉工作人數 Number of asbestos workers	男Male ..... 女Female		
(11) 開始進行石棉工作日期 Date of commencement of asbestos work		(12) 石棉工作完工日期 Date of completion of asbestos work	
(13) 石棉工作 質 Nature of asbestos work			
(14) 石棉工作涉及的石棉物料(註明物料含溫石棉或閃石類石棉) Type of asbestos-containing material involved in asbestos work (indicate whether chrysotile or amphibole asbestos is present in the material)			

第三部 Part III (祇須填寫有改變的詳情 Fill in the particulars that have been changed)

(15) 開始進行石棉工作日期 Date of commencement of asbestos work		(16) 石棉工作完工日期 Date of completion of asbestos work	
(17) 石棉工作 質 Nature of asbestos work			
(18) 石棉工作涉及的石棉物料(註明物料含溫石棉或閃石類石棉) Type of asbestos-containing material involved in asbestos work (indicate whether chrysotile or amphibole asbestos present in the material)			

* 請在適當空格內加上 '✓' 。
Please '✓' in the appropriate box.

注意 (i) 任何工業經營的東主在開始進行石棉工作之前，須給予勞工處處長不少於28天的書面通知。
(ii) 任何工業經營的東主在得知已通知石棉工作有所改變後，須在7天內將該改變通知勞工處處長。
(iii) 任何東主不遵守工廠及工業經營(石棉)規例第6(1)或第6(3)條通知石棉工作或通知改變已通知的石棉工作，即屬犯罪，可處第5級罰款。

Note (i) Notification of asbestos work shall be submitted to the Commissioner for Labour not less than 28 days before commencement of the asbestos work.
(ii) Notification of change in notified asbestos work shall be submitted to the Commissioner for Labour within 7 days after a proprietor becomes aware of the change.
(iii) A proprietor who fails to give notification of asbestos work or fails to give notification of change in notified asbestos work in accordance with sections 6(1) or 6(3) of the Factories and Industrial Undertakings (Asbestos) Regulation commits an offence and is liable to a fine at level 5.

簽名 Signature	姓名(正楷) Name in Block Letter	職位 Position	日期 Date

ASB-F-NOT

Appendix II

Safe practices for removal of asbestos-containing friction materials

1. Asbestos has been used as a constituent in the manufacture of friction materials which are commonly used in the automotive industry — brake linings, disc brake pads and clutch facings. The asbestos content in these materials may vary from 10% to 60% by weight and usually chrysotile asbestos was used. In these materials, asbestos fibres are "locked" in resins and binders thereby preventing the release of asbestos fibres during normal handling. However, heat and abrasion during operation will generate fine dust which may contain asbestos.

2. A proprietor should be aware of the potential hazard of exposing workmen involved in the removal of friction materials containing asbestos, and take adequate precautions to protect these workmen. A proprietor should use asbestos-free substitutes available in the market for replacing asbestos-containing friction materials.

Safe practices

3. Any dust accumulated on the machine assembly where asbestos-containing friction material is installed should be removed by HEPA filter-equipped vacuum cleaner. In a workshop (other than vehicle repairing/ servicing workshop) where servicing of machine assembly with friction materials is incidental to the main business and is carried out only occasionally, abraded dust on the assembly may be removed by wiping with damp cloth in the absence of HEPA filter-equipped vacuum cleaner, and the contaminated cloth should be disposed of immediately afterwards as asbestos waste. In no circumstances should compressed air or dry brushing be used for cleaning purposes.

4. In a vehicle repairing/servicing workshop, cleaning asbestos-containing brake assemblies prior to removal should be carried out inside specially designed local dust extraction system consisting of a HEPA filter-equipped vacuum cleaner and a brake assembly isolation cylinder

which is a wheel-shaped cylinder to enclose the wheel assembly. The cylinder should be fitted with:

(a) a vision or sight glass to provide visibility;

(b) rubber access gloves for the workman to handle the brake assembly parts; and

(c) a suction hose for connection to a HEPA filter-equipped vacuum cleaner;

The HEPA filter-equipped vacuum cleaner should be capable of capturing all the airborne dust generated within the cylinder.

5. The specially designed local dust extraction system should be used in accordance with manufacturer's instruction. Before removing the brake assembly isolation cylinder from the cleaned brake assembly, the inside of the cylinder should be thoroughly cleaned.

6. In addition to engineering control measures, workmen engaged in removal of asbestos-containing friction materials should be provided with appropriate approved RPE (half-face with replaceable filtering cartridge as the minimum requirement). Protective clothing of the disposable type should also be provided where there is risk of body contamination.

7. When removal of asbestos-containing friction materials is completed, all plant and equipment, machinery and work surfaces should be kept free of asbestos dust and waste by vacuum cleaning, wet wiping or other method of cleaning that will not create dust. Workmen should decontaminate themselves with HEPA filter-equipped vacuum cleaner or wet wiping. RPE should be wiped with damped cloth and the filtering cartridge sprayed wet. Workmen should remove their protective clothing followed by removing the RPE and disposing of the filtering cartridge before leaving the work area. In addition, a proprietor should make arrangements on the premises for workmen to wash exposed parts of their bodies.

8. All asbestos wastes, contaminated protective clothing and filters of respirators should be disposed of as asbestos waste in accordance with Section 18.

Appendix III

Safe practices for removal of asbestos cement products

1. Asbestos cement is a grey, hard and brittle material generally containing 10% to 15% asbestos fibre which is bound in a cement mixture. Most asbestos cement products contained only chrysotile (white asbestos) but older products that were manufactured prior to 1970, may contain the more hazardous crocidolite (blue asbestos) or amosite (brown asbestos). Blue and/or brown asbestos are present particularly in asbestos cement pressure pipes. Asbestos-free fibre-cement products should be used to substitute asbestos-cement products.

2. A large number of building products used in the building and construction industry have been compounded from asbestos cement. These products include, but not limited to:

(a) corrugated and flat sheets*;

(b) roofing tiles and slates;

(c) grille panels; and

(d) pipes for water, drainage or flues.

*Note: Most asbestos cement sheets will not support a person's weight. Falling through asbestos cement roofing is a hazard and adequate safety measure should be taken to prevent such accident.

The hardness and structure of asbestos cement and relatively low asbestos content mean that these materials are less likely to generate asbestos dust. Asbestos-cement products pose low risk to health of workmen if they are in good condition and are removed carefully. However, risk of exposure to asbestos dust will occur during demolition and other operations causing breakage of the asbestos cement products. Exposure to asbestos dust will also occur when work is carried out on worn, crumbly or damaged products.

Safe practices

3. Only workmen who are authorized by the proprietor and who are properly protected should be permitted to perform removal work of asbestos cement. Warning notices should be posted around the perimeter of the work area.

4. Work method should be established so as to minimize the need to operate directly on asbestos cement products and to break the products into pieces. Asbestos cement material should be removed with minimal breakage. As far as practicable the removal should be accomplished by only operating on fixings holding the cement material in place, and the removed cement material should not be dropped from height so as not to cause damage.

5. Removal of asbestos cement products should be carried out in well-ventilated area, and where possible in open air. Before the operation, asbestos cement products should be kept wet by generous application of amended water in a fine mist to minimize dust generation whenever reasonably practicable (wetting of asbestos cement products should be carefully applied to ensure that workmen are not exposed to the danger of slip and fall).

6. Non-powered hand tools such as hand-saws, cutters, hammer, chisel should be used for the operation as these tools will generate a greater quantity of predominantly coarser dust or waste chips, hereby reducing the risk of generating a large amount of airborne fibres. Off-cuts and coarse dust should be collected by heavy duty plastic sheeting.

7. The work area should be kept clean and tidy to prevent the accumulation of asbestos dust and debris. At the end of each work shift, the work area should be cleaned of asbestos dust and debris. Appropriate dustless method such as using HEPA filter-equipped vacuum cleaner or wet wiping should be used in cleaning the work area. Removed asbestos cement products should be properly packed up as asbestos waste as soon as possible and not allowed to lie about in the site where they may be broken up or crushed by other site activities.

8. Asbestos cement products, waste and debris, contaminated protective clothing and filters of respirators etc. should be packed in suitable containers and disposed of as asbestos waste (refer to Section 18). The containers should be labelled in accordance with Section 19.

Personal protective equipment

9. In addition to adopting the above safe practices, workmen engaged in removal of asbestos cement should be provided with:

(a) disposable protective coveralls;

(b) rubber boots with non-slip sole where there is danger of slip and fall; and

(c) appropriate approved RPE (refer to Appendix VI).

Decontamination

10. Washing and changing facilities should be provided for workmen to decontaminate themselves after removal of asbestos cement. The type and extent of washing and changing facilities to be provided should be related to the nature and degree of exposure as indicated by the assessment carried out under Section 5. When the area of asbestos cement to be removed is more than 15 m^2, hygiene facilities and if required transit facilities constructed and equipped in accordance with Section 14 should be provided. Procedures for entering and leaving the work area through these facilities stipulated in Appendix X or Appendix XI should be followed as appropriate by all workmen.

11. In small scale removal of asbestos cement where exposure is low and brief, existing washing and changing facilities on the premises may be shared with other workmen who are not liable to such exposure. Exposed workmen should preliminary clean themselves, remove their protective clothing and RPE before leaving the work area to use these facilities.

12. Preliminary cleaning should include cleaning any asbestos dust that may be on protective clothing of workmen with use of HEPA filter-equipped vacuum cleaner and by wet wiping, cleaning RPE with sponge and water and spraying wet the filter, washing clean rubber footwear in boot-bath and washing exposed parts of bodies. Sufficient quantity of water should be provided at the work area to enable the workmen to carry out preliminary cleaning.

13. Surfaces of containers/plastic wrappings holding asbestos cement products, wastes and debris should be thoroughly cleaned before being removed from the asbestos removal work area. Washing and changing facilities provided for workmen should not be used to decontaminate the containers. Wherever reasonably practicable, a 2-chamber debris port (consisting of a washing room and a clean room) should be provided for controlling transfer of these asbestos wastes out of the asbestos removal work area.

Appendix IV

Safe practices for removal of asbestos coating and asbestos insulation

1. Asbestos coating and asbestos insulation are particularly hazardous types of asbestos materials. Removal of these materials without adequate control measures will likely give rise to high dust levels. In order to contain the airborne asbestos dust, removal of asbestos coating and asbestos insulation should be conducted inside a work area enclosure (hereinafter referred to as the enclosure), which is maintained at a pressure slightly lower than that of the surrounding atmosphere. The following only contains a brief description of the safe practices, readers should refer to the main text of the COP for details.

2. A proprietor should also refer to the *Code of Practice on Asbestos Control-Asbestos Work Using Full Containment or Mini Containment Method* published by the Environmental Protection Department for guidelines on preparation of the work area, construction of the containment, and clearance of the work area after removal work is completed.

The enclosure

3. The asbestos work area should be totally enclosed inside the enclosure which is constructed, tested and maintained according to Sections 8 and 11. The enclosure should be designed and constructed in such a way that the asbestos materials are not disturbed during the erection of the containment. In case where asbestos materials are present in the ceiling void above false ceilings, the ceiling tiles should only be disturbed after the enclosure is completed and in operation. All movable items inside the work area should be removed, after pre-cleaning to avoid contamination. Any item that cannot be removed should be pre-cleaned and sealed inside heavy duty plastic sheeting.

4. The enclosure should be equipped with the following items:

(a) viewing panels (refer to paragraph 56 under Section 11) of sufficient number and at appropriate positions such that all

activities inside the enclosure can be viewed through these viewing panels;

(b) appropriate type of fire extinguishers;

(c) emergency lighting, such as an appropriate number of suitable torches; and

(d) means of communication with the workmen inside the enclosure from outside in case of emergency, such as audible alarm.

5. The enclosure should be as small as possible but should be large enough to contain the work and to allow reasonable working space. Maximum volume of the enclosure should not exceed 2,800 cubic metres. For larger work area, dividing the space into a number of smaller enclosures rather than treating it as one single unit is required.

6. The enclosure should as far as practicable be constructed with separate means for access of personnel and for transport of asbestos wastes from the work area. Workmen should enter and leave the work area through the hygiene facilities while asbestos wastes should be removed through a separate 2-chamber debris port.

7. For a large enclosure, appropriate means of escape should be provided. Hygiene facilities and debris port should be located at different positions of the enclosure to serve as alternative means of escape. Alternatively, points of escape from the enclosure should be designated and a knife accessible from inside the enclosure for slitting open the polythene sheet partition in case of emergency should be provided at these points. The routes of escape should be clearly indicated inside the enclosure.

Safe practices

8. Work procedures for removing asbestos coating and asbestos insulation should be established to minimize release of asbestos dust into the atmosphere. The wet method, involving handling materials containing asbestos wet, is one of the most reliable methods in ensuring that asbestos

fibres do not become airborne, and this practice should therefore be used whenever feasible.

9. Wet method involves soaking the asbestos material with amended water which facilitates rapid wetting. The amended water should be applied by means of an airless sprayer to minimize disturbance to the materials containing asbestos, and should be applied continually throughout the work period to ensure that any dry material containing asbestos exposed in the course of work is wet and remains wet until final disposal. The rate of application of the amended water should be such as to minimize any excess water in the work area.

10. In case of thick asbestos insulation where penetration by wet spraying will not be effective, the amended water should be injected into the asbestos material (with the use of lances etc.) in order to obtain adequate penetration and diffusion. Holes or cuts should be made in the outer covering of the insulation enabling injection of amended water in such a manner and quantity as to ensure that the material is wetted but is not washed out.

11. The time required to soak the asbestos material depends on thickness of the material and location of the holes. Removal should not be attempted until visual examination reveals that the insulation is of a dough-like consistency and water may readily be squeezed from it. However, over-saturation should be avoided since this will lead to the formation of pools of water and may turn the material into a slurry.

12. Asbestos material saturated with amended water should be removed in sections by scraping or cutting. The wetted material should be removed while still wet and should not be allowed to drop from height, and should be placed directly into properly labelled plastic bags or containers, re-wetted with amended water as necessary.

13. Removal of asbestos insulation should not be carried out on hot plant unless that is unavoidable. Routine or scheduled work should be planned to be performed during plant shutdowns or annual holidays, or else temporary equipment as substitution for the out-of-service plant or temporary piping to by-pass the affected section should be installed. Only

after all possibilities to avoid hot removal of asbestos materials have been explored and, after careful consideration, rejected should "hot removal" be considered.

14. In carrying out "hot removal", temperature of the plant should be reduced as low as possible in order to allow wetting to be carried out safely. Adequate precautions should also be taken to protect workmen from being scalded by hot substances and possible risks of heat stress.

15. In using wet removal method, additional safety precautions shall be taken to prevent electrical hazards. Any plugs, sockets, switches and other sources of electric current should be covered with waterproof protection so that water cannot penetrate.

Personal protective equipment

16. The proprietor should provide at least disposable respirators to workmen engaged in erection of enclosure. Where erection of the enclosure may disturb materials containing asbestos, which should be kept to a minimum, respirators of higher performance will be required (refer to Appendix VI) and workmen may also have to wear protective clothing. Appropriate hygiene facilities may have to be installed prior to erection of the enclosure in order that the workmen can decontaminate themselves after work.

17. All workmen inside the enclosure where removal work is carried out should wear, as a minimum, full-face powered air-purifying or supplied-air respirators. Respirators of lower performance may only be worn by workmen during cleaning in connection with clearance of the work area and dismantling of the plastic layers of the enclosure when air monitoring shows that the respirator can provide adequate protection.

18. Workmen engaged in the removal work inside the enclosure should also wear protective clothing of the disposable type as well as disposable underclothing.

Decontamination

19. The proprietor shall provide adequate hygiene facilities for workmen to change and to decontaminate themselves after working inside the enclosure. Hygiene facilities should be located adjoining the enclosure in accordance with Section 14. All workmen should follow the procedures in Appendix X in entering and leaving the enclosure through the hygiene facilities.

20. In case where it is not possible to provide hygiene facilities adjoining the enclosure, transit facilities (refer to Section 14) should be provided contiguous to the enclosure to enable workmen to carry out preliminary decontamination before proceeding to the hygiene facilities provided elsewhere on the premises for thorough decontamination. The procedures in Appendix XI should be followed by all workmen when using the transit facilities.

Appendix V

Safe practices in using the glove bag method

1. Glove bag method is suitable for use in small scale short duration asbestos abatement work. It is suitable for removing small section of asbestos pipe insulation, for removing asbestos lagging from individual valves or joints in pipelines. A proprietor should also refer to the *Code of Practice on Asbestos Control - Asbestos Work Using Glove Bag Method* published by the Environmental Protection Department for precautions in the use of glove bag.

2. Glove bag is fabricated from transparent polyethylene (0.15 to 0.30 mm thickness) with built-in sleeves and access ports. It is a disposable bag and should be disposed of after use. It should never be shifted, moved, re-installed or re-used once contaminated with asbestos.

3. Workmen using glove bag should have the appropriate training and experience in the operating procedures and precautions. Preferably they should work in pairs — one workman performs the removal work while the other wets the asbestos material simultaneously at regular intervals. They should wear disposable protective clothing and half-face cartridge respirators as a minimum.

4. The work surface where glove bag will be applied should be cleaned of any loose debris or asbestos fibres with the use of HEPA filter-equipped vacuum cleaner before installing the bag. The pipe lagging on both sides of the bag should be sufficiently sound to support the weight of the bag and its wet content, and the bag should be additionally supported at the bottom.

5. In using glove bag, work is performed from outside the bag by inserting hands and arms through the built-in sleeves. The access ports will be used for introducing the nozzle of airless sprayer for applying wetting agent, and for introducing the hose of the HEPA filter-equipped vacuum cleaner.

6. The asbestos insulation should be thoroughly wetted by spraying with amended water before being removed. The amended water should be

continually applied as new insulation is being exposed in order to prevent release of fibre.

7. Choice of tools used to remove the asbestos insulation depends on the nature of the material. Powered tools should not be used inside glove bag and the tools used should be so designed that the likelihood of puncturing or cutting the bag is minimized (examples of tools that can be used are knife with retractable blade, snips, brush with non-metal bristles).

8. After removal of asbestos insulation, the pipe or surface from which asbestos has been removed must be brushed and wet-wiped to remove all visible materials containing asbestos. In addition, the upper section of the bag should be washed down to remove any adhering asbestos material.

9. Any asbestos-containing insulation edges that have been exposed as a result of the removal activity must be sealed with suitable material to ensure that these edges do not release asbestos dust to the atmosphere after the glove bag has been removed.

10. Once the removal and encapsulation of asbestos have been completed, a vacuum hose from a HEPA filter-equipped vacuum cleaner should be inserted through the access port to remove any air in the bag that may contain asbestos dust. Once the bag has been evacuated, the bag should be squeezed tightly (as close to the top as possible), twisted and sealed with tape to keep the asbestos materials safely in the bottom of the bag. The vacuum hose can then be removed from the glove bag.

11. While the glove bag is still attached to the pipe, a heavy duty plastic bag is slipped around the bag which can then be detached from the pipe and received in the plastic bag for disposal as asbestos waste.

12. Arrangements should be made for workmen to wash themselves after finishing work. Washing facilities existing on the premises can be made use of or temporary hygiene facilities should be erected at the work area where there is significant risk of body contamination. Before leaving the work area to use washing facilities on the premises, workmen should remove their protective clothing, wet wipe the RPE and spray wet the filtering cartridge, and carry out preliminary washing of face and hands.

Appendix VI

Selection guide to approved respiratory protective equipment (RPE) for protection against asbestos dust

1. This selection guide serves as a reference for selecting the appropriate RPE for use in various jobs or in workplaces with known likely maximum concentration of asbestos dust. It is the responsibility of the proprietor to verify the likely maximum dust level in actual situations prior to selection from the approved list (refer to Section 4). Before using this selection guide, it is important to ensure that the guidance regarding control measures, safe practices, selection and proper use and maintenance of RPE set out in Sections 7 and 11 of the COP has been followed. To account for any unforeseeable circumstances, it is a good practice to select RPE which can offer better protection in order to prevent excessive exposure to asbestos dust.

2. Efficiency is a key factor to be considered in selecting the appropriate RPE for use. The efficiency of various types of RPE, in terms of the assigned protection factor, is illustrated in the following table. The maximum use concentration (MUC) represents the maximum fibre concentration in the air outside the respirator such that the air inside the respirator can be maintain to a level below 0.1 fibre/ml under optimal experimental conditions.

Types of Respiratory Protective Equipment	Assigned Protection Factor	MUC (fibres/ml)
Disposable, half-face particulate respirator	5	0.5
Half-face particulate filter (cartridge) respirator	10	1
Powered air-purifying, loose-fitting helmet or hood respirator	25	2.5
Supplied-air, continuous-flow, loose-fitting helmet or hood respirator	25	2.5
Full-face particulate filter (cartridge) respirator	50	5
Powered air-purifying, full-face particulate respirator	100	10
Supplied-air, positive pressure demand, full-face respirator	>1000	>100
Supplied-air, continuous flow, full suit	>1000	>100

Note: 1. All supplied-air respirator should be equipped with escape respirator with HEPA filter.

2. Any respirator considered to have efficiency superior to that listed in the table needs to be supported by field evaluation data.

3. Proper fit of the RPE and face-seal for individual workman is another factor to be considered. Spectacles, beards, moustaches, sideburns or even a visible growth of stubble will affect the face-seal, and workmen with these facial features will not be provided with adequate protection from asbestos when the RPE worn relies on a good face-seal. A solution to the problem of facial features is the use of equipment that does not rely on good face-seal for adequate protection, e.g. positive pressure powered RPE with blouse. There are two methods for testing the fitness of the RPE to individual workman:

(a) Qualitative fit-test involves the introduction of a harmless odorous or irritating substance into the breathing zone around the RPE being worn. If no odour or irritation is detected by the wearer, a proper fit is indicated.

(b) Quantitative fit-test offers more accurate, detailed information on fitness of RPE. It involves the introduction of a harmless

aerosol to the wearer who is in a test chamber. While the wearer performs exercise that could induce facepiece leakage, the air inside and outside the facepiece is then measured for the presence of the harmless aerosol to determine any leakage into the RPE.

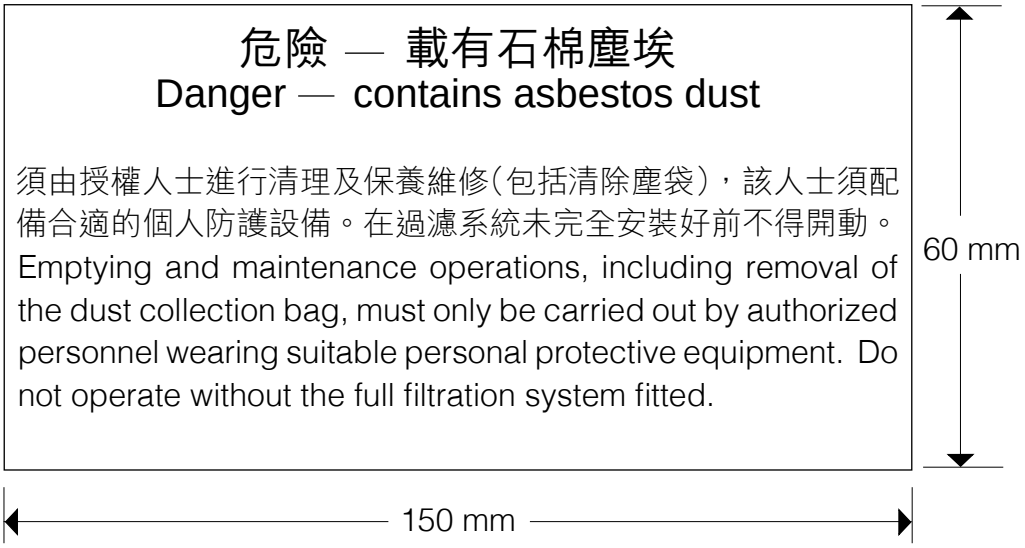
4. The following tables are selection guide to approved RPE indicating the likely dust level in the workplace of certain typical jobs involving asbestos and the corresponding types of RPE required. The likely dust level represents concentration of airborne asbestos when the process is carefully carried out with implementation of good control measures and safe practices. Bad handling practices may result in higher value. These values are for reference only. It is the duty of a proprietor to verify the dust level in the actual situation by appropriate means such as air monitoring. The minimum types of RPE represent the types of respirator of minimum efficiency that are sufficient to provide protection of workman to asbestos dust. It requires that the respirators are properly used and maintained according to Section 11. Respirators assigned for high dust levels can be used for lower dust levels.

Selection guide to RPE for jobs involving asbestos materials

Job	Likely Dust Level (fibres/ml)	Minimum Types of RPE
simple short duration sampling; enclosure erection; clearance sampling	0 to 2	any approved respirator, including disposable or half-face cartridge respirators
some sampling operations; enclosure erection under adverse conditions	0 to 4	any approved respirator other than disposable respirator and half-face cartridge respirator
extensive sampling operations on friable lagging; enclosure erection under adverse conditions and on friable lagging	0 to 20	any approved full-face respirator equipped with high efficiency filters
Removal work in progress		
removal work of asbestos-cement sheeting;	0 to 1	any approved respirator other than disposable respirator
certain forms of wet stripping in which wetting is prolonged and effective; certain small scale dry stripping operations	0 to 180	any approved full-face powered air-purifying or supplied-air respirator
ineffectively wet stripping (light wetting with inadequate time for saturation); dry stripping	>180	approved full-face, positive pressure demand respirator; or supplied-air, continuous flow, full suit

Appendix VII

Warning label for HEPA filter-equipped appliances



Specifications

Colour : letters and characters should be in white and/or black on red background; or other colour combination such that the label is clearly distinguishable from the background of the appliance.

Size : dimensions shown above are the minimum requirement.

Appendix VIII

Procedures for the face-fit check of respiratory protective equipment

The seal of a respirator should be checked prior to entering a contaminated atmosphere by procedures recommended by the manufacturer of the RPE or by the following tests:

Negative pressure test

(a) Block the end of the breathing tube or close off the inlet opening of the respirator's cartridge(s) or filter(s) by covering with the palm of the hand(s) or replacing the seals so that it will not allow the passage of air.

(b) The wearer inhales gently so that the facepiece collapses slightly and holds the breath for at least 10 seconds. If the facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it can be reasonably assumed that the respirator has been properly put on and the exhalation valve and facepiece are not leaking.

Positive pressure test

(a) Close off the exhalation valve of the respirator so that it will not allow the passage of air.

(b) The wearer exhale gently for at least 10 seconds. If a sight positive pressure can be built up inside the facepiece without the detection of any outward leakage of air, it can be reasonably assumed that the respirator has been properly put on.

Note : 1. The tests can only be used on respirators which depend on good face-seal.

2. For some respirators, the positive pressure test requires that the wearer first remove the exhalation valve cover from the respirator and replace it after completion of the test. This task is difficult to carry out without disturbing the fit of the respirator.

Appendix IX

Warning notice for protective equipment zone

Specifications

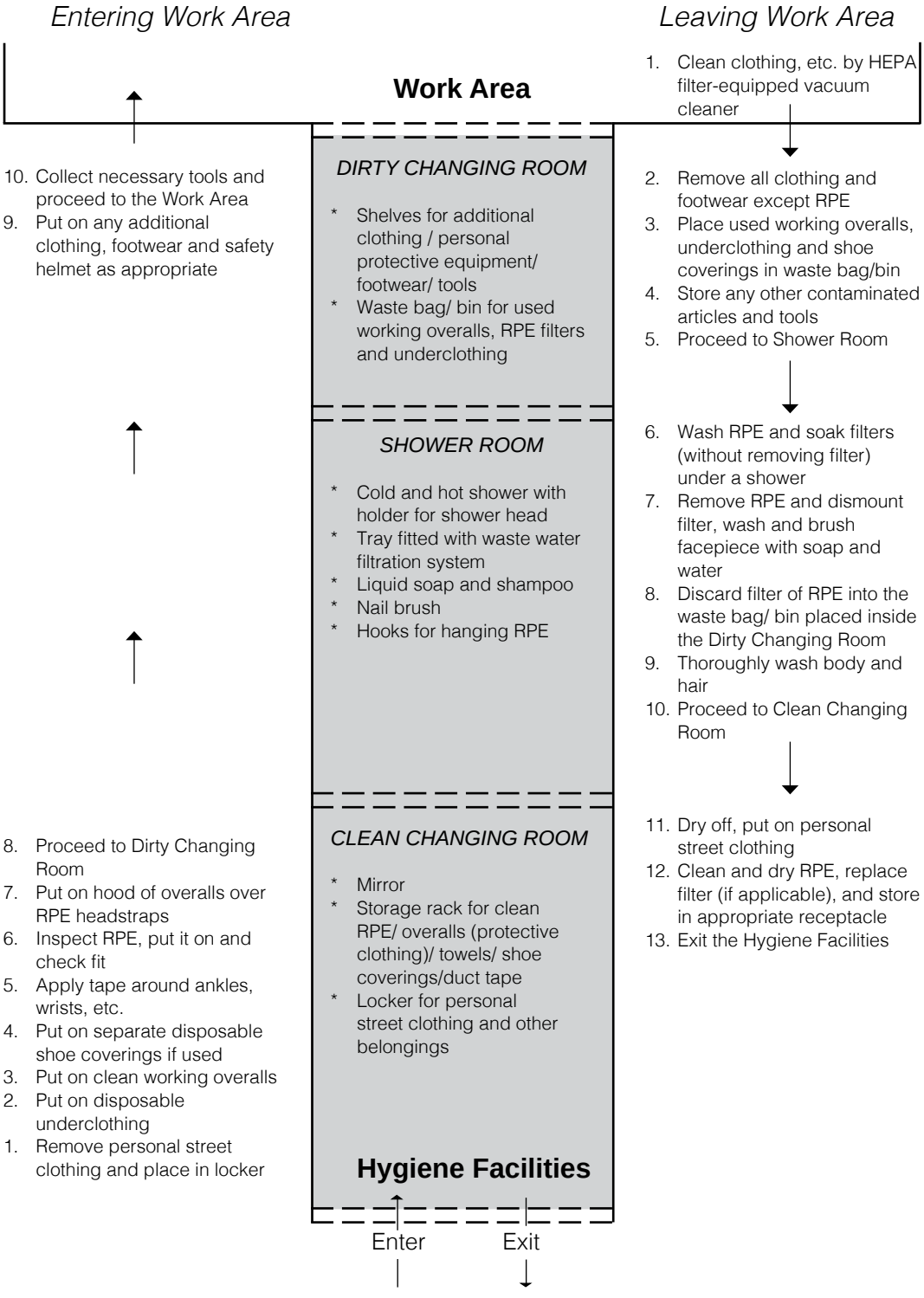
The warning notice should comprise both warning signs and explanatory labels.

Colour : (a) for 'Danger' sign
sign : black lines on yellow background
label : black letters and characters on yellow background
(b) for 'No unauthorized entry' sign
sign : red lines on white background with the figure in black
label : white letters and characters on red background
(c) for 'Wear approved respirator' and 'Wear protective clothing' sign
sign : white sign on blue background
label : white letters and characters on blue background

Size : height of the overall warning notice not less than 400mm
height of individual sign not less than 80mm

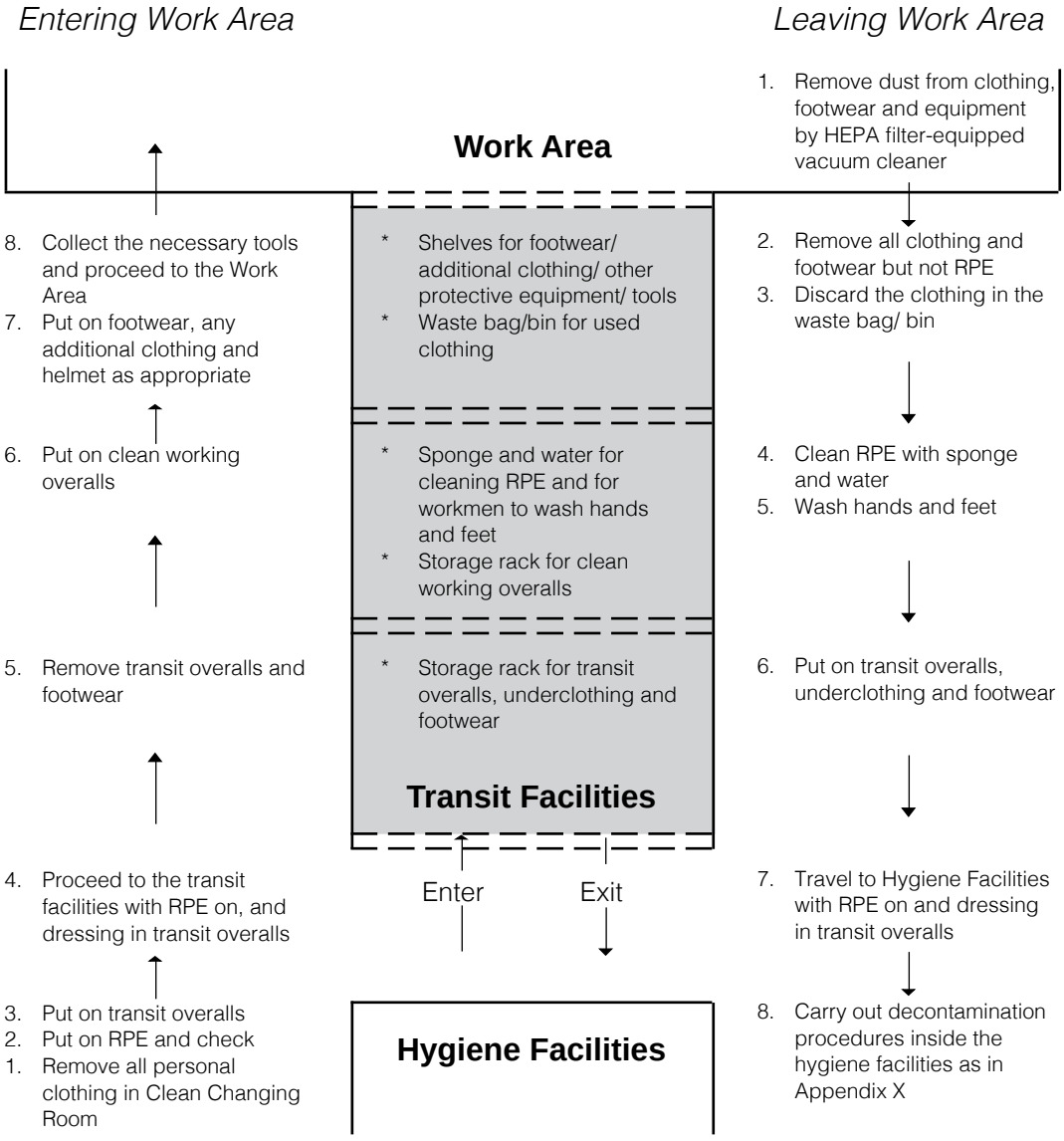
Appendix X

Procedures for entering and leaving work area through hygiene facilities



Appendix XI

Procedures for entering and leaving work area through transit facilities



Note : 1. Transit overalls are protective clothing for transit purposes only, while working overalls are protective clothing used in the work area. Transit overalls should be clearly distinguishable from the working overalls, for example by use of different colours or markings.

2. The workman may not put on RPE in travelling between the transit facilities and the hygiene facilities if wearing the RPE is considered hazardous. In this case, the RPE should be packed in a plastic bag and carried by the workman.

Appendix XII

工廠及工業經營(石棉)規例
Factories and Industrial Undertakings (Asbestos) Regulation

[規例第17(3)條]
[Section 17(3)]

受僱於石棉工作的人的健康登記冊
Health Register for Person Employed in Asbestos Work

本表格乃由勞工處處長就工廠及工業經營(石棉)規例第17(3)條的需要而認可
Form approved by the Commissioner for Labour for the purposes of section 17(3) of the Factories and Industrial Undertakings (Asbestos) Regulation

工業經營的名稱
Name of Industrial Undertaking _____

受僱人姓名
Name of employed person _____

身份證號碼
Identity card no. _____

出生日期
Date of birth _____

該人在工業經營首次受僱於石棉工作的日期
Date on which the person first employed in asbestos work in the industrial undertaking _____

健康檢查日期 Date of medical examination	進行健康檢查的註冊醫生姓名 Name of registered medical practitioner conducting the examination	健康檢查結果 (註明該人是否被證明適合從事石棉工作) Result of medical examination. (State whether the person is certified fit for working with asbestos)	填寫此記項的人的姓名、簽名及職位 Name, signature and position of person making this entry	填寫此項日期 Date of making this entry

注意
(i) 須為每名受僱於石棉工作的人分別備存健康登記冊。
(ii) 此健康登記冊須附有由進行健康檢查的醫生所簽發的證明書。
(iii) 健康登記冊須保存為期最少5年，自登記冊內最後一項記項的日期起計。
(iv) 在健康登記冊所涉的人在僱用終止時,東主須給予該人一份健康登記冊的副本。
(v) 任何東主不遵守工廠及工業經營(石棉)規例第17(3)條為受僱於石棉工作的人備存健康登記冊，即屬犯罪，可處第5級罰款。

Note
(i) A separate health register shall be maintained for each person employed in asbestos work.
(ii) The certificate issued by the medical practitioner conducting the examination shall be attached to this health register.
(iii) Health register shall be kept for at least 5 years from the date of last entry in the register.
(iv) A copy of the health register shall be given to the person covered by it upon termination of his employment.
(v) A proprietor who fails to maintain health register for person employed in asbestos work in accordance with section 17(3) of the Factories and Industrial Undertakings (Asbestos) Regulation commits an offence and is liable to a fine at level 5

ASF-F-HR

Appendix XIII

Warning label for articles containing asbestos

Specifications

Colour : (a) letter ‘a’ in white on black background; and
(b) for the warning wording, letters and characters in white and/or black on red background;

OR

if the label is printed directly on the article, label in single colour clearly distinguishable from that of the background.

Size : dimensions shown above are the minimum requirements

This Code of Practice is issued free of charge and can be obtained from offices of the Occupational Safety and Health Branch of the Labour Department. It can also be downloaded from website of the Labour Department at http://www.labour.gov.hk. For enquires about addresses and telephone numbers of the offices, please visit the above website or call 2559 2297.

Occupational Safety and Health Branch
Labour Department

10/2014-1-COP9

Code of Practice on Asbestos Control

Safe Handling of Low Risk Asbestos Containing Material

Issued by the Secretary for the Environment
Under Section 37 of the Air Pollution Control Ordinance (CAP 311)

<PREFACE>

The Code of Practice on Asbestos Control, in four sets, is issued by the Secretary for the Environment, Transport and Works under Section 37 of the Air Pollution Control Ordinance (Chapter 311) after consultation with the Advisory Council on the Environment. It provides advice on matters relating to asbestos control to registered asbestos consultants, registered asbestos contractors, registered asbestos supervisors and registered asbestos laboratories registered in the relevant registers kept and maintained by the Authority under Section 51 of the Ordinance.

The four sets of Codes of Practice provide advice on matters relating to:

1) preparation of asbestos investigation report, asbestos management plan and asbestos abatement plan;
2) asbestos work using full containment or mini containment method;
3) asbestos work using glove bag method; and
4) safe handling of low risk asbestos containing material.

Although these Codes of Practice are not legally binding, compliance with the advice given could be used as evidence of good practice in the course of disciplinary and legal proceedings. It should be noted that the guidance given in these Codes is believed to be the best practice at the time of publication. With advancement in technology and with more experience, it is conceivable that these Codes may require amendment in the future to incorporate new developments. Registered personnel are therefore encouraged to adopt prevailing standards and control measures if such standards are higher than those given in these Codes, and if such control measures are more effective in controlling environmental asbestos.

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CONTENTS

1 Introduction

1.1 This Code of Practice provides guidance and advice to registered asbestos consultants, contractors, supervisors and laboratories on safe handling of low risk asbestos containing material.

1.2 Low risk asbestos containing materials means cementitious, resinated, plastic and bituminous asbestos containing materials which are non-friable in nature, that is, when dry, the material cannot be crumbled, pulverized or reduced to powder by hand pressure. Asbestos fibres in these materials are generally locked into the base material matrix, therefore, under normal usage or handling, the quantity of asbestos fibres that can be released, if any, should be insignificant to present a health risk. Examples of low risk asbestos containing materials are: corrugated asbestos cement sheet, cement piping, cement building fabrics, resinated gasket, pump and valve gland packings, friction product, resilient floor covering, and asphalt roofing felt.

1.3 Because of the relatively low risk involved, containment method is normally not necessary for removal of low risk asbestos containing materials if adequate precautionary measures as described below are taken to suppress dust release. However, if the low risk asbestos containing material is in poor condition, or has a high probability of becoming crumbled, pulverized, or reduced to powder by forces expected to act on the material in the course of removal operation, more stringent precautionary measures should be adopted.

1.4 The measures and procedures described in this Code are the minimum requirements necessary for safeguarding the environment and the health of occupants of areas where asbestos abatement work has been carried out. Additional precautionary measures may be necessary for certain operations and this Code should not be interpreted as precluding the adoption of such measures. The requirements of the Factories and Industrial Undertakings Ordinance for worker safety are particularly relevant in this regard.

2 Materials and Equipment

2.1 The materials and equipment used should conform to the following:

- For preparation of work area, transparent plastic sheets of 0.15mm thickness manufactured from extruded low-density polythene to B.S. 4932:1973 or equivalent, in sizes to minimize the frequency of joints, should be employed.

- Duct tape, foam agent and spray adhesive should be capable of sealing joints of adjacent sheets of polythene, facilitating attachment of polythene sheets to finished and unfinished surfaces, and adhering under both wet and dry conditions, including during the use of amended water.

- Wetting agent for preparing amended water to enhance penetration should be 50% polyoxyethylene ester and 50% polyoxyethylene ether or equivalent, and diluted to a specific concentration in accordance with the manufacturer's instructions.

- HEPA-filtered appliance means an appliance such as an air mover or a vacuum cleaner fitted with a high efficiency particulate air filter capable of trapping and retaining 99.97% of particles (asbestos fibres) greater than 0.3μm mass median aerodynamic equivalent diameter.

- Water-based polyvinyl acetate (PVA) adhesives for spraying onto exposed surfaces during final clean-up of work area should be able to bind traces of asbestos that may still be on the exposed surfaces. The adhesives should be dyed, say red, to indicate where (and whether) they have been applied to facilitate cross-checking at a later stage.

- Polythene sheet, transparent or colour-coded bags and containers used for packing of asbestos waste should meet the specifications given in the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by the Secretary for the Environment, Transport and Works.

- Respiratory protective equipment and protective clothing used for asbestos abatement work should comply with the requirements of the Factories and Industrial Undertakings (Asbestos) Regulation enforced by the Labour Department.

- Joints and ends of ladders and scaffolds used in the contaminated work area should be sealed with tape to prevent incursion of asbestos fibres.

- Portable water sprayer for applying amended water in a fine mist should be of airless type and with capacity of 10 to 20 litres.

2.2 Documentary proof on the safety and specifications of the above materials and equipment may be required for submission to the Authority for endorsement.

3 Site Preparation

3.1 The proposed work area, that is, the area containing asbestos containing materials to be worked on or removed, should be vacated prior to any site preparation work. Warning notices in English and Chinese (see Appendix 1) should be displayed outside the segregated area in a conspicuous place on the first day of site possession and should remain posted until work acceptance test is satisfactorily concluded.

3.2 A designated secure place outside the work area should be identified solely for transit storage of bagged asbestos wastes. This place should bear adequate warning notices and particular attention should be given to maintain good fire safety measures.

4 Decontamination Facility

4.1 For work area larger than $15m^2$, a 3-chamber decontamination unit should be constructed to provide safe access and egress for authorised working personnel, and for the exit of bagged asbestos wastes and equipment in special circumstances when the provision of a separate debris port is not possible. A reduced, 1-chamber decontamination unit may be acceptable for asbestos abatement work of a smaller scale. Also, depending on the size of the job and its proximity to other occupants of the premises, an induced draught ventilation system may be required for the decontamination unit by fitting a HEPA-filtered air mover at the dirty end of the unit.

4.2 Construction details of a decontamination unit are as follows.

- The decontamination unit will consist of three sealable compartments of progressively lower fibre burden, namely the dirty room, the shower room and the clean room. Each compartment should have a minimum size of 2m (height) x 1m (width) x 1m (length). Floor area of the shower room should be $1m^2$ for every shower head provided.

- The unit may either be of a prefabricated design which should have been thoroughly cleaned and decontaminated before re-use, or be constructed on site with 3 individual layers of plastic sheet with sealed taped joints supported on suitable framing.

- Each compartment should be separated by a curtained doorway consisting of a polythene sheet with an I-shaped slit opening covered by a plastic flap which hangs and lifts in the direction of access. The plastic flap should have an

overlap of at least 100mm on each side of the slit opening and be weighted at the bottom.

- The shower room should be constructed and tested against water leakage and fitted with a tray of adequate size to collect waste water. Hot and cold water adjustable at the shower should be provided at a minimum of one shower head per 6 workers calculated on the basis of the largest shift. All waste water should be taken by a sump pump through pipework and hosing to an aquarium type filter unit to remove suspended particles down to 5μm before being discharged to covered soil drainage system or drummed and then properly disposed. The sump pump should be switched on while the facility is in use to prevent overflow of waste water. The electrical fittings and installations should be so installed and protected as to eliminate any possibility of electrocution.

- The shower room should be wet cleaned and HEPA vacuumed before each shift change and meal break.

- Correct procedures for entering and leaving each compartment are summarised in Appendix 2. A warning sign to approved details as given in Appendix 3 should be posted at eye level at the clean entrance of the unit.

4.3 Where practicable, a separate, 2-chamber debris port consisting of a clean room and a washing room fitted with cold water supply and waste water filtration facility should be constructed for controlled transfer of bagged wastes and equipment. Each compartment should have a minimum size of 2m (height) x 1m (width) x 1m (length). This debris port is normally sealed and used only during the period of active waste and equipment transfer. A warning sign (see Appendix 3) should be posted conspicuously at the entrance of the clean end.

4.4 The procedures for waste and equipment transfer are as follows:

- Before entering the debris port, external surface of the bagged waste or the bagged equipment should be cleaned by HEPA vacuuming and wet-wiping in the work area. The bag should be further decontaminated in the washing room by ‘flushing' with a fine water spray followed by wet-wiping. Worker in the clean room, who should have entered from the uncontaminated side wearing appropriate respirator, gloves and protective clothing, should receive the bag in a 0.15mm thick transparent plastic bag which should then be vacuum packed and goose-neck sealed with tape. The doubled bagged waste should be

transferred immediately to the waste transit store and should not be stacked more than 3 bags high.

- Worker in the clean room must not enter the washing room. Upon completion of work, he should discard his protective clothing and gloves as contaminated waste and exit by the clean room.

- The washing room should be wet cleaned twice using amended water upon completion of waste and equipment transfer. When the main decontamination unit alternates as a debris port, the shower room should be washed immediately with cloth saturated with a detergent solution prior to wet cleaning.

5 Preliminary Decontamination

5.1 Prior to masking the work area with plastic sheet, the area should be pre-cleaned using HEPA-filtered vacuum cleaner and wet-wiping method. Fixed objects which remain within the work area should be cleaned and sealed with 2 layers of plastic sheet to protect them from re-contamination.

5.2 After the preliminary decontamination work and a visual inspection by the registered asbestos contractor to verify that the area is uncontaminated, the floor up to at least 1.5m away from the activities should be covered with 2 individual layers of plastic sheet of 0.15mm thickness which should extend, where appropriate, at least 300mm up and be sealed to the wall with adhesive tapes. All wall openings such as windows should be covered and sealed with 2 layers of plastic sheet. For removal of asbestos floor covering, floor sheet will not be required but a continuous 1m high dust barrier sealed to the floor should be constructed around the work area.

5.3 For asbestos removal work on roof of building, tarpaulin windscreen of at least 2m high should be erected around the work area.

6 Asbestos Removal

6.1 All workers should put on approved respirators and full-body protective clothing with hoods and shoe covers. Only non-powered hand tools should be used. Extreme care should be exercised in handling the asbestos containing material to reduce breakage to a minimum. The asbestos containing material should be kept wet throughout by generous application of amended water in a fine mist.

6.2 For removal of corrugated asbestos cement roofing sheets covered with a layer of concrete screeding, the roofing sheets should be separated carefully into manageable sizes for easy handling and packaging for disposal. This should be done by manually chiselling the concrete screeding along the joints of the cement sheets or along a convenient line for separating the cement sheets before taking down the cement sheets with the concrete screeding intact. All debris of concrete screeding so produced should be bagged immediately and disposed of as asbestos waste.

6.3 For removal of asbestos containing vinyl floor tiles, individual tiles should be lifted by scraping manually at the base. The underlying mastic adhesives, which may also contain asbestos, and any adhering remnant of tiles should be completely removed from the floor slab by manual scraping. Alternatively, chemical mastic removers of proven safe formula may be used.

6.4 A portable enclosure constructed with wood strut framing and two layers of plastic sheets may be used for removal of asbestos cement insulation tiles on roof of building if excessive breaking of the tiles cannot be avoided during removal.

6.5 It is important that debris is not allowed to lie around where it may be further broken or crushed. It should be cleared as soon as possible and certainly before the end of each work shift. All debris should be packed, labelled and disposed of in accordance with the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste.

6.6 All personnel, tools, instrument and bagged wastes leaving the work area should be thoroughly decontaminated in the decontamination unit to a condition of no visible debris.

7 Acceptance of Work

7.1 Upon completion of the asbestos removal work, all surfaces in the work area should be cleaned by suitable dustless method such as HEPA vacuuming and wet-wiping.

7.2 The registered asbestos contractor should then perform a thorough visual inspection to ensure that any debris in the form of contaminated items, dust, chips or untreated effluent has been cleared from the work area. A reassurance air test should be carried out by a registered asbestos laboratory and the test should have at least two samples, unless the volume of the enclosed work area is less than $10m^3$ when only one sample would suffice. With that overriding condition, the number of samples required should be at least the whole number next below $(\sqrt[3]{A} - 1)$, where A is determined as follows:

- If the enclosed work area is less than 3m high, or if the enclosed work area is in open space where exposure is only likely to be at ground level, A is the area of the enclosed work area in square metres.

- In other cases A is one third of the volume of the enclosed work area in cubic metres. If there are large items in the work area, their volume may be subtracted from the gross volume before calculating A.

7.3 Sampling should be carried out only after a thorough visual inspection of the work area to establish that it is clean, dry and free from any visible debris. Aggressive sampling techniques should be used to agitate any dust deposit that may be present inside the work area.

7.4 Reassurance air testing is considered satisfactory only when every collected sample is less than 0.01 fibre/ml as determined by phase contrast microscopy. Each homogeneous work area which does not meet this criterion should be thoroughly recleaned using HEPA-filtered vacuum cleaner and wet-wiping method. This process should be repeated until the work area passes the reassurance air test.

7.5 When satisfactory reassurance air test results are attained, all used plastic sheets should be sprayed with PVA, allowed to dry and then disposed of as contaminated wastes in accordance with the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste.

8 Emergency Procedures

8.1 Emergency procedures are site specific and prior assessment of the work area is important in developing suitable procedures to cater for emergencies such as fire, explosion, vandalism, typhoon, and accidents due to slips, trips and falls, working in confined space, electrical hazard, heat stress and exhaustion. All instructions should be brief and concise and should include a layout plan of the work site indicating the location of fire extinguishing equipment and means of escape. The procedures in a written form in both English and Chinese should be posted conspicuously at the entrance of the work area and read and understood by all working personnel.

8.2 If during the course of asbestos abatement work, a worker collapses or some other accidents occur, the victim should follow normal decontamination procedures with assistance from fellow workers before exiting the work area. For life-threatening situations, however, decontamination should take a lower priority and every effort

should be made to ensure the victim receives immediate medical treatment. Any area contaminated during the emergency should be thoroughly cleaned by wet wiping and HEPA vacuuming at the earliest opportunity, and verified by the registered asbestos supervisor before work is allowed to continue.

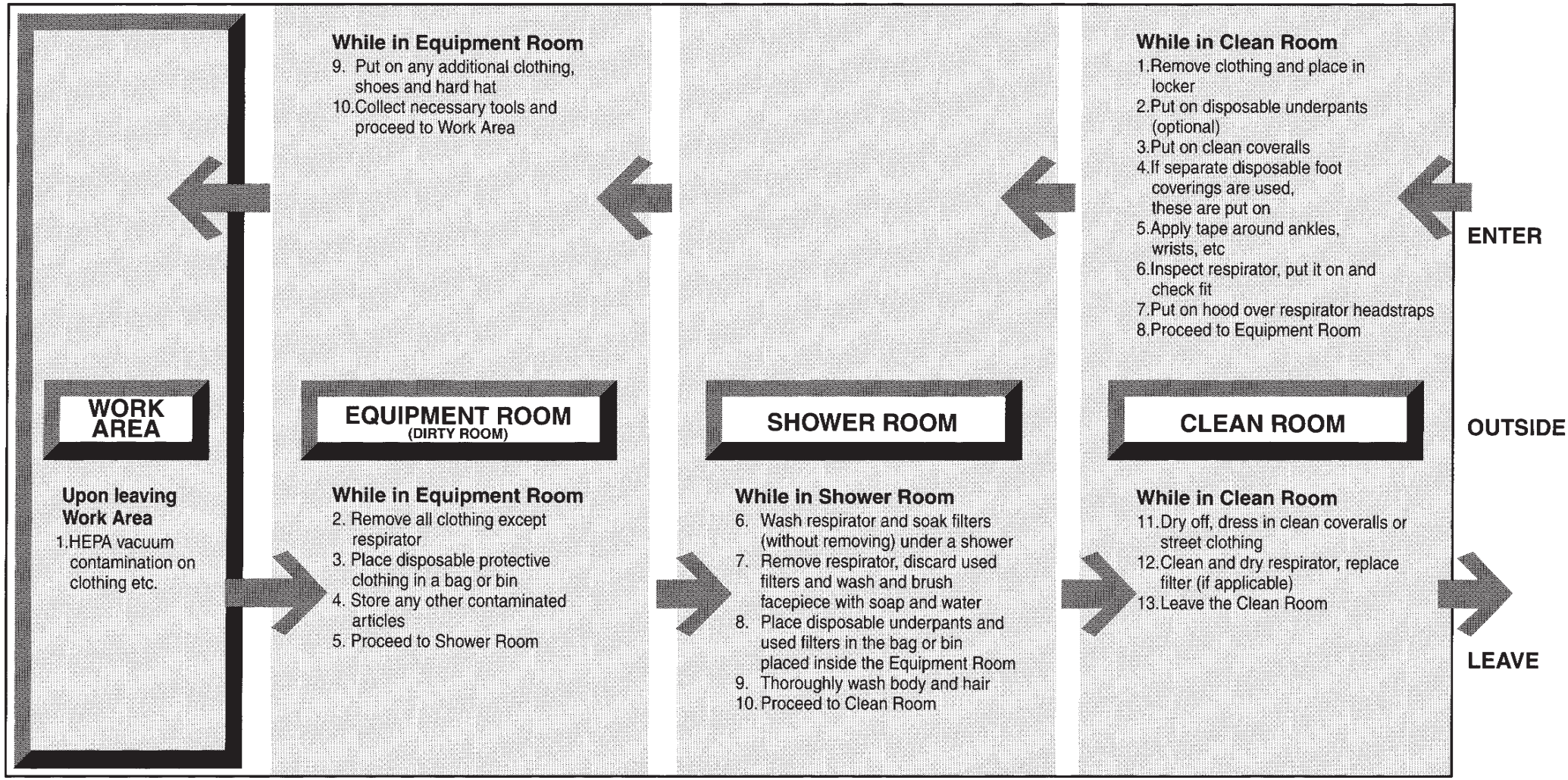
Warning Notice for Posting Outside the Work Site

Specification

The Warning Notice should comprise both warning signs and explanatory labels.

1. Material: Durable, weather-resistant and rigid on a vertical plane outside the work site.
2. Colour:
   (a) For 'DANGER' sign
   Sign: Black lines on yellow background
   Label: Black letters and characters on yellow background
   (b) For 'No unauthorized entry' sign
   Sign: Red lines on white background with the figure in black
   Label: White letters and characters on red background
3. Size:
   Height of sign - Not less than 120mm
   Height of capital letters - Not less than 25mm
   Height of Chinese characters - Not less than 35mm

PROCEDURES FOR ENTERING AND LEAVING DECONTAMINATION UNIT



Facilities:

EQUIPMENT ROOM
(DIRTY ROOM)

*Shelves for additional clothing/ personal protective equipment/boots/tools
*Waste bag/bin for used protective clothing, respirator filters and underpants

SHOWER ROOM

*Cold and hot shower with holder for shower head
*Tray fitted with waste water filtration system
*Liquid soap and shampoo
*Nail brush

CLEAN ROOM

*Mirror
*Storage rack for clean respirator/ protective clothing/towels/shoecovers/ gloves/duct tape
*Locker for personal belonging

Warning Notice for Posting at the Entrance of Decontamination Unit

Specification

The Warning Notice should comprise both warning signs and explanatory labels.

1. Material: Durable, weather-resistant and rigid on a vertical plane at the entrance of the decontamination unit.

2. Colour:
   (a) For 'DANGER' sign
   Sign: Black lines on yellow background
   Label: Black letters and characters on yellow background
   (b) For 'No unauthorized entry' sign
   Sign: Red lines on white background with the figure in black
   Label: White letters and characters on red background
   (c) For 'Wear approved respirator' and 'Wear protective clothing' signs
   Sign: White sign on blue background
   Label: White letters and characters on blue background

3. Size: Height of sign - Not less than 80mm
   Height of capital letters - Not less than 25mm
   Height of Chinese characters - Not less than 30mm

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Code of Practice on Asbestos Control

Preparation of
Asbestos Investigation Report,
Asbestos Management Plan and
Asbestos Abatement Plan

Issued by the Secretary for the Environment
Under Section 37 of the Air Pollution Control Ordinance (CAP 311)

<PREFACE>

The Code of Practice on Asbestos Control, in four sets, is issued by the Secretary for the Environment, Transport and Works under Section 37 of the Air Pollution Control Ordinance (Chapter 311) after consultation with the Advisory Council on the Environment. It provides advice on matters relating to asbestos control to registered asbestos consultants, registered asbestos contractors, registered asbestos supervisors and registered asbestos laboratories registered in the relevant registers kept and maintained by the Authority under Section 51 of the Ordinance.

The four sets of Codes of Practice provide advice on matters relating to:

1) preparation of asbestos investigation report, asbestos management plan and asbestos abatement plan;
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Although these Codes of Practice are not legally binding, compliance with the advice given could be used as evidence of good practice in the course of disciplinary and legal proceedings. It should be noted that the guidance given in these Codes is believed to be the best practice at the time of publication. With advancement in technology and with more experience, it is conceivable that these Codes may require amendment in the future to incorporate new developments. Registered personnel are therefore encouraged to adopt prevailing standards and control measures if such standards are higher than those given in these Codes, and if such control measures are more effective in controlling environmental asbestos.

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CONTENTS

1 Introduction

1.1 This Code of Practice provides guidance and advice to registered asbestos consultants on conduction of asbestos investigations and subsequent formulation of overall asbestos management and abatement strategies. Factors to be considered in selecting an appropriate asbestos abatement method to control the release of asbestos dust from in-situ asbestos containing materials in buildings and ships are also given.

1.2 This Code also sets out the specifications, scope and type of information that should be included in an asbestos investigation report, an asbestos management plan and an asbestos abatement plan for submission to the Authority.

1.3 The measures and procedures described in this Code are the minimum requirements necessary for safeguarding the environment and the health of occupants of areas where asbestos abatement work has been carried out. Additional precautionary measures may be necessary for certain operations and this Code should not be interpreted as precluding the adoption of such measures. The requirements of the Factories and Industrial Undertakings Ordinance for worker safety are particularly relevant in this regard.

2 Definitions

'Amended water' means water with wetting agent, for example, 50% polyoxyethylene ester and 50% polyoxyethylene ether, added to it to achieve a specific concentration in accordance with the manufacturer's instructions.

'Asbestos abatement work' means any work or a procedure physically taken to control fibre release from asbestos containing material. This includes removal, encapsulation, enclosure and transport of asbestos containing material.

'Asbestos' means any of the minerals, and substances including the minerals, crocidolite, amosite, chrysotile, fibrous actinolite, fibrous anthophyllite and fibrous tremolite.

'Asbestos containing material' means any material, substance or product which is made with or contains more than 1% asbestos by weight.

'Encapsulation' means treatment of asbestos containing material with another material that surrounds or embeds asbestos fibres in an adhesive matrix to prevent the release of fibres, as the encapsulant creates a membrane over the surface, penetrates the asbestos containing material and binds its components together.

'Enclosure' means the construction of an airtight, impermeable barrier around asbestos containing material to control the release of asbestos fibres into the adjacent environment.

'Non-friable asbestos containing material' means any asbestos containing material which when dry cannot be crumbled, pulverised or reduced to powder by hand pressure. For practical reasons, non bonded asbestos containing woven material should be considered as friable.

'HEPA-filtered appliance' means an appliance such as air mover or vacuum cleaner fitted with high efficiency particulate air filter capable of trapping and retaining 99.97% of particles (asbestos fibres) greater than 0.3μm mass median aerodynamic equivalent diameter.

'Homogeneous area' means an area which is uniform by colour, texture, construction or application date, and general appearance.

'Removal' means the stripping of any asbestos containing material from surfaces or components in a building or ship.

3 Planning an Asbestos Investigation

3.1 A registered asbestos consultant should plan and lead the investigation to provide an accurate inventory of all asbestos containing materials and suspected asbestos containing materials (say, in inaccessible areas) on the premises or ship, or part thereof affected by the intended asbestos abatement work. The investigation team, headed by a registered asbestos consultant, should normally comprise the following members:

- a representative of the owner of the premises or ship;
- maintenance staff of the premises or ship; and
- staff from a registered asbestos laboratory appointed to perform asbestos sampling, identification and measurement.

3.2 Every effort should be made to have all materials on the premises or ship, or part thereof affected by the intended work, visually examined and where appropriate sampled and analysed by a registered asbestos laboratory to ascertain the presence or otherwise of asbestos containing material. As a general rule, the following areas should be thoroughly examined:

- insulation lagging and gaskets on steam and hot water pipes, flues, boilers and autoclaves;

- friable materials (all friable materials should be treated as asbestos containing unless proved otherwise);

- acoustic boards, sprayed- or trowelled-on materials, decorative plastering and panels;

- fireproofing materials such as fire doors, blankets, curtains and fire-stop for cable penetrations;

- friction materials; and

- insulation materials in electrical and ventilation systems.

3.3 Collection of bulk samples should be carried out by a registered asbestos laboratory on the advice and under the supervision of a registered asbestos consultant. In order to help eliminate any inadvertent bias that may lead to incorrect investigation result, the locations of collection of bulk samples from each homogeneous area should be selected in a statistically random manner.

3.4 For surface materials, at least 3 bulk samples (full-depth and minimum 25mm x 25mm each) should be collected from each homogeneous area of 100m^2 or less; 5 bulk samples from a homogeneous area of between 100 and 500m^2; and at least 7 bulk samples from homogeneous areas that are larger than 500m^2.

3.5 For thermal insulation, a minimum of 3 bulk samples should be collected from any homogeneous run of pipe; at least 2 bulk samples from each pipe elbow, valve and flange suspected of having different insulation material; and at least 2 bulk samples from any patched insulation of less than 2m in length.

3.6 Bulk sampling, however, may be waived if objective data documenting a material's content are available.

3.7 The location, estimated quantity, friability, condition, use, accessibility and potential for damage should be recorded and mapped for all asbestos containing materials and suspect materials. Suitable personal protective equipment such as protective clothing and respirator should be worn when any asbestos containing material or suspect material may be disturbed during the inspection and under such circumstances, the area must be adequately segregated.

4 Asbestos Hazard Assessment

4.1 When the presence of asbestos containing material is confirmed, the registered asbestos consultant should proceed to make an assessment on the likelihood of users of the premises or ship being exposed to an excessive amount of asbestos contaminant. The demographics of the exposed population as well as the potential for release of asbestos fibres are two major factors to be considered.

4.2 A physical assessment of the airborne fibre generation potential could be done by visual inspection of the asbestos containing material. The following parameters influencing fibre release or re-entrainment should be considered:

- Asbestos type, percentage content and quantity- Is the more dangerous amosite or crocidolite involved? What percentages and quantities are present?
- Friability of the material - Does the material flake, powder, or crumble easily by hand pressure and readily emit fibres?
- Existing condition - Is the material damaged or deteriorated? If so, how severe?
- Accessibility and exposed surface area of the material giving a potential for physical damage by vandalism, impact, or mechanical vibration.
- Extent of occupant activity - What is the potential for continued suspension of airborne fibres and for settled, previously released fibres to become airborne again (re-entrainment)?
- Frequency of repairs to asbestos containing material-covered items.
- Potential for water damage (water damage often loosens the matrix binding the asbestos fibres in place and to the underlying substrate).
- Potential for air erosion - Is there a direct air stream or plenum opening likely to wear out the material?
- Population at risk - What is the size and age distribution of the exposed population? What is the duration of exposure? How likely is it that asbestos dust on personal clothing might be brought home and exposed to family members?

4.3 In addition to bulk sampling and visual inspection, the registered asbestos consultant should consider whether air quality measurements should be taken to support a specific remedial course of work. It should be borne in mind, however, that air measurements are episodic in nature. As such, low air measurement results do not necessarily indicate low hazard, but high air measurement results are always indications of imminent hazard.

5 Types of Asbestos Abatement Method

5.1 Asbestos abatement alternatives fall into four main categories -

- Removal

  Asbestos containing material should be separated in a controlled environment from the underlying surface, collected and placed in approved containers for burial in a designated government landfill. The situation in terms of material damage, friability and exposure potential will determine whether the asbestos removal work should be:

  - immediate;
  - as soon as possible - not waiting for the normal repair and maintenance cycle and that access to that part of the premises should be controlled prior to actual removal; or
  - planned to have the asbestos removal work taking place as part of the normal maintenance and repair cycle thus minimising costs and disturbance.

- Encapsulation

  Asbestos containing material should be coated with a sealant. This may be a penetrant, which penetrates and hardens the asbestos containing material; or a bridging sealant, which covers the surface of the material with a protective coating. Sealants should normally be applied over the surface of the material using airless spray equipment at low pressure in order to reduce fibre release during application. The surface to be encapsulated should first be cleaned with a HEPA-filtered vacuum cleaner to remove all loose debris to ensure good adhesion of the coating to be applied. Only encapsulants specially designed for the control of asbestos fibre should be used.

- Enclosure

  A barrier should be installed between the asbestos containing material and the surrounding environment thus confining any dust inside the enclosure, e.g. a suspended ceiling constructed between the asbestos containing material in the plenum and the indoor environment. Since fibre release and fallout can continue, a combination of encapsulation and enclosure may be required for adequate protection.

- Deferred action

  Asbestos abatement work can be deferred when the exposure risk is considered negligible or the asbestos containing material is well-protected so that fibre release is very unlikely. However, a continuing effort in the form of an operation and maintenance programme should be set up to monitor the situation by regular surveillance to make sure no disturbance would be made to the asbestos containing material during normal use, repair or refurbishment, and to lay down a course of action in case deterioration of the asbestos containing material is observed.

5.2 The advantages and disadvantages of these four asbestos abatement methods are summarised in Appendix 1. The choice of the most appropriate method depends largely on circumstances and the criteria to be considered are given in Appendix 2. It is only by conducting a cost-benefit analysis of the different methods (e.g. comparing 'immediate removal' with 'phased removal plus operation and maintenance programme' with 'removal just before demolition plus lifetime operation and maintenance programme') that it is possible to determine which method is the most suitable. Asbestos containing material not required to be immediately removed should be labelled with an approved warning sign (see Appendix 3) to ensure that it is not inadvertently disturbed or worked upon without correct precautions.

6 Different Levels of Protection

6.1 All the direct asbestos abatement methods, namely encapsulation, enclosure and removal, require precautionary measures to be taken to control dust release during the asbestos abatement process in addition to requirements of safe practice for normal construction work. The level of protection required depends on the nature of the asbestos containing material involved, the type of asbestos abatement method and the degree of disturbance to the asbestos containing material.

6.2 General guidelines are drawn up for various situations which can be grouped into four categories according to the level of protection.

Category

1: Total containment with 3-chamber decontamination unit. The containment is maintained under negative air pressure by using HEPA-filtered appliances.

2: Segregation between asbestos work area and external area using plastic sheet. A controlled air flow through the work area is maintained by using HEPA-filtered appliances.

3: Basically no containment required, only physical barrier to the outside environment with warning signs posted prominently and asbestos containing materials removed intact.

4: Completely open-air asbestos work with proper worker protection, appropriate warning signs and adequate wetting during asbestos work.

Material / Asbestos Abatement Method	Friable (Sprayed-on, powdery)	Woven (cloth, rope)	Friable board	Cementitious	Resinated/ plastic/ bituminous
	Category				
Removal	1	1	1	3, 2*	3
Encapsulation	1	2	2	4	4
Enclosure (direct disturbance)	1	2	2	4	4
Enclosure (no direct disturbance)	2	4	4	4	4

* when the asbestos containing material is in poor condition, or has a high probability of becoming crumbled, pulverized, or reduced to powder by forces expected to act on the material in the course of removal operation.

6.3 These guidelines apply only to major asbestos abatement activities. Small-scale asbestos abatement work which can be completed within one work shift may be conducted with different approaches giving effectively the same level of protection. An example would be the use of glove bags in delagging small sections of asbestos pipe insulation.

7 Means of Dust Suppression During Asbestos Abatement Work

The following methods of dust suppression should be adopted as far as practicable in asbestos abatement activities -

- Containment or segregation of work area.
- Use of negative pressure equipment with HEPA filters to control air flow between the work area and the outside environment.
- Decontamination facilities for cleaning of workers, equipment and bagged waste before leaving the work area.
- Wetting of asbestos containing material before and during disturbance, using amended water where appropriate.
- Minimising the breakage and dropping of asbestos containing material, and packing of debris and waste immediately after it is produced.
- Cleaning of work area by wet wiping and vacuuming with HEPA-filtered vacuum cleaner.
- Coating on any surfaces previously in contact with or contaminated by asbestos with a proper sealant .
- Proper bagging, handling and disposal of asbestos waste or asbestos-contaminated waste.

8 Asbestos Investigation Report

8.1 An asbestos investigation report should be signed by a registered asbestos consultant to certify that, to the best of his knowledge and belief, the materials contained therein are real and up-to-date, and the investigation was conducted without bias.

8.2 As a minimum, the following information should be included.

- Particulars of the owner:

  This includes the owner's identity including name, passport or identity card number, address and telephone number. If the owner of premises or ship is a company, the name, business registration number, number of certificate of incorporation, address and telephone number of the company as well as the

identity of the proprietor, partners, directors or persons having control of the company should be provided.

- Detailed description of the premises or ship:

  This includes detailed description of the location, age, structure, occupancy, usage pattern and main activities of the premises or ship in question, and brief description of the neighbourhood in terms of their occupancy and activities.

- Details of the registered asbestos consultant and registered asbestos laboratory:

  This includes the names, registration numbers and the respective scope of duties of the registered asbestos consultant and the registered asbestos laboratory appointed for the investigation.

- Method of investigation:

  While the method of investigation may vary from case to case, the following approach should normally be followed. The report should be so written as to reflect fully the scope and depth of work performed by the investigation team:

  - Record review - All building records and drawings, records of maintenance and renovation should be screened to identify all asbestos containing materials and suspect materials.

  - Field inspection - A thorough inspection of all materials on the premises or ship to

    - confirm the validity of the records and drawings;

    - locate any asbestos containing material or suspect material not revealed in the records and drawings; and

    - form an overall view of the condition of the asbestos containing material and suspect material, and of the population at risk. Any suspect material should be assumed to contain asbestos and treated accordingly.

  - Sample collection - Unless justification can be given to disregard an air or bulk sampling exercise, the registered asbestos consultant should develop an overall sampling strategy and methodology to be implemented under

his supervision by the registered asbestos laboratory. Details of the sampling criteria adopted, type and number of samples collected, their locations and means of access, any inaccessible area with presence of suspect material, type and number of samples analyzed should be provided.

- Laboratory analysis - Collected air or bulk samples must be analyzed by a registered asbestos laboratory and the results should be presented in reports in the format endorsed by the relevant accreditation scheme. Copies of the reports should be appended to the asbestos investigation report for submission to the Authority.

■ Interpretation of results:

The registered asbestos consultant should interpret the findings of the investigation and conclude, in terms of statistical significance where appropriate, whether or not asbestos containing material is present. Additional samples or follow-up inspections may sometimes be required before a definitive statement can be made.

■ Hazard assessment:

Detailed assessment on the hazard of any identified asbestos containing material or suspect material with particular reference to:

- the quantity, type and composition;
- the friability;
- the physical condition and likelihood of future fibre release;
- the accessibility;
- the location in relation to the path of natural and artificial ventilation; and
- the population and activities in the immediate vicinity.

Given there exists a latency period of some 10 to 40 years between first exposure to asbestos and onset of symptoms of diseases, particular attention should be given to infants and school-age children who are more vulnerable to asbestos-related diseases.

8.3 The registered asbestos consultant is encouraged to include in the report any other information considered to be useful and relevant.

9 Asbestos Management Plan

9.1 An asbestos management plan should be so written that it can be used as a self-contained document, and signed by a registered asbestos consultant to confirm authenticity of the materials contained therein.

9.2 The mere presence of asbestos containing material does not necessarily imply that the health of users of the premises or ship is being jeopardised. The registered asbestos consultant should determine, with due regard to the results of the investigation, whether asbestos abatement work is required. If the situation does not warrant asbestos abatement work to be pursued, an operation and maintenance plan should be provided. If asbestos abatement work is deemed necessary, however, an asbestos abatement plan should be prepared. Therefore, an asbestos management plan should comprise an operation and maintenance plan for asbestos containing material and other suspect material not requiring abatement work and an asbestos abatement plan for any asbestos abatement work or work involving the use or handling of any asbestos containing material.

10 Operation and Maintenance Plan

10.1 The objective of an operation and maintenance plan is to set out work practices to:

- maintain any asbestos containing material and suspect material in good condition;
- ensure proper clean-up of asbestos fibres previously released;
- prevent further release of asbestos fibres;
- monitor the condition of asbestos containing material and any suspect material; and
- safely handle accidental release of asbestos fibres.

10.2 An operation and maintenance plan should state clearly the operation and maintenance policies and procedures tailored for the premises or ship in question, be regularly updated when necessary and made available to and understood by all personnel involved. It should include the following information as a minimum.

- Detailed description of the premises or ship:

  This includes detailed description of the location, age, structure, occupancy, usage pattern and main activities of the premises or ship in question, and brief description of the neighbourhood in terms of their occupancy and activities.

- Organization of people for implementing the operation and maintenance plan:

  This includes an organization chart showing the administrative line of authority (with names and positions) and defining the responsibilities of key participants such as the owner, the registered asbestos consultant, custodial and maintenance supervisors and staff and the registered asbestos contractor.

- Details of any identified asbestos containing material and suspect material:

  This includes the characteristics, type, quantity and physical condition of all identified asbestos containing materials and suspect materials. Information should be presented in a tabulated form. All asbestos containing materials and suspect materials should be depicted clearly on building plans or sketches to indicate their exact locations.

- Condition of the identified asbestos containing material and suspect material:

  This includes a description of the condition of all identified asbestos containing materials and suspect materials, and a detailed account of any damaged material with dimensions, potential for further damage and air quality measurements where appropriate. Any clean-up of previously released asbestos contaminant should be described in detail. When the damaged asbestos containing material is located in the path of natural or artificial ventilation which may cause fibres to be transported, the clean-up may need to be extended to the whole of the premises, including possibly the ventilation system itself.

- Reasons why any asbestos containing material or suspect material should not be removed:

  In-situ asbestos containing material or suspect material can often be left in place and effectively managed but the reasons for adopting other asbestos abatement methods such as deferred action, encapsulation or enclosure should be provided. Such reasons should be based on the findings of the investigation.

- Method of labelling the asbestos containing material:

  All identified asbestos containing material not requiring removal should be labelled to the specifications given in Appendix 3. Details of the method of labelling and maintenance of labels should be provided.

- Method of informing all people who may be affected:

  It is always advisable to take an honest and open approach to keep workers, tenants and other users of the premises or ship fully informed of the location and physical condition of the asbestos containing material which they might disturb, and to encourage them to report any evidence of disturbance or damage of asbestos containing material to the owner for corrective action. Any structured communications to that effect should be described in detail.

- Surveillance scheme:

  A registered asbestos consultant should be appointed to carry out a comprehensive reinspection of all the asbestos containing materials and suspect materials at least once every two years. Meanwhile, a carefully designed programme of airborne asbestos fibre monitoring may be useful to give early warning of deterioration or disturbance of the asbestos containing material. Compiling a set of colour photos on the condition of the material over time can be of great value. Details of a surveillance scheme to that effect should be provided.

- Method to avoid disturbing the asbestos containing material:

  Workers, tenants and other users of premises or ship should be encouraged to notify the owner of even small planned maintenance and renovation before any work is carried out. In addition, an authorization system should be adopted to

  - monitor any operation and maintenance activities;
  - prevent accidental disturbances of asbestos containing material or suspect material; and
  - discourage the introduction of new asbestos containing material.

  Sample work forms are given in Appendices 4 and 5 for reference. Details for the administration of such a notification and authorization system should be provided.

- Record keeping scheme:

  Details of a record keeping scheme for all asbestos management documents should include investigation and assessment reports, operation and maintenance plan, policies and work procedures, workers training and medical records, fibre release reports, airborne fibre monitoring reports, maintenance and renovation notifications, authorizations issued, evaluation of work affecting asbestos containing material and reinspection and surveillance of asbestos containing material.

- Actions for handling deteriorating asbestos containing material:

  Special operation and maintenance practices for handling deteriorating asbestos containing material as well as under what circumstances a major clean-up operation would be required, should be fully explained.

11 Asbestos Abatement Plan

11.1 The objective of an asbestos abatement plan is to set out:

- the method of abatement of asbestos containing material;
- the performance criteria for protection of workers and the environment; and
- any emergency procedures and contingency measures required.

11.2 The asbestos abatement plan should include the following information as a minimum.

- Detailed description of the premises or ship:

  This includes detailed description of the location, age, structure, occupancy, usage pattern and main activities of the premises or ship in question, and brief description of the neighbourhood of the asbestos abatement work site as well as the premises or ship in terms of their occupancy and activities. The exact location and boundary of the asbestos abatement work site should be described and shown clearly on building plans or sketches.

- Details of the registered asbestos consultant, contractor and laboratory:

  This includes the names, registration numbers, and respective scope of duties of the registered asbestos consultant, registered asbestos contractor, and registered asbestos laboratory appointed for the asbestos abatement work.

When available, the name and registration number of the registered asbestos supervisor to be deployed should also be included.

- Reasons why any asbestos containing material or suspect material should not be removed:

  This includes any reason given for the asbestos containing material or suspect material to remain. Such should be based on the findings of a comprehensive asbestos investigation. Any preventive measures to be taken during asbestos abatement work to avoid disturbing the remaining asbestos containing material inadvertently should be described in detail.

- Programme for asbestos abatement work:

  This includes presentation in a chart form to show the critical path of the asbestos abatement work and date for the various stages of work including site possession, delivery of specialised equipment and consumables, site preparation, preliminary decontamination of work area, background air test, construction of containment, leak test, asbestos abatement work, air monitoring, final clean-up, penultimate air test, visual inspection by a registered asbestos consultant, final clearance air test, removal of containment, reassurance visual inspection by a registered asbestos consultant and removal of asbestos waste and decontaminated equipment from site.

- Asbestos abatement method and performance criteria:

  This includes justification for the choice of a particular asbestos abatement method and detailed description of the method of abatement including site preparation, construction of containment, air monitoring strategy and programme and work acceptance procedures. A description of methods, measures, steps for checking the performance before, during and after the asbestos abatement work or work involving the use or handling of asbestos containing material should also be provided. The objective is to ensure reduction or elimination of exposure to the asbestos workers, other users of the premises or ship, and the environment.

- Amount of asbestos waste and method of disposal:

  An estimate on the amount of asbestos and asbestos-contaminated waste to be generated from the asbestos abatement work, arrangement for temporary storage of waste on site and their packaging, method of handling and

decontamination of asbestos waste before leaving work site, and method of transportation and contingency measures during transportation.

- Emergency procedures and contingency measures:

  Emergency procedures and contingency measures tailored for the premises or ship in question should be supplied to cater for mishaps such as fire, explosion, vandalism, typhoon, bursting of pipe and industrial accidents.

12 Implementation of an Asbestos Management Plan

12.1 The success of an asbestos management plan hinges on key personnel understanding the asbestos management programme and committing themselves to implementing it effectively. To that end, it is important that a registered asbestos consultant is authorized to oversee all asbestos-related activities on the premises or ship, including inspections, operation and maintenance activities and other asbestos abatement actions. The registered asbestos consultant should also be responsible for ensuring the maintenance and custodial staff have received proper training in operation and maintenance techniques which may include wet methods, use of HEPA-filtered vacuum unit and avoidance of certain activities such as sawing, sanding and drilling of the asbestos containing material.

12.2 The appointed registered asbestos consultant should also endeavour to establish clear lines of communication with users of the premises or ship regarding asbestos issues to maintain their confidence in the effective implementation of the asbestos management plan.

13 Supervision and Monitoring of Asbestos Abatement Work

13.1 A registered asbestos consultant should supervise and monitor the performance of the registered asbestos contractor for the entire period of asbestos abatement work in the following manner:

- At least 1 registered asbestos supervisor per 15 workers engaged in asbestos abatement work must be present on site full-time.

- All workers directly involved in handling asbestos must have received proper training.

- All equipment used for dust control must be properly maintained, tested and certified to be in good working condition by a recognized laboratory (if established) on a regular basis.

- All working procedures including decontamination must be in accordance with the asbestos abatement plan and must follow sound principles for dust control.

- No visible emission from the work area is allowed.

- All effluent from the work area should be pre-treated before discharged.

The registered asbestos consultant should ensure the above through inspection, interview and consultation with the registered asbestos contractor, air monitoring and other appropriate methods on a regular basis.

13.2 It is the duty of the registered asbestos consultant to notify the Authority of any modification of the content of the asbestos management plan or asbestos abatement plan before implementing the modifications. For effective supervision of work, any deviation of work on site from the plan must be supported by written confirmation from the registered asbestos consultant, otherwise the registered asbestos contractor shall bear full responsibility.

14 Related Codes of Practice

Further information on the requirements for undertaking asbestos work are available in the following codes of practice issued by the Secretary for the Environment, Transport and Works:

- Code of Practice on Asbestos Control : Asbestos Work Using Full Containment or Mini Containment Method.

- Code of Practice on Asbestos Control : Asbestos Work Using Glove Bag Method.

- Code of Practice on Asbestos Control : Safe Handling of Low Risk Asbestos Containing Material.

- Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste.

APPENDIX 1

Advantages and Disadvantages of Asbestos Abatement Methods

Asbestos Abatement Method	Advantages	Disadvantages
Removal	Asbestos source eliminated. No further action required.	Often highest cost, most complex and time-consuming method. Removal creates major disturbance and may increase fire risk within building. Possible contamination of whole building if removal done poorly. Higher potential for worker exposure. Substitute material required.
Encapsulation	Usually a quick and economical method for repair to damaged areas. May be an adequate technique to control release of asbestos dust.	Asbestos source remains. If material is damaged or deteriorating, additional weight of the sealant may cause delamination. Cost for large areas may be near removal cost. Management system required to check regularly for damage to encapsulated surface. Eventual removal may be more difficult and costly.

Asbestos Abatement Method	Advantages	Disadvantages
Enclosure	May be an adequate method of control for some situations. May minimise disturbance to occupants.	Asbestos source remains and fibre fallout continues behind enclosure. Management system required to provide continuous maintenance to enclosure. May be costly if enclosure disturbs functions or requires relocation of other systems. Precautions necessary for entry into enclosure for maintenance or renovation. Need to remove enclosure before eventual removal of asbestos.
Deferred Action	No initial cost.	Potential for exposure may increase with time. Management system required. Precautions necessary to prevent damage during maintenance or renovation. Continuing inspection and re-evaluation necessary.

Criteria for Choosing an Appropriate Asbestos Abatement Method

Asbestos Abatement Method	When Appropriate	When Inappropriate
Removal	Material severely damaged or liable to further damage or deterioration. Material friable or poorly bonded to substrate. Prior to building or ship renovation or demolition.	Material located on complex and inaccessible surfaces. Removal extremely difficult and other techniques offer better alternative.
Encapsulation	Removal not feasible. Material still retains firm bonding to substrate. Damage to material unlikely. Limited accessibility of material. Short remaining life of structure. Economic or time advantage.	Material does not adhere well to substrate. Weight of sealant may cause delamination. Material is deteriorating or damaged. Water damage likely. Continuing inspection and maintenance of encapsulated material doubtful.
Enclosure	Removal not feasible. Fibres can be completely contained within enclosure. Disturbance or entry into enclosed area unlikely. Economic advantage.	Damaged or deteriorating material causing high levels of fibre fallout. Water damage likely. Damage to enclosure likely. Entry into enclosure probable for repairs and maintenance. Continuing inspection and maintenance of enclosure doubtful.
Deferred Action	Negligible exposure potential. Material inaccessible and fully contained. Material in stable condition and not liable to damage.	Definite or questionable exposure potential. Possibility of deterioration or damage. Continuing inspection doubtful.

Labelling of Asbestos-containing Material

It is the owner's responsibility to label all exposed asbestos-containing material in a premises or ship with the following warning sign so as to ensure that the material is not inadvertently disturbed or worked upon without correct precautions. Durable and weather-resistant material should be used for the sign in question.

APPENDIX 4

Application Form for Maintenance or Renovation Work (SAMPLE)

Person-in-charge of work : _____ Telephone No. : _____

Commencement Date : _____ Completion Date : _____

Address of premises or ship (or description of area) where work is to be performed :

_____

_____

_____

Description of work :

_____

_____

_____

Description of any asbestos-containing material that might be affected or used, if known (including location and type) :

_____

_____

_____

Name and telephone no. of applicant : _____
Address : _____

Signed : _____ Date : _____
(Applicant)

NOTE : An application must be submitted for all maintenance or renovation work whether or not asbestos-containing material might be affected. An authorization must then be received before any work can proceed.

_____ Granted (Application No. _____)
_____ With Condition*
_____ Denied

* Conditions : _____

_____

_____

Remarks (Follow-up visit and observations) :

_____

_____

_____

_____

Signed : _____ Date : _____
(registered asbestos consultant)

APPENDIX 5

Authorization Form for Maintenance or Renovation Work (SAMPLE)

AUTHORIZATION

Authorization is given to _____ (Person-in-charge of work) to proceed with the following maintenance or renovation work at the specified location :

_____
_____
_____
_____

This authorization will expire at _____ hrs. on _____.

PRESENCE OF ASBESTOS-CONTAINING MATERIALS

_____ Asbestos-containing materials (ACM) not present in the vicinity of the maintenance/renovation work.

_____ ACM is present, but its disturbance is not anticipated, however, if conditions change, the registered asbestos consultant will re-evaluate the work request prior to proceeding.

_____ ACM is present, and may be disturbed.

Work Practices if Asbestos-Containing Materials are Present

The following work practices shall be employed to avoid or minimize disturbing asbestos.

_____
_____
_____
_____

Personal Protection if Asbestos-Containing Materials are Present

The following equipment/clothes shall be used/worn during the work to protect workers.

_____
_____
_____
_____

Special Practices and/or Equipment Required

_____
_____

Signed : _____ Date : _____
(registered asbestos consultant)

Printed by the Government Logistics Department
(Printed with environmentally friendly ink on recycled paper)

CODE OF PRACTICE ON THE HANDLING, TRANSPORTATION AND DISPOSAL OF ASBESTOS WASTE

(Published under the Waste Disposal Ordinance (Cap.354) Section 35)

Environmental Protection Department
Hong Kong

PREFACE

Asbestos is a material that has been used for many years in the construction, manufacturing, services and shipping industries. It is a hazardous material and appropriate care must be taken in handling any material which contains asbestos. Asbestos waste is classifiable as chemical waste under the Waste Disposal (Chemical Waste) (General) Regulation and its handling, collection, transportation and disposal is controlled by the legislation. This code gives guidance to persons who may come into contact with asbestos waste on the safe handling of asbestos waste and how they can comply with the legislative controls.

This Code of Practice is a statutory document. It was first published in January 1993 by the Secretary for Planning, Environment and Lands under Section 35 of the Waste Disposal Ordinance after consultation with the Environmental Pollution Advisory Committee. The purpose of this Code is to provide guidance and advice on the collection, storage, treatment, transportation and disposal of waste. It is not legally binding, but compliance with the Code could be employed as evidence of good practice in the course of a legal defence.

Enquiries concerning the Code of Practice may be addressed to the Environmental Protection Department at :

Address

Environmental Protection Department
28/F, Southorn Centre
130 Hennessy Road, Wanchai, Hong Kong.

Telephone **:** 2838 3111

E-mail **:** enquiry@epd.gov.hk

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1. LEGISLATIVE CONTROLS

■ Under the Waste Disposal (Chemical Waste) (General) Regulation (the Regulation) made under the Waste Disposal Ordinance (Laws of Hong Kong Chapter 354), asbestos waste is classified as a chemical waste. The legislative controls include controls on the packaging, labelling, storage, collection and disposal of chemical wastes. This Code of Practice provides guidance to any person who may be involved in the handling, packaging, transportation and disposal of asbestos waste and on how they can comply with the legislation. More details of the above legislation can be found in **A Guide to the Chemical Waste Control Scheme** published by the Environmental Protection Department (EPD) (address shown in the Preface).

■ A separate code of practice, published by the Labour Department, and entitled **Control of Asbestos at Work**, covers the protection of the health and safety of workers handling asbestos or involved in the production of asbestos waste. This should also be complied with. Specific requirements are also laid down on the distribution of asbestos waste under the Factories and Industrial Undertakings (Asbestos) Special Regulations 1986 and these requirements should be followed. The Notice to Shipowner, Shipbuilders, Ship Repairers and Shipbreakers issued by the Marine Department also provides advice on the health hazards of asbestos and the precautions to be taken during demolition or repair work aboard ships and floating structures.

2. FORMS OF ASBESTOS

■ Asbestos is a mineral which, both in its raw form and as a constituent of composite materials, has many uses in the construction, manufacturing, services and shipping industries. It occurs in three main forms-

- Crocidolite or blue asbestos - widely used at one time for insulation especially where chemical resistance is required.
- Amosite or brown asbestos - used mainly in bonded asbestos products.
- Chrysotile or white asbestos - now used for most applications.

■ There are other, much less common forms, which may be encountered occasionally. Concern over health risks has led to asbestos being replaced by safer substitutes in many products. Practically all asbestos now used in Hong Kong is chrysotile, though blue and brown asbestos will continue to be produced as waste for many years from the stripping of old insulation and lagging.

3. TYPES OF WASTE

■ For the purposes of this Code of Practice asbestos wastes are classified as follows -

Type 1

Bonded asbestos wastes (other than blue or brown asbestos) in good condition, and free from any material likely to release asbestos fibres. Examples of bonded asbestos materials are: asbestos cement sheets, pipes and other fittings; asbestos reinforced plastics; asbestos reinforced jointings, packings and gaskets. Any friable or crumbly material containing asbestos reinforcement, or any dust from sawing, drilling and machining bonded asbestos products are Type 2 waste.

Type 2

Any waste containing loose asbestos fibres (other than blue or brown asbestos); for example asbestos lagging, asbestos wall and ceiling insulation; asbestos wool and textile products; dust from sawing, drilling and machining bonded asbestos products; friable asbestos cement products; loose asbestos diaphragms from chloralkali cells; asbestos-containing sludges; empty sacks, bags or

drums that have contained loose asbestos fibre; floor sweepings from any operation involving asbestos dust or powder.

Type 3

All blue asbestos (crocidolite) and brown asbestos (amosite), whether in good condition or not, or any articles contaminated by blue or brown asbestos.

3.1 Mixed Asbestos Wastes

■ The three types of asbestos waste should normally be kept separate from each other, and from other waste. In some circumstances this can be difficult, for example where intact bonded asbestos is mixed with sawdust and friable materials. In such cases, EPD as the authority under the Regulation may allow mixed loads to be delivered to the disposal sites. These loads will be subject to special conditions, the general nature of which are found in section 8 below, though further conditions may be placed on particular loads at the discretion of EPD.

■ Unlike many other hazardous wastes, asbestos cannot be readily detoxified or rendered harmless by waste treatment processes (Note 1). Many of the waste handling and treatment operations used in Hong Kong will have the effect of breaking up asbestos waste and releasing fibres into the atmosphere, thereby endangering employees and the general public. Thus asbestos waste must never be mixed with household or commercial wastes, nor delivered to incinerators, refuse collection points, transfer stations or public dumping area and reclamations.

Note 1: Several processes to detoxify asbestos are being developed. Asbestos vitrification is a new process developed in the UK and has been marketed worldwide.

3.2 Identification of Asbestos Waste

■ The positive identification of asbestos fibres requires specialist laboratory techniques. Asbestos waste produced by industrial processes is readily identified from the raw materials used, but in the case of many construction and demolition operations (involving for instance the stripping of lagging or other forms of insulation) the waste may contain either asbestos or other fibrous materials. Even where asbestos is known to be present, exposure to heat can change the characteristic blue-grey colour of crocidolite to a dirty, white colour, which may be confused with the less hazardous forms.

■ Waste which may contain asbestos should be treated as hazardous unless and until laboratory tests prove its absence. In the case of small amounts of waste it is more practicable to dispose of it as if it were asbestos rather than to undertake laboratory testing to determine the actual constituents. For larger quantities (above $5m^3$ in bulk or $100m^2$ for sheets) samples of the waste should be taken and tested in the laboratory for asbestos. These samples should be taken before work begins in the case of demolition work and insulation stripping. Information on laboratories accredited to undertake asbestos determinations may be obtained from the Air Management Group of EPD (address shown in Appendix A).

4. REGISTRATION OF WASTE PRODUCERS

■ Under the Regulation, producers of chemical waste including asbestos waste are required to register with EPD before engaging in any activity which produces such waste. Any producer who fails to comply with the registration requirements commits an offence. For more details, please refer to **A Guide to the Registration of Chemical Waste Producers** published by EPD. Copies of the Guide and registration forms can be obtained from EPD.

5. LICENSING OF WASTE COLLECTORS

■ Under Section 10 of the Waste Disposal Ordinance, collectors who collect and transport asbestos waste to an off-site facility for disposal have to be licensed by EPD. Any waste producer who wishes to transport his own waste also has to be licensed. Details on the licensing requirements and the application procedures can be obtained from EPD.

6. PACKAGING, LABELLING AND HANDLING OF ASBESTOS WASTE

6.1 Type 1 Waste

■ Type 1 waste (bonded asbestos products free from dust, and in good condition) shall be packed with 2 individual layers of strong transparent plastic sheets of not less than 0.15 mm thickness and completely sealed with adhesive tapes. Type 1 waste shall be packed in suitable sizes for easy handling. The height of each package shall not exceed 750 mm. On no account should Type 1 waste be mixed with domestic or commercial wastes for disposal. The inner sheet should be clearly labelled as illustrated in Appendix B. The dimensions of the label should not be less than 120 mm x 150 mm.

6.2 Type 2 Waste

■ Type 2 waste contains loose asbestos fibres which are potentially hazardous to workers handling the waste, and to the general public if the waste is allowed to disperse into the air, even in very small quantities.

■ All Type 2 waste must be contained, as soon as it is produced, in strong bags made from plastic or other containers approved by EPD (Details in Appendix B). The bags should be goose-neck sealed by means of adhesive tapes. A bag filled with asbestos waste should be placed inside another plastic bag to provide additional protection. The colour of the inner bag should be white while the outer bag should be transparent to facilitate visual inspection. The inner bags of the Type 2 waste should be clearly labelled as illustrated in Appendix B. Vacuum packing of asbestos waste should be carried out wherever possible such that air is excluded from the bags as far as possible before sealing.

■ All articles contaminated with Type 2 waste (gloves, breathing masks, etc.) should also be contained in bags for disposal. Type 2 waste packed in bags should be kept apart from other waste, and must on no account be mixed with non-asbestos waste since the bags could easily be split, releasing asbestos fibres to the environment.

6.3 Type 3 Waste

■ Type 3 waste (blue or brown asbestos) is hazardous in very small quantities. Great care must be taken to prevent release of any blue or brown asbestos waste. The handling of Type 3 waste should be similar to that of Type 2 as mentioned in section 6.2 except that the colour of the inner bags should be orange and clearly labelled as illustrated in Appendix B.

6.4 Presence of Sharp Objects

■ The presence of sharp objects could easily damage the plastic packaging when plastic sheets or bags are used for packaging asbestos waste. This should be avoided by wrapping the sharp ends with strong plastic sheets of 0.15 mm thickness and completely sealed with adhesive tapes. Alternatively, the waste should be placed inside a sealed metal drum to avoid any possible release of asbestos fibres (Details in Appendix B).

6.5 Bulky Asbestos Waste

■ Bulky asbestos waste which cannot be suitably contained in plastic bags or drums should be wrapped with 2 individual layers of strong plastic sheets of not less than 0.15 mm thickness and completely sealed with adhesive tapes. For Type 1 waste, two layers of transparent plastic sheets should be used. The colour of the inner plastic sheets should be white for Type 2 and orange for Type 3, while the outer plastic sheets should be transparent for both types of waste. The inner sheet must bear the appropriate markings as mentioned in sections 6.1-6.3. Since the packages would be disposed of into pre-excavated trenches, the maximum size of the packages should be restricted to 3000 mm(L) x 1500 mm(W) x 750 mm(H).

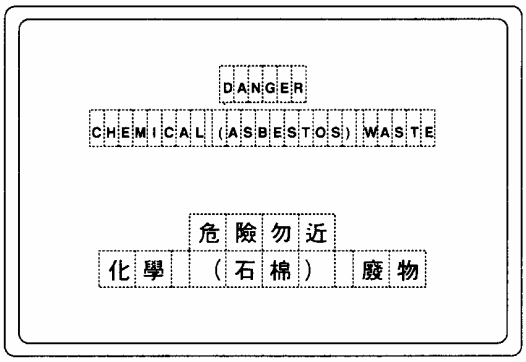
■ The external surface of all containers and bags must be thoroughly cleaned by wet wiping or vacuuming using specialized equipment in a controlled environment to achieve a condition of no visible debris or fibres.

6.6 Loading and Unloading

■ Asbestos waste should be loaded and unloaded by hand or mechanical crane as appropriate. Bags should not be thrown or dropped into the pre-excavated trenches. Approved face masks as specified in the Factories and Industrial Undertakings (Asbestos) (Approval of Respiratory Protective Equipment) Notice 1986, appropriate heavy duty rubber gloves, overalls and working shoes should be worn during the handling of asbestos waste.

7. STORAGE OF ASBESTOS WASTE

■ If special arrangements have to be made at the disposal site for large arisings of asbestos waste, then waste producers will need to make provisions for the temporary storage of the waste. All storage of asbestos waste should be carried out properly in a secure place isolated from other substances so as to prevent any possible release of asbestos fibres into the atmosphere and contamination of other substances. Type 1 waste should not be stored together with Types 2 and 3 waste so as to avoid damage to the plastic bags of Type 2 or 3 waste, unless the bags are packed in boxes or drums for additional protection. Bagged asbestos waste should not be stacked more than 3 bags high in order to avoid damage to the bottom bag. The storage area should be isolated from other working areas and bear warning panels to alert people of the presence of asbestos waste. Details of the warning panels required under the Regulation are illustrated in Figure 1. Particular attention should be given to maintain good fire safety measures in the storage area. In the case of asbestos spillage at the storage site, appropriate action as found in section 11 should be taken. For more details on the requirements of storage area, please refer to the **Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes** published by EPD.



Specifications:

1. Material:	Durable, weather resistant and rigid on a vertical plane of the storage structure.	
2. Colours:	Background	White
	Characters & Letters	Red
3. Size:	Letters	Height ≥ 60mm
	Characters	Height ≥ 60mm

(The rectangular lines forming the tiles do not form part of the actual sign)

Figure 1 - Notes on the Hazard Warning Panel for Storage Area

■ In any process involving asbestos and the generation of asbestos waste, the proprietor, property owner or occupier should ensure that the operation is carried out properly. He should also ensure that his own worker or contractor has sufficient expertise and training in carrying out the operation so as to avoid the release of asbestos fibres. Further advice on asbestos removal operation can be obtained from the Air Management Group of EPD.

8. TRANSPORT TO THE DISPOSAL SITE

■ Asbestos waste should be transported to the disposal sites by enclosed skips, open lorries or enclosed vehicles, according to the requirement for each type of waste. The following conditions must be complied with-

- Types 2 and 3 asbestos waste contained in plastic bags must be transported in enclosed skips which meet the following specifications -
  - Dedicated skips must be exclusively used to transport asbestos waste.
  - Skips must be constructed of steel and possess sealable drain outlet.
  - Skips must be fully enclosed and be of the walk-in type with double lockable door at the rear end. The doors and joints of the skips must be rubber sealed, and the doors must be locked during transport.
  - The capacity of the skips will normally be 9 or 15m^3, and the skips must not be overloaded.
  - Skips must be capable of being hydraulically loaded on and off the transport vehicles.
  - Loading and unloading of the bagged waste must be conducted by hand whilst the skip is in the lowered position (on the ground).
  - The bagged asbestos waste should not be stacked indiscriminately resulting in damage to the bottom bag due to the weight at top.
  - Proper warning panels must be placed on the skips to indicate the carriage of asbestos waste (Details in Appendix C).
  - Pallets of Types 2 and 3 asbestos waste may be carried together within the skips.
  - Contaminated skips must be washed down at the disposal sites where wash water may be drained into reception trenches.
- Drummed waste and Type 1 waste are not required to be transported by skips and may be transported by open lorries or enclosed vehicles subject to the following requirements-
  - Vehicles should not be loaded above the free edge of the sideboards.
  - The waste should be secured on the vehicles.
  - Plastic sheets should be used for covering waste on an open type lorry and for lining the vehicles when loaded with Type 1 waste. The used sheets should be disposed of as contaminated waste at the landfill.
  - Proper warning panels must be placed on vehicles to indicate the carriage of asbestos waste (Details in Appendix C).
  - Wash down asbestos contaminated vehicles with water at the disposal sites where the wash water may be drained into reception trenches.

9. DISPOSAL

■ The legislation requires that all asbestos wastes must be disposed of at designated or licensed facilities. In Hong Kong the only proven method of disposing asbestos is by secure burial in a landfill site.

■ Since asbestos is listed in Part A of Schedule 1 to the Regulation, notification has to be given to EPD for its disposal. Furthermore, disposal at a landfill site requires site preparation, and to allow for this, and the phasing of asbestos disposal with other operations on the site, EPD will normally require ten working days notice of the intention to dispose of any quantity of asbestos waste.

■ The notification should be made on the prescribed form obtainable from EPD (Appendix D). After processing the notification, EPD will issue specific instructions and directions for disposal of the waste. Generally, the directions will specify the description (i.e. Type 1, 2 or 3) and quantity of the waste; the designated landfill for codisposal; the period of waste delivery; and any special instructions on the disposal method. These directions must be strictly followed by the waste producer or his agent.

■ Certain operations may produce large quantities of asbestos waste within a short period of time, for instance when a power station or chemical plant is demolished. Waste arising greater than 250m^3 in volume will be considered a large quantity. In those circumstances the rate of waste production may exceed the ability of the disposal sites to handle and dispose of the waste and it would be necessary for a waste producer to inform EPD at the planning stage of the operations. The waste producer should provide EPD with his programme of works and the estimated waste arisings so that suitable disposal arrangements can be made. If there is no prior agreement between the waste producer and EPD, the disposal of large arisings of asbestos waste may be severely restricted and more stringent conditions than usual may be imposed by EPD.

■ At the disposal site, the waste producer or collection contractor should ensure that the disposal operation is carried out in accordance with the instructions of the landfill site staff. Type 1 asbestos waste should normally be disposed of at the tipping face at the location as directed by the landfill operator whilst Types 2 and 3 wastes should be disposed of into pre-excavated trenches. Asbestos waste should be placed into a trench by hand or mechanical crane as appropriate. Placement of waste should progress from one end of the trench to the other. Throwing, dropping of bags and stepping on bags or packages during unloading are strictly forbidden. A half metre clearance at the top of the trench for subsequent backfilling with soil should be allowed for. A trained person who is experienced on working with asbestos should be provided by the waste collector and should be assigned with the responsibility to supervise the disposal operation.

10. TRIP TICKET SYSTEM

■ A "cradle-to-grave" control system has been introduced under the Regulation, as a mechanism of keeping track of the movement of chemical waste from its point of arising to its final place of disposal (illustrated in Figure 2). For every waste consignment, a waste producer needs to complete a "trip-ticket" before the waste will be accepted for collection from his premises. The waste producer has to keep one copy as a record of the consignment, and the waste collector will retain a further copy of the form upon delivery of the waste to a reception point manager. The original copy will be retained by the reception point manager. Each party in the waste disposal chain has to keep his copy for at least 12 months. At each stage, the receipt of a properly completed trip-ticket is a condition for acceptance of the waste. In addition, the waste collector and reception point manager should send regular returns to EPD in the specified format as required under the waste collection and waste disposal licences respectively. Further details of the trip ticket system can be found in **A Guide to the Chemical Waste Control Scheme** published by EPD.

11. SAFETY EQUIPMENT AND PROCEDURES

■ If asbestos waste is packed in the approved containers as soon as it is produced, and handled and transported as recommended in this Code of Practice, there will be little risk of asbestos fibres being emitted. However, as a further precautionary measure, safety and emergency handing equipment should be carried on every delivery vehicle including -

- approved face masks for all workers.
- appropriate heavy duty rubber gloves.
- protective clothing.
- working shoes.
- spare containers/bags and seals.
- shovel.

- amended water (water mixed with wetting agents) in airless spraying equipment – about 50 L.
- emergency and first-aid kit.

The workers should wear the protective clothing and other safety equipment during all loading and unloading operations.

■ Immediate action must be taken to prevent asbestos fibres from being released to the air in the event of an accident during transportation, or at a disposal site, resulting in the bursting or splitting of containers and the release of asbestos waste. This is best done by immediately wetting the waste with amended water applied in a fine mist. Protective clothing, appropriate gloves, working shoes and an approved dust mask should be worn for this operation in order to prevent contamination of hair, skin and personal clothing. The gloves are used for protection against friction and abrasion during handling of drums as well as for prevention of contamination. The shovel and spare bags or drums together with seals carried on the vehicle are used for repacking and resealing the split waste. In case of extensive contamination of the environment, EPD should be notified immediately.

■ Contaminated vehicles should be thoroughly washed. The washings should be disposed of into the asbestos waste disposal trenches at the disposal sites. All contaminated equipment should be thoroughly washed before reuse. However, if they are difficult to clean, they should be treated as asbestos waste and placed in suitably labelled plastic bags for proper disposal.

■ Further advice on safety equipment and procedures may be obtained from the Labour Department or the Marine Department at the addresses shown in Appendix A. Advice on the legislative control under the Factories and Industrial Undertakings (Asbestos) Special Regulations 1986 may also be obtained from the Labour Department.

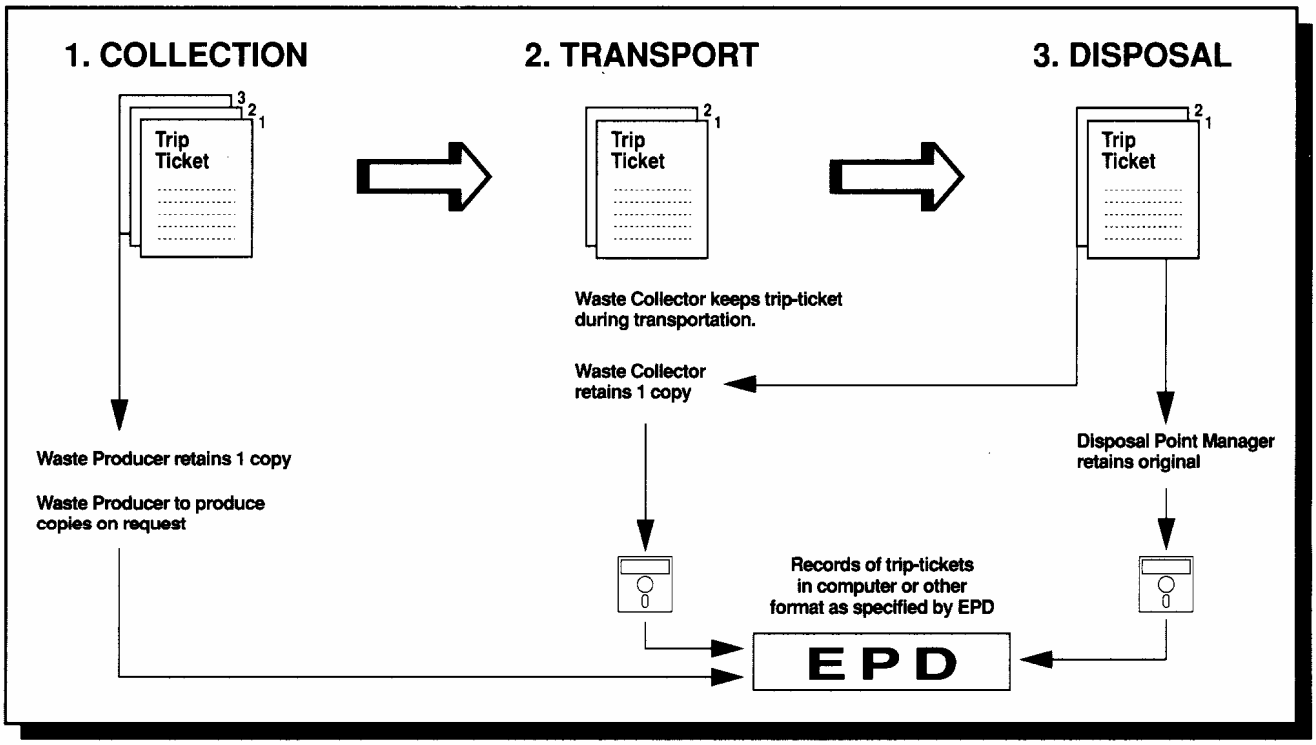


Figure 2 - The Trip-Ticket System for Tracking the Consignment of Chemical Waste

APPENDICES

CONTACT NAMES, ADDRESSES AND TELEPHONE NUMBERS

FOR ADVICE ON ASBESTOS REMOVAL

Territorial Control Group
Environmental Protection Department
24th Floor
Southorn Centre
130 Hennessy Road, Wanchai
Hong Kong
Telephone Contact: Asbestos Management and Control Section
2755 3554

FOR ADVICE ON PROCEDURES ON BOARD SHIPS AND FLOATING STURCTURES

Marine Department
Harbour Building, 23rd Floor
38 Pier Road
Central
Hong Kong
Telephone Contact: Marine Industrial Safety Section
2852 4477

FOR ADVICE ON SAFETY EQUIPMENT AND PROCEDURES AND THE LEGISLATIVE CONTROL ON INDUSTRIAL UNDERTAKINGS

Occupational Safety and Health Branch
Labour Department
25th floor, Western Harbour Centre,
181 Connaught Road West
Hong Kong
Telephone Contact: Advisory and Development Division
2559 2297

APPROVED PACKAGING, CONTAINERS AND LABELLING FOR ASBESTOS WASTE

TYPE A

Transparent plastic sheets of not less than 0.15 mm thickness are to be used for packing Type 1 asbestos waste. Inner plastic sheets should be white for bulky Type 2 waste and orange for bulky Type 3 waste, while the outer plastic sheets should be transparent for both types of waste.

TYPE B

Heavy duty polythene bags complying with the minimum standard prescribed in British Standard BS4932:1973 (Note 2) or equivalent are to be used for packing Types 2 and 3 asbestos waste. Inner bags should be white for Type 2 waste and orange for Type 3 waste while outer bags should be transparent for both types of waste.

The inner plastic sheet or inner bag must be clearly marked with indelible ink as follows -

For Type 1 or 2 asbestos waste:

DANGER CHEMICAL (ASBESTOS) WASTE
危險勿近 化學（石棉）廢物

DO NOT INHALE DUST
切勿吸入石棉塵埃

For Type 3 asbestos waste:

DANGER CHEMICAL (BLUE/BROWN ASBESTOS) WASTE
危險勿近 化學（青石棉或鐵石棉）廢物

DO NOT INHALE DUST
切勿吸入石棉塵埃

All letters and characters must be at least 50 mm high. The chemical waste label required under the Regulation shall also be attached (Figures 3 and 4). Figure 5 shows an example of a sheet or bag with markings and label. Information on suppliers of suitable bags is available from EPD at the address shown in the Preface.

NOTE 2: For quality control and assurance purposes, all the parameters specified in BS 4932: 1973 should be tested by an accredited laboratory.

Figure 3 - Chemical Waste Label for Type 1/2 Asbestos Waste Container

Figure 4 - Chemical Waste Label for Type 3 Asbestos Waste Container

APPROVED PACKAGING, CONTAINERS AND LABELLING FOR ASBESTOS WASTE

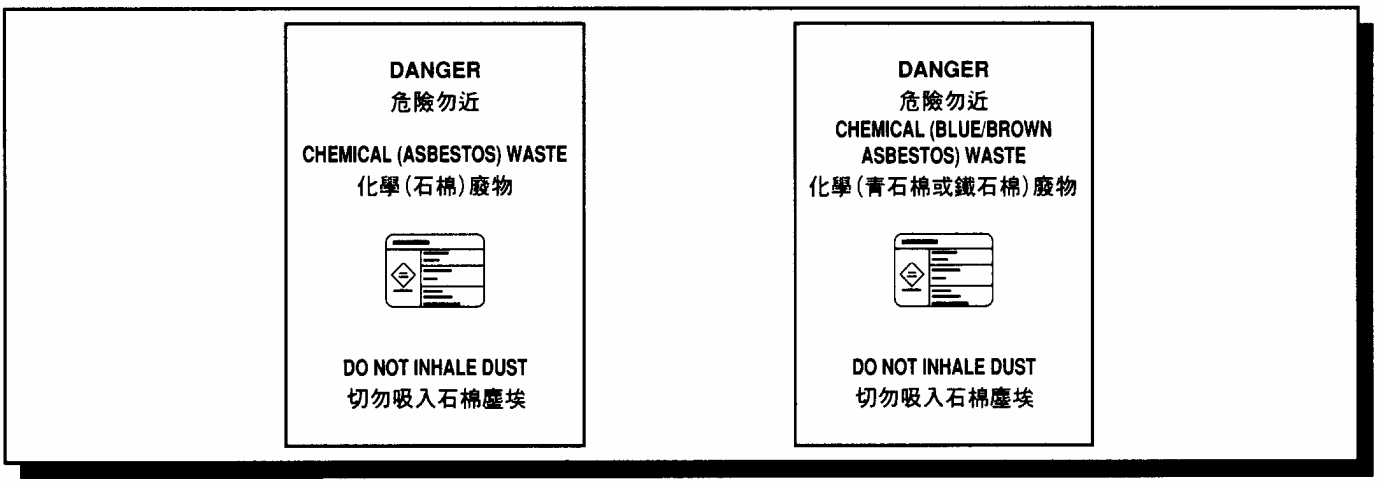


Figure 5 - Plastic Sheet and/or Polythene Bag with Appropriate Markings and Label

TYPE C

In some cases, particularly where the asbestos waste is wet or heavy, bags may not be approporiate and drums should be used. They should conform to the British Standard for mild steel drums (light duty : removable heads), BS 2003 : October 1974. These drums are of the full aperture type and the lids may be secured with latch, lever, or nut and bolt closures. Figure 6 shows examples of drums with appropriate markings and labels, and typical closures.

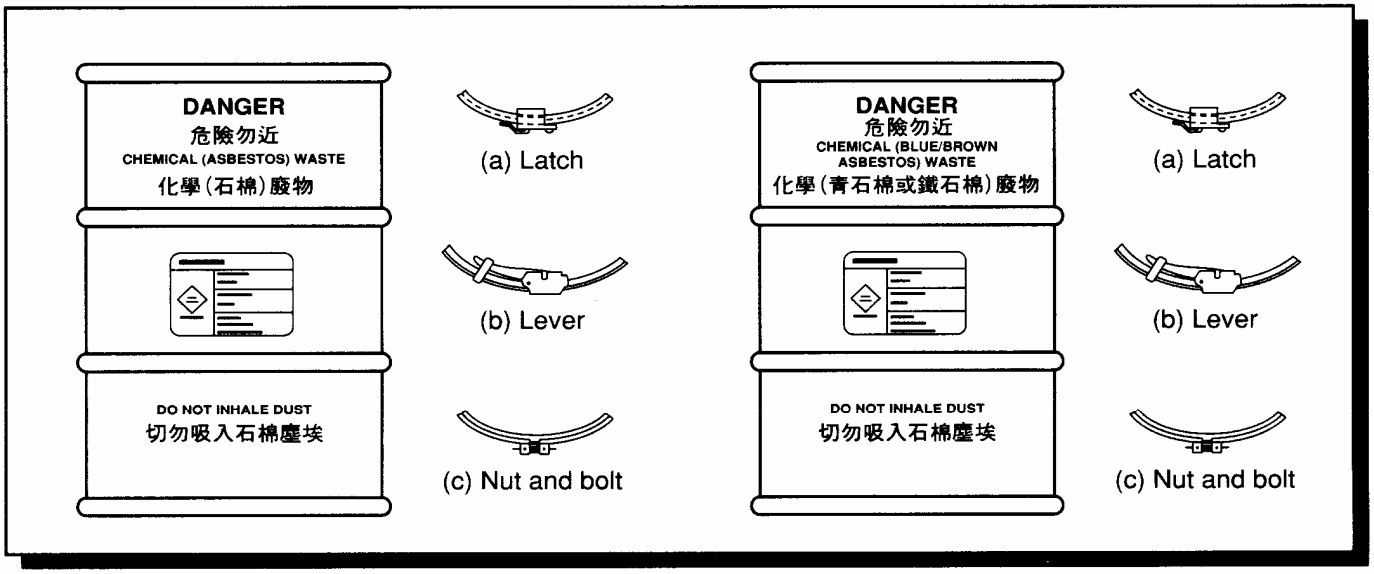


Figure 6 - Full Aperture Drum with Typical Closures and Labels

NOTES ON THE HAZARD WARNING PANEL FOR VEHICLE

One of the two versions (Version A and Version B) of the hazard warning panel as shown in Figure 7 should be displayed at the front and rear of the vehicle in a position that does not conceal any lights, licence plates or other legally required signs or markings. Both versions are acceptable, and the choice is mainly governed by the space available for the sign.

Specifications :

1. Material: aluminium plate (1.6 mm)
2. Finish: reflective background
3. Retro reflective materal: class 2, BS 873
4. Colours: the colour of the sign face sheet material, sign face material or finish shall be as follows:

Border	Black
Background	Yellow
Characters, Letters	Black

5. All sign face sheet material, sign face material, edge sealant, clear coat lacquers and silk screen inks used shall be mutually compatible.
6. Size: Letters (Height ≧ 60 mm)
   Characters (Height ≧ 60 mm)

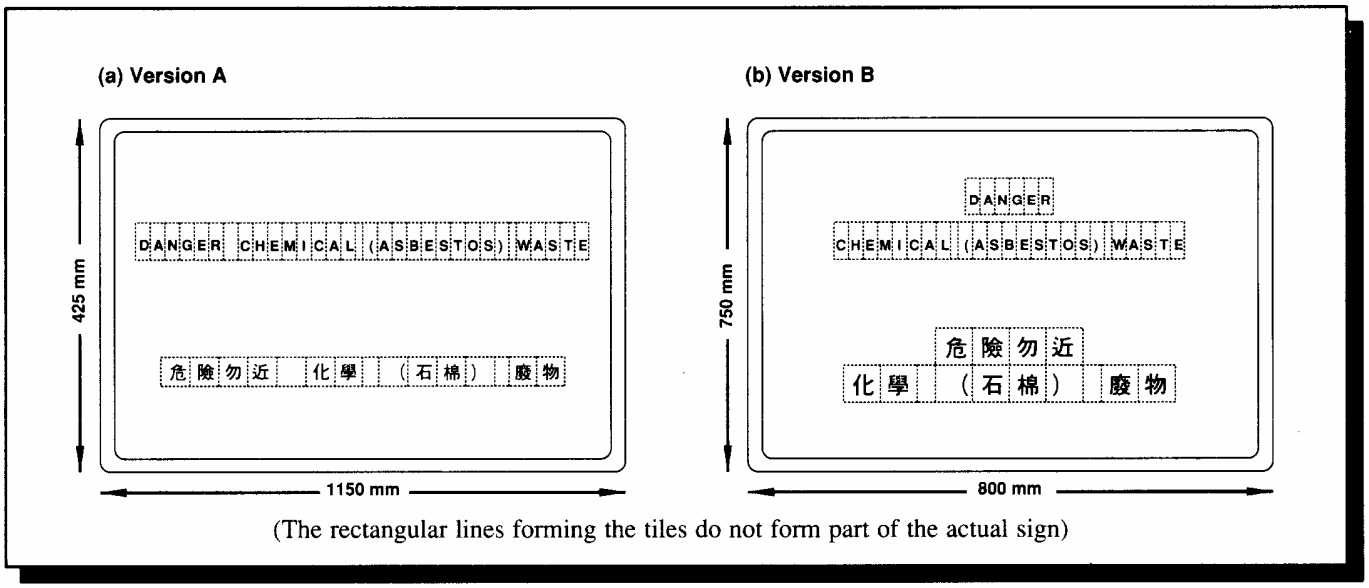


Figure 7 - Hazard Warning Panels for Vehicle

NOTIFICATION FORM

Environmental Protection Department
環 境 保 護 署
Waste Disposal Ordinance (Chapter 354)
香港法例第 354 章廢物處置條例
Notification under Section 17 for 'Part A' Chemical Wastes
根據條例第 17 條的規定呈報指定（甲類）化學廢物通知書

For Official Use 本欄不用填寫
Reference No. 編號：

A. WASTE PRODUCER（廢物產生者）
Full Name (全名) : _____ Waste Producer No. (廢物產生者編號) : ⌊⌊⌊⌊⌋-⌊⌊⌊⌋-⌊⌊⌊⌊⌊⌋-⌊⌊⌋
Address for Correspondence (通訊地址) : _____
Tel. No. (電話) : _____

B. LOCATION OR PREMISES WHERE THE WASTE IS PRODUCED（產生廢物的地點或樓宇）
Name of Establishment (機構名稱) : _____
Major chemical waste type(s) (主要化學廢物種類) : _____
Address (地址) : _____
Tel. No. (電話) : _____ Nature of Business (業務性質) : _____
Full Name of Contact Person (聯絡人全名) : _____ Capacity (職位) : _____

C. ACTIVITY OR PROCESS WHICH PRODUCES 'PART A' CHEMICAL WASTE(S)
（產生甲類廢物機構經營的主要業務）
Brief description of the activity(ies) or process(es). Attach flowchart or diagram if necessary.
簡介指定（甲類）化學廢物的生產工序，可附上有關流程圖或圖解。

D. WASTE DESCRIPTION（廢物的描述）
List all 'PART A' chemical wastes which are produced at the above location or premises and which are intended for disposal. Please also indicate the frequency of production and estimated quantity for disposal.
詳列上述地點或樓宇產生的及擬予棄置的所有甲類化學廢物。請同時說明其生產的頻率及估計要棄置的數量。

(* State the appropriate one 選擇適用者)

Waste Type / Chemical Name (廢物種類 / 化學名稱)	Waste Code (廢物代號)	Previous Notification (先前的通知書) Y* 有 / N 否	Reference No. (編號)	Dangerous Goods (危險物品) Y* 有 / N 否	Category (類別)	Physical Form (廢物形態) Solid 固體, Liquid 液體, Sludge 污泥, Others 其他	Frequency of Waste Production (廢物產生的頻率)	Estimated Quantity for Disposal (估計要棄置的數量) (L or Kg)* (升或公斤)	
1.	⌊⌊⌊⌊⌊⌋								L 升 / Kg 公斤
2.	⌊⌊⌊⌊⌊⌋								L 升 / Kg 公斤
3.	⌊⌊⌊⌊⌊⌋								L 升 / Kg 公斤
4.	⌊⌊⌊⌊⌊⌋								L 升 / Kg 公斤

E. PROPOSED DISPOSAL ARRANGEMENT（處理廢物的方法）
Describe briefly any on-site treatment or other disposal arrangement for each waste type set out in D.
簡述在原址處理及其他棄置 D 欄內各廢物種類之辦法。

F. REMARKS（註譯）(Include any additional information for safe handling of the waste(s) 填上其他附加資料以確保廢物的安全處理）

G. DECLARATION（聲明）
I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief.
特此證明，就本人所知及所信，表格內填報的資料全屬真實無訛。

Signature (簽署) _____ Name in Block Letters (正楷姓名) _____ Capacity (職位) _____

* on behalf of
代表 : _____
Company Name and Chop as appropriate (公司名稱及印鑑) (如適用者) _____ Date (日期) _____

WARNING : Any person(s) who fails to give notice to the Director of Environmental Protection as required under Section 17 of the Waste Disposal Ordinance commits an offence punishable with a maximum fine of $100,000 for the first offence, and a maximum fine of $200,000 and 6 months' imprisonment for a second or subsequent offence.

警 告 : 任何人士若不按廢物處置條例第十七條的規定通知環境保護署署長，即屬違法，初犯者最高可被判罰款港幣十萬元，次犯及其後再犯最高可被判罰款港幣二十萬元及監禁六個月。

EPD 132

HK ELECTRIC - GENERATION DIVISION
RISK ASSESSMENT REPORT FOR HANDLING OF EXEMPTED ASBESTOS CONTAINING MATERIALS

Ref: _____

Part 1	Section:	Date of Assessment:
	Assessor:	Work Order No.:
Part 2	(1) The type of work and materials containing asbestos involved: _____	
	(2) Details of the expected exposure 2.1 Duration of exposure to asbestos _____ 2.2 Whether the exposure is liable to exceed the control limit and the number of workmen affected _____ _____ 2.3 Whether the exposure is liable to exceed the action limit and the number of workmen affected _____ _____	
	(3) Control measures to be applied to prevent or reduce exposure to the lowest possible level, such as suppression of dust at source, wetting by application of amended water (polyoxyethylene ester and polyoxyethylene ether mixture in water), partial enclosure with dust extraction, etc. _____ _____ _____ _____	

	(4) The choice, provision and use of respiratory protective equipment Requirement of protective equipment: Type of respirator to be provided (_____)
	(5) Determination of any on-going monitoring requirements _____ _____ _____ _____ _____
	(6) The procedure for dealing with emergencies _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

LAMMA POWER STATION

CHECKLIST FOR WORK INVOLVING EXEMPTED ASBESTOS CONTAINING MATERIALS

Part A

Section: _____

Relevant Work Order No: _____

Location of work : _____

Scope of work:_____

_____

No. of trained workers required: _____

Frequency and duration of exposure to asbestos: _____

Part B

		(Put a tick in the square where appropriate)
B1	Only exempted asbestos product is handled. Please refer to APCO (asbestos) Ordinance (Chapter 311) and Gazette No.25/1997 – G.N.3021 and G.N.3022 which is available in Lotus Notes (Environmental Document and Divisional Environmental Working Instruction database) [Note: **Work shall not proceed further if other type of asbestos product is involved.**]	☐
B2	Type of ACM product has been checked: (a) Non-woven non-friable asbestos gasket/resinated asbestos gasket ☐ (b) Asbestos packing ☐ (c) Non-friable asbestos friction product ☐	☐
B3	Risk assessment Report (ref. _____ dated _____)	☐
B4	All the following precautionary measures/tools have been prepared: (a) Dust suppression by Amended water (b) Dust removal by HEPA filter-equipped vacuum cleaner (c) Approved asbestos waste bag (d) Prevention of spread of asbestos by containment method ☐/glove bag method ☐ (e) Condon off the working area and display of warning notice for Asbestos work	☐
B5	Medical record have been checked: (a) Worker employed in working with asbestos has within the 4 months immediately preceding the commencement of such employment undergone a radiographic examination of his chest and is certified by a registered medical practitioner to be fit to do such work. (b) At intervals of not more than 12 months every person employed in working with asbestos shall undergo a radiographic examination of his chest and is certified by a registered medical practitioner to be fit to do such work.	☐

B6	All the following Personal Protective Equipment (PPE) have been provided: (a) Approved respiratory protective equipment (b) Approved clothing (c) Impact type goggles (d) Safety glove (e) Others, please state _____	☐
B7	All the following procedures have been prepared: (a) Working instruction for the ACM work (ref. _____) (b) Procedure for removal of waste from work area (ref. _____) (c) Procedure for dealing emergency (ref._____)	☐
B8	Asbestos waste submitted to CHEM on _____with ref. _____	☐

Remarks:

Approved by: _____

Signature

Name:_____

Date:_____

Code of Practice on Asbestos Control

Safe Handling of Low Risk Asbestos Containing Material

Issued by the Secretary for the Environment
Under Section 37 of the Air Pollution Control Ordinance (CAP 311)

<PREFACE>

The Code of Practice on Asbestos Control, in four sets, is issued by the Secretary for the Environment, Transport and Works under Section 37 of the Air Pollution Control Ordinance (Chapter 311) after consultation with the Advisory Council on the Environment. It provides advice on matters relating to asbestos control to registered asbestos consultants, registered asbestos contractors, registered asbestos supervisors and registered asbestos laboratories registered in the relevant registers kept and maintained by the Authority under Section 51 of the Ordinance.

The four sets of Codes of Practice provide advice on matters relating to:

1) preparation of asbestos investigation report, asbestos management plan and asbestos abatement plan;
2) asbestos work using full containment or mini containment method;
3) asbestos work using glove bag method; and
4) safe handling of low risk asbestos containing material.

Although these Codes of Practice are not legally binding, compliance with the advice given could be used as evidence of good practice in the course of disciplinary and legal proceedings. It should be noted that the guidance given in these Codes is believed to be the best practice at the time of publication. With advancement in technology and with more experience, it is conceivable that these Codes may require amendment in the future to incorporate new developments. Registered personnel are therefore encouraged to adopt prevailing standards and control measures if such standards are higher than those given in these Codes, and if such control measures are more effective in controlling environmental asbestos.

For enquiries, please contact:

Environmental Protection Department
24/F, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong.

Tel: 2755 3554 Fax: 2834 9960

CONTENTS

1 Introduction

1.1 This Code of Practice provides guidance and advice to registered asbestos consultants, contractors, supervisors and laboratories on safe handling of low risk asbestos containing material.

1.2 Low risk asbestos containing materials means cementitious, resinated, plastic and bituminous asbestos containing materials which are non-friable in nature, that is, when dry, the material cannot be crumbled, pulverized or reduced to powder by hand pressure. Asbestos fibres in these materials are generally locked into the base material matrix, therefore, under normal usage or handling, the quantity of asbestos fibres that can be released, if any, should be insignificant to present a health risk. Examples of low risk asbestos containing materials are: corrugated asbestos cement sheet, cement piping, cement building fabrics, resinated gasket, pump and valve gland packings, friction product, resilient floor covering, and asphalt roofing felt.

1.3 Because of the relatively low risk involved, containment method is normally not necessary for removal of low risk asbestos containing materials if adequate precautionary measures as described below are taken to suppress dust release. However, if the low risk asbestos containing material is in poor condition, or has a high probability of becoming crumbled, pulverized, or reduced to powder by forces expected to act on the material in the course of removal operation, more stringent precautionary measures should be adopted.

1.4 The measures and procedures described in this Code are the minimum requirements necessary for safeguarding the environment and the health of occupants of areas where asbestos abatement work has been carried out. Additional precautionary measures may be necessary for certain operations and this Code should not be interpreted as precluding the adoption of such measures. The requirements of the Factories and Industrial Undertakings Ordinance for worker safety are particularly relevant in this regard.

2 Materials and Equipment

2.1 The materials and equipment used should conform to the following:

- For preparation of work area, transparent plastic sheets of 0.15mm thickness manufactured from extruded low-density polythene to B.S. 4932:1973 or equivalent, in sizes to minimize the frequency of joints, should be employed.

- Duct tape, foam agent and spray adhesive should be capable of sealing joints of adjacent sheets of polythene, facilitating attachment of polythene sheets to finished and unfinished surfaces, and adhering under both wet and dry conditions, including during the use of amended water.

- Wetting agent for preparing amended water to enhance penetration should be 50% polyoxyethylene ester and 50% polyoxyethylene ether or equivalent, and diluted to a specific concentration in accordance with the manufacturer's instructions.

- HEPA-filtered appliance means an appliance such as an air mover or a vacuum cleaner fitted with a high efficiency particulate air filter capable of trapping and retaining 99.97% of particles (asbestos fibres) greater than 0.3μm mass median aerodynamic equivalent diameter.

- Water-based polyvinyl acetate (PVA) adhesives for spraying onto exposed surfaces during final clean-up of work area should be able to bind traces of asbestos that may still be on the exposed surfaces. The adhesives should be dyed, say red, to indicate where (and whether) they have been applied to facilitate cross-checking at a later stage.

- Polythene sheet, transparent or colour-coded bags and containers used for packing of asbestos waste should meet the specifications given in the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste issued by the Secretary for the Environment, Transport and Works.

- Respiratory protective equipment and protective clothing used for asbestos abatement work should comply with the requirements of the Factories and Industrial Undertakings (Asbestos) Regulation enforced by the Labour Department.

- Joints and ends of ladders and scaffolds used in the contaminated work area should be sealed with tape to prevent incursion of asbestos fibres.

- Portable water sprayer for applying amended water in a fine mist should be of airless type and with capacity of 10 to 20 litres.

2.2 Documentary proof on the safety and specifications of the above materials and equipment may be required for submission to the Authority for endorsement.

3 Site Preparation

3.1 The proposed work area, that is, the area containing asbestos containing materials to be worked on or removed, should be vacated prior to any site preparation work. Warning notices in English and Chinese (see Appendix 1) should be displayed outside the segregated area in a conspicuous place on the first day of site possession and should remain posted until work acceptance test is satisfactorily concluded.

3.2 A designated secure place outside the work area should be identified solely for transit storage of bagged asbestos wastes. This place should bear adequate warning notices and particular attention should be given to maintain good fire safety measures.

4 Decontamination Facility

4.1 For work area larger than $15m^2$, a 3-chamber decontamination unit should be constructed to provide safe access and egress for authorised working personnel, and for the exit of bagged asbestos wastes and equipment in special circumstances when the provision of a separate debris port is not possible. A reduced, 1-chamber decontamination unit may be acceptable for asbestos abatement work of a smaller scale. Also, depending on the size of the job and its proximity to other occupants of the premises, an induced draught ventilation system may be required for the decontamination unit by fitting a HEPA-filtered air mover at the dirty end of the unit.

4.2 Construction details of a decontamination unit are as follows.

- The decontamination unit will consist of three sealable compartments of progressively lower fibre burden, namely the dirty room, the shower room and the clean room. Each compartment should have a minimum size of 2m (height) x 1m (width) x 1m (length). Floor area of the shower room should be $1m^2$ for every shower head provided.

- The unit may either be of a prefabricated design which should have been thoroughly cleaned and decontaminated before re-use, or be constructed on site with 3 individual layers of plastic sheet with sealed taped joints supported on suitable framing.

- Each compartment should be separated by a curtained doorway consisting of a polythene sheet with an I-shaped slit opening covered by a plastic flap which hangs and lifts in the direction of access. The plastic flap should have an

overlap of at least 100mm on each side of the slit opening and be weighted at the bottom.

- The shower room should be constructed and tested against water leakage and fitted with a tray of adequate size to collect waste water. Hot and cold water adjustable at the shower should be provided at a minimum of one shower head per 6 workers calculated on the basis of the largest shift. All waste water should be taken by a sump pump through pipework and hosing to an aquarium type filter unit to remove suspended particles down to 5μm before being discharged to covered soil drainage system or drummed and then properly disposed. The sump pump should be switched on while the facility is in use to prevent overflow of waste water. The electrical fittings and installations should be so installed and protected as to eliminate any possibility of electrocution.

- The shower room should be wet cleaned and HEPA vacuumed before each shift change and meal break.

- Correct procedures for entering and leaving each compartment are summarised in Appendix 2. A warning sign to approved details as given in Appendix 3 should be posted at eye level at the clean entrance of the unit.

4.3 Where practicable, a separate, 2-chamber debris port consisting of a clean room and a washing room fitted with cold water supply and waste water filtration facility should be constructed for controlled transfer of bagged wastes and equipment. Each compartment should have a minimum size of 2m (height) x 1m (width) x 1m (length). This debris port is normally sealed and used only during the period of active waste and equipment transfer. A warning sign (see Appendix 3) should be posted conspicuously at the entrance of the clean end.

4.4 The procedures for waste and equipment transfer are as follows:

- Before entering the debris port, external surface of the bagged waste or the bagged equipment should be cleaned by HEPA vacuuming and wet-wiping in the work area. The bag should be further decontaminated in the washing room by ‘flushing' with a fine water spray followed by wet-wiping. Worker in the clean room, who should have entered from the uncontaminated side wearing appropriate respirator, gloves and protective clothing, should receive the bag in a 0.15mm thick transparent plastic bag which should then be vacuum packed and goose-neck sealed with tape. The doubled bagged waste should be

transferred immediately to the waste transit store and should not be stacked more than 3 bags high.

- Worker in the clean room must not enter the washing room. Upon completion of work, he should discard his protective clothing and gloves as contaminated waste and exit by the clean room.

- The washing room should be wet cleaned twice using amended water upon completion of waste and equipment transfer. When the main decontamination unit alternates as a debris port, the shower room should be washed immediately with cloth saturated with a detergent solution prior to wet cleaning.

5 Preliminary Decontamination

5.1 Prior to masking the work area with plastic sheet, the area should be pre-cleaned using HEPA-filtered vacuum cleaner and wet-wiping method. Fixed objects which remain within the work area should be cleaned and sealed with 2 layers of plastic sheet to protect them from re-contamination.

5.2 After the preliminary decontamination work and a visual inspection by the registered asbestos contractor to verify that the area is uncontaminated, the floor up to at least 1.5m away from the activities should be covered with 2 individual layers of plastic sheet of 0.15mm thickness which should extend, where appropriate, at least 300mm up and be sealed to the wall with adhesive tapes. All wall openings such as windows should be covered and sealed with 2 layers of plastic sheet. For removal of asbestos floor covering, floor sheet will not be required but a continuous 1m high dust barrier sealed to the floor should be constructed around the work area.

5.3 For asbestos removal work on roof of building, tarpaulin windscreen of at least 2m high should be erected around the work area.

6 Asbestos Removal

6.1 All workers should put on approved respirators and full-body protective clothing with hoods and shoe covers. Only non-powered hand tools should be used. Extreme care should be exercised in handling the asbestos containing material to reduce breakage to a minimum. The asbestos containing material should be kept wet throughout by generous application of amended water in a fine mist.

6.2 For removal of corrugated asbestos cement roofing sheets covered with a layer of concrete screeding, the roofing sheets should be separated carefully into manageable sizes for easy handling and packaging for disposal. This should be done by manually chiselling the concrete screeding along the joints of the cement sheets or along a convenient line for separating the cement sheets before taking down the cement sheets with the concrete screeding intact. All debris of concrete screeding so produced should be bagged immediately and disposed of as asbestos waste.

6.3 For removal of asbestos containing vinyl floor tiles, individual tiles should be lifted by scraping manually at the base. The underlying mastic adhesives, which may also contain asbestos, and any adhering remnant of tiles should be completely removed from the floor slab by manual scraping. Alternatively, chemical mastic removers of proven safe formula may be used.

6.4 A portable enclosure constructed with wood strut framing and two layers of plastic sheets may be used for removal of asbestos cement insulation tiles on roof of building if excessive breaking of the tiles cannot be avoided during removal.

6.5 It is important that debris is not allowed to lie around where it may be further broken or crushed. It should be cleared as soon as possible and certainly before the end of each work shift. All debris should be packed, labelled and disposed of in accordance with the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste.

6.6 All personnel, tools, instrument and bagged wastes leaving the work area should be thoroughly decontaminated in the decontamination unit to a condition of no visible debris.

7 Acceptance of Work

7.1 Upon completion of the asbestos removal work, all surfaces in the work area should be cleaned by suitable dustless method such as HEPA vacuuming and wet-wiping.

7.2 The registered asbestos contractor should then perform a thorough visual inspection to ensure that any debris in the form of contaminated items, dust, chips or untreated effluent has been cleared from the work area. A reassurance air test should be carried out by a registered asbestos laboratory and the test should have at least two samples, unless the volume of the enclosed work area is less than $10m^3$ when only one sample would suffice. With that overriding condition, the number of samples required should be at least the whole number next below $(\sqrt[3]{A} - 1)$, where A is determined as follows:

- If the enclosed work area is less than 3m high, or if the enclosed work area is in open space where exposure is only likely to be at ground level, A is the area of the enclosed work area in square metres.

- In other cases A is one third of the volume of the enclosed work area in cubic metres. If there are large items in the work area, their volume may be subtracted from the gross volume before calculating A.

7.3 Sampling should be carried out only after a thorough visual inspection of the work area to establish that it is clean, dry and free from any visible debris. Aggressive sampling techniques should be used to agitate any dust deposit that may be present inside the work area.

7.4 Reassurance air testing is considered satisfactory only when every collected sample is less than 0.01 fibre/ml as determined by phase contrast microscopy. Each homogeneous work area which does not meet this criterion should be thoroughly recleaned using HEPA-filtered vacuum cleaner and wet-wiping method. This process should be repeated until the work area passes the reassurance air test.

7.5 When satisfactory reassurance air test results are attained, all used plastic sheets should be sprayed with PVA, allowed to dry and then disposed of as contaminated wastes in accordance with the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste.

8 Emergency Procedures

8.1 Emergency procedures are site specific and prior assessment of the work area is important in developing suitable procedures to cater for emergencies such as fire, explosion, vandalism, typhoon, and accidents due to slips, trips and falls, working in confined space, electrical hazard, heat stress and exhaustion. All instructions should be brief and concise and should include a layout plan of the work site indicating the location of fire extinguishing equipment and means of escape. The procedures in a written form in both English and Chinese should be posted conspicuously at the entrance of the work area and read and understood by all working personnel.

8.2 If during the course of asbestos abatement work, a worker collapses or some other accidents occur, the victim should follow normal decontamination procedures with assistance from fellow workers before exiting the work area. For life-threatening situations, however, decontamination should take a lower priority and every effort

should be made to ensure the victim receives immediate medical treatment. Any area contaminated during the emergency should be thoroughly cleaned by wet wiping and HEPA vacuuming at the earliest opportunity, and verified by the registered asbestos supervisor before work is allowed to continue.

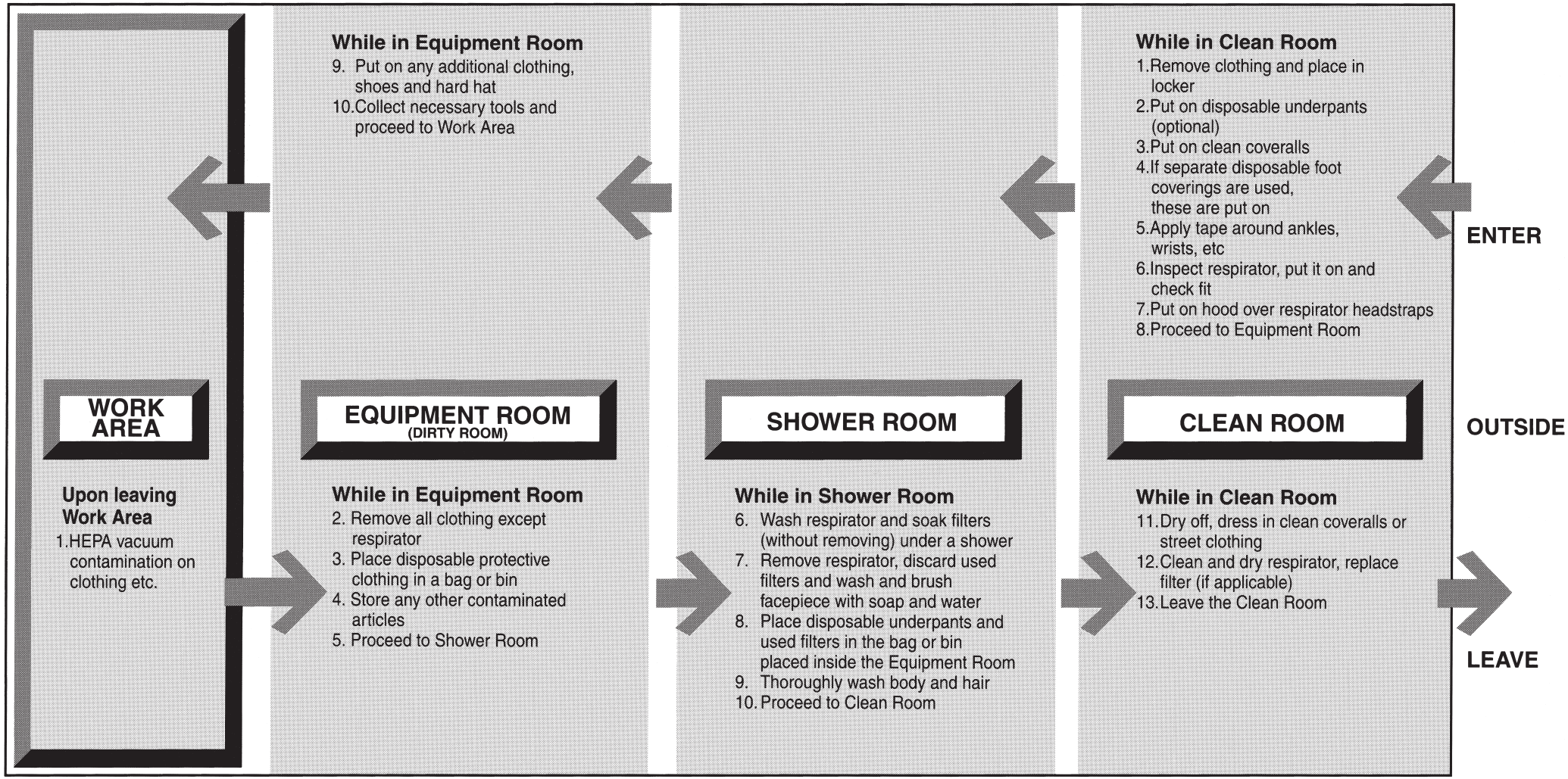
Warning Notice for Posting Outside the Work Site

Specification

The Warning Notice should comprise both warning signs and explanatory labels.

1. Material: Durable, weather-resistant and rigid on a vertical plane outside the work site.
2. Colour:
   (a) For 'DANGER' sign
   Sign: Black lines on yellow background
   Label: Black letters and characters on yellow background
   (b) For 'No unauthorized entry' sign
   Sign: Red lines on white background with the figure in black
   Label: White letters and characters on red background
3. Size:
   Height of sign - Not less than 120mm
   Height of capital letters - Not less than 25mm
   Height of Chinese characters - Not less than 35mm

PROCEDURES FOR ENTERING AND LEAVING DECONTAMINATION UNIT



Facilities:

EQUIPMENT ROOM
(DIRTY ROOM)

*Shelves for additional clothing/ personal protective equipment/boots/tools
*Waste bag/bin for used protective clothing, respirator filters and underpants

SHOWER ROOM

*Cold and hot shower with holder for shower head
*Tray fitted with waste water filtration system
*Liquid soap and shampoo
*Nail brush

CLEAN ROOM

*Mirror
*Storage rack for clean respirator/ protective clothing/towels/shoecovers/ gloves/duct tape
*Locker for personal belonging

Warning Notice for Posting at the Entrance of Decontamination Unit

Specification

The Warning Notice should comprise both warning signs and explanatory labels.

1. Material: Durable, weather-resistant and rigid on a vertical plane at the entrance of the decontamination unit.
2. Colour:
   (a) For 'DANGER' sign
   Sign: Black lines on yellow background
   Label: Black letters and characters on yellow background
   (b) For 'No unauthorized entry' sign
   Sign: Red lines on white background with the figure in black
   Label: White letters and characters on red background
   (c) For 'Wear approved respirator' and 'Wear protective clothing' signs
   Sign: White sign on blue background
   Label: White letters and characters on blue background
3. Size: Height of sign - Not less than 80mm
   Height of capital letters - Not less than 25mm
   Height of Chinese characters - Not less than 30mm

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