

Code of Practice on Asbestos Control

Asbestos Work Using Glove Bag Method

**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

	Page
1 Introduction.....	1
2 Materials and Equipment.....	1
3 Limitations of Glove Bag Method	3
4 Site Preparation and Preliminary Decontamination.....	4
5 Air Monitoring.....	6
6 Asbestos Removal.....	6
7 Acceptance of Work	8
8 Emergency Procedures.....	8
Appendix 1 Warning notice for posting outside the work site	
Appendix 2 Procedures for entering and leaving decontamination unit	
Appendix 3 Warning notice for posting at entrance of decontamination unit	

1 Introduction

- 1.1 This Code of Practice provides guidance and advice to registered asbestos consultants, contractors, supervisors and laboratories on asbestos work using glove bag method.
- 1.2 The glove bag method for removing asbestos pipe insulation is widely accepted within the asbestos industry as an asbestos abatement technique for small-scale and short duration works. It has the advantage of allowing workers to remain totally segregated from the asbestos containing material being removed. It is ideal for handling small sections of piping, valves, joints, elbows, flanges, and other non-planar surfaces allowing asbestos containing insulation and lagging to be removed whilst minimizing the chance of asbestos fibres becoming airborne.
- 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.
- 1.4 The need for the worker to be properly trained in the use of glove bag before commencement of work is of great importance. It is the duty of the registered asbestos contractor to ensure that formal training is given to the worker and that knowledgeable and close supervision is provided to monitor quality of work and to ensure the worker does not take shortcuts.

2 Materials and Equipment

- 2.1 The materials and equipment used during asbestos abatement activities should conform to the following.
 - Only commercial grade glove bags of proven design shall be used. Glove bags are available in different sizes and designs (e.g. for use on vertical pipes) but they normally consist of the following features:
 - 0.15 to 0.30mm thickness transparent PVC or polythene bag open at the top with shoulders.
 - heat sealed seams attaching to glove bag two inward-projecting long-sleeve gloves, one inward-projecting water sprayer access sleeve and an internal tool pouch.

- zippers to seal top flaps of glove bag.
- nylon straps to seal both shoulders of glove bag to pipe or insulation.
- 'zip-lock' feature to seal lower part of glove bag from top portion.
- Tools used inside a glove bag should be non-powered and so designed that the likelihood of puncturing or cutting the bag is minimized. For example, a knife used inside a glove bag should have a retractable blade; a saw used inside should be the flexible wire type; and a brush should not have metal bristles. Clean rags for final clean-up of the pipe surface should be protected in a sealable bag to curb cross-contamination inside the glove bag.
- For construction of temporary partitions, 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 $0.3\mu\text{m}$ mass median aerodynamic equivalent diameter.
- 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.

- 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 Limitations of Glove Bag Method

- 3.1 Glove bags should not be used where the surface temperature of pipes exceeds 65 degree Celsius or when pipe insulation is in such a poor condition that a glove bag cannot be fixed to the surface in a secure manner.
- 3.2 Glove bags should not be used to remove pipe insulation which has an aluminium cladding of thickness exceeding 0.51mm (24 gauge) or a steel cladding. For aluminium cladding of 0.51mm or less, the following must be satisfied to ensure that the choice of glove bag method is acceptable:
 - The length of each section of the cladding does not exceed the length of the glove bag.
 - The cladding should be removed only after the glove bag has been attached to the pipe and sealed.
 - Any jagged or sharp edges which have been produced during the removal of the cladding should be handled in such a way so as to minimize the possibility of ripping or puncturing the glove bag.
- 3.3 Glove bags should never be shifted, moved, re-installed or re-used once contaminated with asbestos by the asbestos removal work. Repetitive use of the glove bag method on long pipe insulation for which full containment method would have been used is not permitted. As a general rule, one glove bag (of standard size) per room per day is the maximum acceptable for small-scale and short duration work.

4 Site Preparation and Preliminary Decontamination

- 4.1 The proposed work area (area containing asbestos containing material to be abated or worked on) should be vacated prior to any site preparation work. Warning notices in English and Chinese (see Appendix 1) should be displayed conspicuously outside the

work site on the first day of site possession and should remain posted until reassurance air testing is satisfactorily concluded.

- 4.2 If work is performed indoors, the work area should be isolated from the rest of the premises by walls or by erection of temporary partitions. Partitions should be constructed of wood strut framing or other material of sufficient strength (maximum spacing 400mm) to support one layer of plastic barrier sheet on the side facing the asbestos abatement activity, and taped at the floor, ceiling, walls, joints and fixtures to form an airtight barrier. A curtained doorway to give access to the work area should also be provided, consisting of a polythene sheet with an I-shaped slit opening covered by a plastic flap weighted at the bottom to maintain a good seal. All heating, ventilation and air-conditioning (HVAC) systems affecting the work area should be shut down and locked out. All HVAC openings in the area should be covered and tape sealed with polythene sheet.
- 4.3 Facilities for workers to wash hands and arms when leaving the work area should be arranged at the work area. Also, shower facilities (either portable or existing in premises) should be arranged for possible use by workers in the case of accidental contamination.
- 4.4 Where necessary, 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.
- 4.5 Debris of asbestos containing material should be removed by HEPA-vacuuming or wet wiping. Workers should wear appropriate respirators and depending on the extent of contamination, full-body protective clothing and a negative air pressure environment including a 3-chamber decontamination unit may be required.
- 4.6 The registered asbestos consultant will decide on the extent of provisions to be made and verify that preliminary decontamination has been satisfactorily completed. He should also decide whether a background air test is required.

4.7 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 1m² 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.

4.8 The floor of up to 1.5m from the asbestos abatement activity should be lined with 2 layers of polythene sheet to collect debris in the event of a spill due to rupture of glove bag. If the pipe insulation adjacent to the section to be worked on is damaged,

the adjacent section should be misted with amended water and then wrapped in 2 layers of polythene sheet and sealed airtight with duct tape.

5 Air Monitoring

5.1 The registered asbestos laboratory appointed to conduct background and reassurance (similar to final clearance) air tests should carry out the tests which should have at least two samples unless the volume of the enclosed work area is less than 10m³ 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 exposure is only likely to be at ground level inside the enclosed work area, 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.

5.2 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.

5.3 Background or 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 air test.

6 Asbestos Removal

6.1 Glove bag method for asbestos removal must be conducted by workers who are specifically trained in glove bag procedures. Personal protection equipment should include appropriate respirators and full-body protective clothing worn throughout the entire course of work. The pipework to be worked on should be checked to ensure the temperature is low enough and that services to the pipework in question have been shut down for worker safety. Friable asbestos containing material which would be disturbed or removed during the work should be thoroughly wetted with amended water before the glove bag is attached.

6.2 The procedures specified by the manufacturer for attaching the glove bag should be followed. As a rule, the diameter of the pipe insulation should not exceed one half the glove bag's working length above the gloves. If the glove bag is without zipper to seal the top flaps, doubled-sided tape (minimum 50mm wide) can be used to hold the top two flaps together, smoothly and without wrinkles or air pockets, and then the entire length of the tape should be stapled at intervals of approximately 100mm to ensure good seal across the top. The stapled top should then be folded back and taped down with a strip of duct tape. The shoulders of the glove bag should be attached over duct tape (minimum 75mm wide) which has been placed securely around the insulation forming a smooth seal. The shoulders should then be strapped around the pipe over the duct tape to make an airtight seal, using duct tape or the nylon straps provided. Enough slack to the top of the glove bag should exist to allow working fully around the pipe without stretching the glove bag or the seals. The nozzle of a water sprayer should be inserted through the access sleeve of the glove bag and tape sealed.

6.3 The integrity of the glove bag should be tested by a simple 'squeeze' test, that is, gently squeeze the glove bag and if it does not collapse, it is properly sealed. In case there is leakage and the leakage points cannot be located, a test using smoke tubes will be required. The nozzle of the water sprayer should be retrieved to allow contents of the smoke tubes to be injected into the glove bag. After replacing the spray nozzle in the access sleeve and proper sealing, the glove bag should again be squeezed gently to check for the leakage points which are then taped airtight.

6.4 The bottom of the glove bag should be supported to take the weight of any dislodged metal cladding and soaked insulation which can strain even a well constructed seal at the top. The asbestos containing material within the glove bag should be made thoroughly wet with amended water prior to stripping. Workers should work in pairs with one to accomplish removal while the other wets the asbestos containing material simultaneously at regular intervals. Care must be taken in handling any wire mesh holding the asbestos containing material to the pipe to avoid puncturing the glove bag.

6.5 After the insulation has been removed, the exposed pipework surfaces should be sprayed with amended water and brushed to remove all visible asbestos containing material. All reusable tools including the nozzle of the water sprayer should be wet cleaned and the interior of the glove bag washed down to collect all visible debris at the bottom. The enclosed volume of the glove bag should then be misted and sufficient time should be allowed for the mist to settle out. Any pipe insulation ends created by removal procedures should be sealed with suitable encapsulant and end caps prior to detaching the glove bag.

- 6.6 To recover the tools, the worker should grasp the items and pull through a glove insert, thus turning the glove inside out to form a new pouch with the tools in it. The glove is then twist sealed, taped and severed at mid-seal forming a separate bag to be immersed in a bucket of water for further cleaning.
- 6.7 The cleaned nozzle of the water sprayer should be retrieved and the opening of the access sleeve should be immediately covered with the nozzle of the HEPA vacuum cleaner to suck air out and collapse the glove bag (but be careful not to suck water into the vacuum cleaner). With the glove bag collapsed and the access sleeve twist sealed, the bottom part of the glove bag should be 'zip-locked' to contain the asbestos containing material collected there. Alternatively, the glove bag should be twisted several times and the 'neck' taped to seal the bottom part.
- 6.8 A colour-coded disposal bag should be slipped around the glove bag while it is still attached to the pipe. The glove bag should then be detached from the pipe by cutting across the top with blunt scissors and received in the disposal bag for further packaging in accordance with the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste. All exposed surfaces of pipe, flange and valve should be wet wiped once again and the work area thoroughly HEPA-vacuumed. All used protective clothing, polythene sheets and soiled clean-up materials should be disposed of properly as asbestos waste. Facilities for washing the hands and arms should be used by every worker leaving the work area and any soiled water should be disposed of as asbestos waste in sealable drums if no proper aquarium type filter unit (capable of removing suspended particles down to $5\mu\text{m}$) is available.

7 Acceptance of Work

The registered asbestos consultant should carry out a visual inspection to certify the absence of any visible asbestos debris and proper decontamination of hand tools and equipment. Upon approval by the registered asbestos consultant, all surfaces stripped of asbestos containing material should be encapsulated with a suitable sealing material. A reassurance air test should then proceed to confirm an air quality of no more than 0.01 fibre/ml is attained or else the work area should be re-cleaned and a further reassurance air test be carried out. Upon a satisfactory test result, all remaining plastic sheets and temporary partitions may be dismantled.

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 rupture

of glove bag, fire, explosion, vandalism, typhoon, bursting of pipe, 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 and approved by the registered asbestos consultant before work is allowed to continue.

Warning Notice for Posting Outside the Work Site

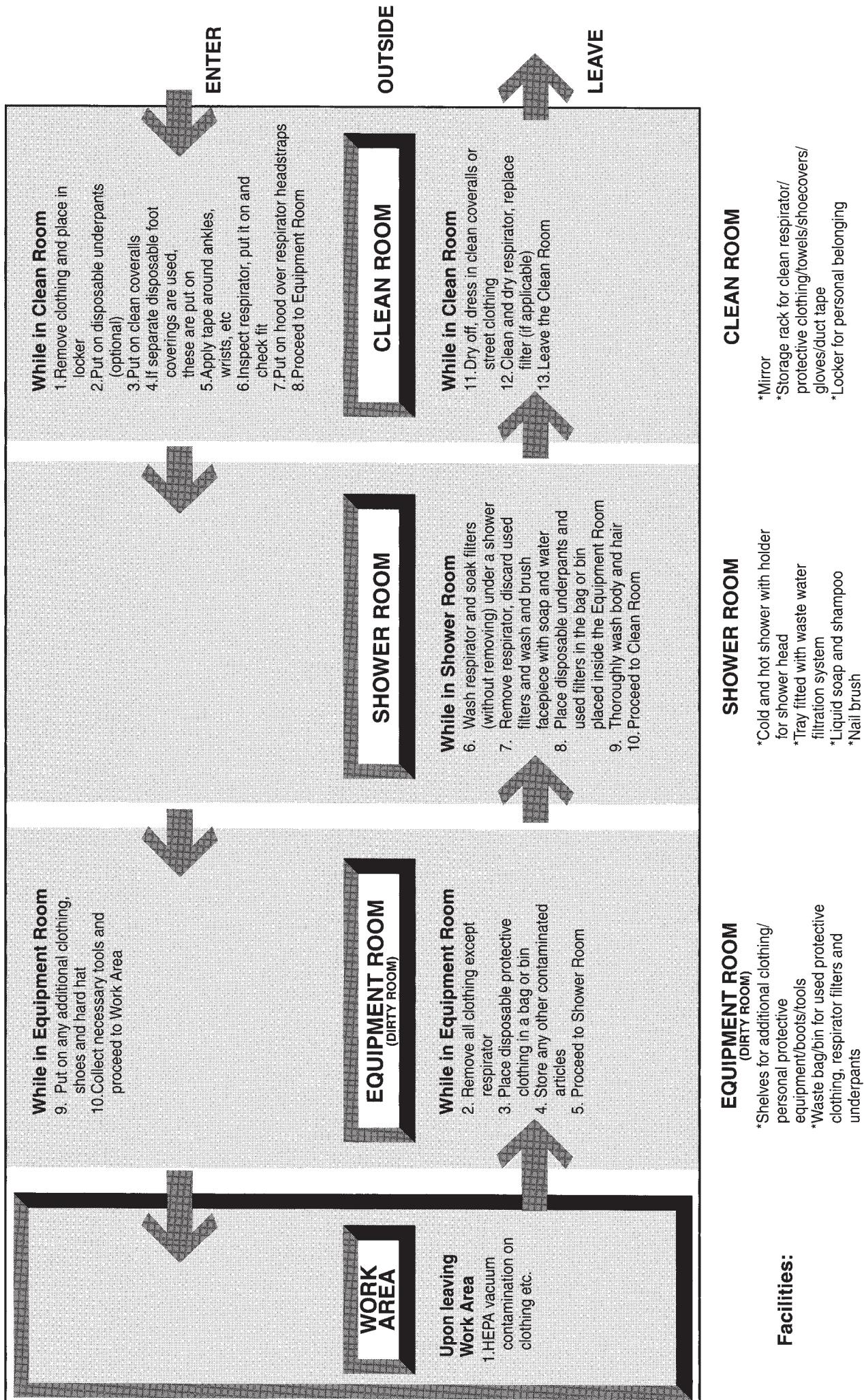


Specification

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



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