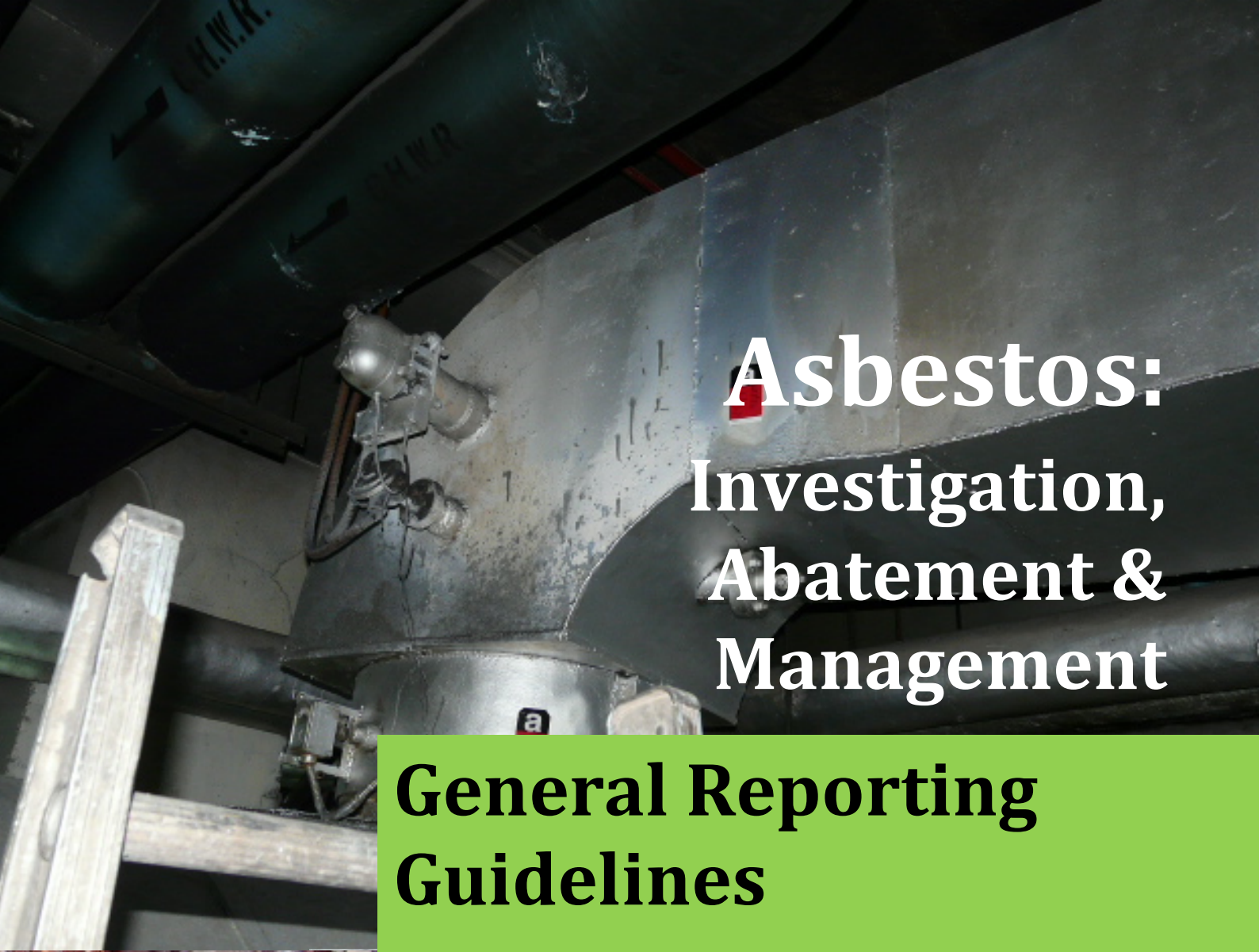

Asbestos: Investigation, Abatement & Management

General Reporting Guidelines

A supplementary guide to the Code of Practice on Preparation of Asbestos Investigation Report, Asbestos Abatement Plan and Asbestos Management Plan

Asbestos Management and Control Section
Environmental Protection Department

August 2015

Contents

Executive Summary

These guidelines have been produced as supplementary information to the Code of Practice (CoP) on Asbestos Control: Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan.

Since the implementation of the current asbestos control measures in 1997 (Air Pollution Control Ordinance (APCO), CAP311) a lot of experience has been gained in the identification, management and abatement of the various asbestos containing materials (ACMs) that occur in Hong Kong. This experience in handling of various types of ACM has been used to produce these supplementary guidelines.

The primary purpose of the guidelines is to provide Registered Asbestos Consultants (RAC) with additional resources to plan and implement comprehensive asbestos investigation and produce asbestos investigation reports (AIR), asbestos abatement plans (AAP) and asbestos management plans (AMP) which readily meet the requirements under the APCO and the corresponding CoP.

Secondly, the guidelines will enable building owners and other parties who have to use AIR, AAP and AMP to better understand the process and what to expect from specialist companies undertaking asbestos works.

The format of the guidelines is to provide advice and recommend good practice in the following three procedures:

Part One - Preparation of Asbestos Investigation Report

Part Two - Preparation of Asbestos Abatement Plan

Part Three - Preparation of Asbestos Management Plan

To meet the primary aim of preparing AIR/AAP/AMP that fulfills the legislative requirements, the guidelines include general advice relevant to all buildings and a modular format to provide advice for specific building type/uses. The modules, and the associated ACM Identification and Abatement Library, provide collated reference materials for a specific building or area for a RAC or building user to consult prior to and during asbestos works. The modular format will enable these guidelines to be added to as the need arises and assist EPD / private company collaboration in any future revisions to the guidelines.

How to use this Guide

All Asbestos Investigation Reports (AIR), Asbestos Abatement Plans (AAP) and Asbestos Management Plans (AMP) should be prepared to comply with the requirements of the Environmental Protection Department (EPD) Code of Practice on Asbestos Control: Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan - (the CoP).

These supplementary guidelines have been prepared to help achieve compliance with the CoP. The guidelines have been prepared to assist Registered Asbestos Consultants (RAC) in investigating premises for asbestos containing materials (ACMs) and preparing asbestos reports for premises owners.

Section 69 of Air Pollution Control Ordinance (APCO), CAP.311 requires premises owners to engage a RAC to carry out an investigation for ACMs which may be present in the premises before they carry out any intended asbestos abatement work or handling of ACMs. These guidelines also give the premises owner a better understanding of the investigation process and what reports to expect from their appointed RAC.

The guidelines are divided into three parts, namely preparation of AIR, AAP and AMP. The guidelines for these three types of report have been further separated into three increasing levels of complexity as follows:

1. General guidelines for provision of general advice to RAC and premises owners on the procedures for preparation of AIR/AAP/AMP.
2. Guidelines for specific building types/uses. 6no. modules for preparing AIR/AAP/AMP in Hotels, Residential Blocks, Restaurants, Factories and Plant Rooms, Fire Sites and Transformer/electrical sub-stations. These should be consulted by RAC prior to investigations in these premises types – especially if not previously included in their experience. Each module contains recommended best practice and advice at the time of investigation for carrying out a comprehensive investigation in that type of premises to be able to identify all likely ACMs present and prepare AIR/AAP/AMP for submission to the EPD for vetting. Each module details a list of the ACMs most readily associated with that premises type/use.
3. ACM Identification and Abatement Library. A reference resource for ACMs readily found in Hong Kong. Each reference sheet details an ACM occurrence, best practice for its identification, and how to report in an AIR, followed by advice on how to prepare an asbestos abatement method for its removal. Prior to inspecting a building type, the RAC should familiarize themselves with the most likely associated ACMs and consult the reference library for those ACMs prior to the investigation and again prior to report preparation. The library will help RAC improve their ACM identification skills as well as assist in designing abatement method during the AIR/AAP/AMP submissions and vetting process.

These guidelines are also useful for management organisations and building professionals such as architects, building surveyors and building services engineers who need to be aware of the types of ACMs in a building, allowing them to provide advice to premises owners on the need for an asbestos investigation prior to refurbishment or demolition works. General building contractors and Registered Asbestos Contractors will also benefit by being able to interpret AIR/AAP/AMP reports.

Acronym Definition

AAP	Asbestos Abatement Plan
AAW	Asbestos abatement works
ACM(s)	Asbestos containing material(s)
AIR	Asbestos Investigation Report
AMP	Asbestos Management Plan
APCO	Air Pollution Control Ordinance
BS	Building services
CACS	Corrugated asbestos cement sheet
Cop	Code of Practice
EM	Electrical and mechanical
EPD	Environmental Protection Department
ERT	Emergency Response Team
GN	Hong Kong Government Gazette Notice
HEPA	High-efficiency particulate arrestor
HVAC	Heating, ventilating, and air conditioning
ID	Hong Kong Identity Card number
LD	Labour Department
O&MP	Operation and Maintenance Plan
OSHC	Occupational Safety and Health Council
PD	Piping and instrumentation drawings
PPE	Personal protective equipment
PVA	Polyvinyl acetate (usually 1:10 solution in water)
RAC	Registered asbestos consultant
RAL	Registered asbestos laboratory
RPE	Respiratory protective equipment

References

1. Asbestos: The Survey Guide - HSG264: HSE, 2012 [viewed 23 March 2015]. Available from: http://www.hse.gov.uk/pUbns/priced/hsg264.pdf
2. Code of Practice No. 101 for Distribution Substation Design. Code Of Practice 101 For Distribution Substation Design Version 13. [viewed 23 March 2015]. Available from: https://www.clponline.com.hk/MyBusiness/CustomerService/OpenAccount/CodeofPractice101/Documents/cop101_v13jun2014_text.pdf

Citation/Suggested further reading

Hazard assessment:

3. Material and Priority Scoring Tools. [viewed 23 March 2015]. Available from: http://www.hse.gov.uk/asbestos/assets/docs/materials-priority-scoring.pdf

4. Draft 7 for Discussion. 17 Jul 14. PROPOSAL FOR AN ASBESTOS RISK ALGORITHM FOR SCHOOLS. Asbestos in Schools Group and the Joint Union Asbestos Committee. [viewed 23 March 2015]. Available from:

http://www.asbestosexposureschools.co.uk/pdfnewslinks/paper%20risk%20Algorithm%20(draft%207)%2017%20Jul%2014.pdf

5. M E Findley, V E Rose, G R Cutter, and R A Windsor. An assessment of the Environmental Protection Agency's asbestos hazard evaluation algorithm. American Journal of Public Health October 1983: Vol. 73, No. 10, pp. 1179-1181. : 10.2105/AJPH.73.10.1179

Contamination assessment and effects of fire damage:

6. Beard, M.E, and H.L Rook. Advances in Environmental Measurement Methods for Asbestos. West Conshohocken, PA: ASTM, 2000. Print.

7. Deucher, Virginia M. "Access Denied: Asbestos Contamination as Catalyst and Hindrance to Collection Retrieval and Preservation." Journal of the American Institute for Conservation 39.1, Disaster Preparedness, Response, and Recovery (2000): 75-84. [viewed 23 March 2015]. Available from:
http://www.deir.qld.gov.au/asbestos/resources/pdfs/containment-disposal-asbestos-dust-fire.pdf

Disclaimers

The information and advice contained in these guidelines have been produced using the best available knowledge of, and working practices for, common ACMs identified in Hong Kong at the time of publication of the guidelines. Readers of this document should ensure they have the most up to date publication and avail themselves of any additional requirements of EPD since last publication of the guidelines.

These guidelines are for reference only. Exact vetting of AIR/AAP/AMP are site specific and subject to the authority's recommendation. The Guidelines are purely for helping a RAC to prepare the AIR/AAP/AMP. Fulfilling the requirements of these guidelines does not oblige the Authority to accept full compliance with the CoP and APCO.

PART ONE: Preparation of Asbestos Investigation Report

Section 1 – Investigation Planning

Planning for the asbestos investigation of premises includes numerous procedures in order that the RAC can more readily identify all ACMs during the site investigation.

TABLE 1: Investigation planning requirements	
Objective	**Information to be collected/presented**
A. Establish scope of Asbestos Investigation	A clear understanding of the scope of the asbestos investigation is essential, and scope of works is often dictated by whether refurbishment or demolition works are being planned. A full asbestos investigation shall be conducted to identify every ACM which will be disturbed. Given the site constraint or ACM location, a partial investigation is still acceptable prior to refurbishment works as long as the areas to be inspected are clearly defined and that areas not fully inspected will not be disturbed by the planned works. A comprehensive investigation is essential prior to the demolition works or refurbishment works for areas not fully inspected. A comprehensive AIR is regarded as a report which identifies all ACMs in all areas within the premises / project scope, including concealed or buried occurrences. The RAC should ensure that the Employer is aware that any restrictions placed on the scope of the investigation may cause some ACMs to remain unidentified. This can lead to additional expense in identification/ management at a later stage or even accidental disturbance to ACMs. Agree on requirement for ACM hazard labeling.
B. Obtain premises Information	The RAC shall obtain premises information such as age of building and as-built drawings of the premises if available and check for indication of ACMs and locations of possible concealed ACMs such as service voids, tunnels or within walls etc. Drawings of the current layout of the premises are also required to be able to properly record inspection of all areas and location of suspect ACMs. Check if refurbishment or extensions have been made. Check if previous asbestos investigations have been carried out and obtain copies of any reports. To facilitate the investigation try to obtain Electrical & Mechanical / Piping & Instrumentation Drawings to better understand various BS/EM/PD/HVAC system for the premises.
C. Check site access / constraints	Check whether the site is safe for access and arrangements for access to locked/restricted areas. Check on any limitations on photography. Arrange for key holders to accompany the investigation team if necessary. Inspection of electrical plant and control systems are best arranged for when they are not in use to avoid electrocution hazards. Other areas in premises can have slip, trip or burn hazards. Check possibility of exposure to other toxic materials, stored chemicals, dioxin etc. Inspection of high level areas or ceiling voids may be difficult to carry out during normal business hours, or may require provision of safe access such as work platforms. Confined space precautions may be necessary. Removal of ceiling panels or working at height can cause dirt to fall down, creating a dust or hygiene problem. Remedial measures for safe site access should be discussed with the Employer. As standard good practice for inspection of rooms containing hazardous plant the RAC should agree the use of permit to work procedures with the Employer. Registered specialist contractors may have to be employed to assist the investigation and this should be discussed with the Employer.

D. Preliminary site walkthrough	Recommended for complex or large premises to identify specific hazards/access problems. Check information obtained in (A), (B) & (C).
E. Collate materials	Desktop study of information obtained in (A) to (D).
F. Investigation plan and risk assessment	Prepare plan for asbestos investigation, and preliminary sampling plan if possible. Confirm access arrangements to areas and any requirement on shutting down plant / services. Propose any areas for breaking out buried/concealed areas, provision of specialist assistance etc. Detail possible hazards and remedial arrangements. Detail special Employer requirements/restrictions. Detail measures to prevent disturbance to ACMs, required PPE, and actions on finding damaged ACMs.

Section 2 – Site Investigation

The RAC shall carry out the asbestos investigation under the provision of access precautions and other major issues which have been formulated during the investigation planning stage.

TABLE 2 : Site investigation procedures	
Objective	**Procedure**
A. Systematic inspection	If a pre-site walkthrough has not already taken place, carry out a brief premises inspection prior to systematic inspection. Ensure remedial action has been taken for any identified hazards and that they are in place. Work methodically from the roof down to lowest floor or vice-versa, this allows tracing of common elements and avoids missing areas for inspection. Carry out a systematic visual inspection inside each room/area, working from perimeters inwards, from high to low. A torch is essential for most inspections. All building elements should be methodically inspected and a comprehensive visual inspection of all surfaces and plant shall be carried out. Use layout plans and drawings to check that all areas are entered, and for recording investigation progress, suspect ACMs and any no access areas. During the asbestos investigation the RAC must inspect for and take note of locations of potential concealed ACMs. Avoid rushing or getting too tired – allow sufficient time to carry out the investigation. On completion of the investigation carry out another brief walkthrough to re-check areas. ACMs identified towards the end of the investigation may have been missed in areas inspected earlier. Ensure that building services systems with suspect ACMs are traced from source to outlet.
B. Identification of all ACMs	The type of building elements, fixtures and fittings used should be noted. Always keep in mind the basic use of asbestos for structural support, fire and acoustic protection and thermal/chemical protection/insulation. All building materials that could have been used for these tasks should be inspected. If an unknown or unusual material is being used for any of these purposes it should be checked by bulk sampling and/or research. Do not make assumptions about materials without further checking. Metal detectors and bore scopes are recommended for location and inspection of buried/concealed suspect materials. **Refer to the ACM Identification and Abatement Library for assistance in ACM identification.**
C. Recording of identified or suspect ACMs	Establish whether visible ACMs are present in the rooms and their condition. Note the different type of room/area use and suspect ACMs present. A comprehensive photographic record should be taken of the investigation and materials inspected for preparation of the AIR/AAP to help answer any future queries and for quality audit of the investigation. Make a draft bulk sampling plan as the investigation proceeds, using premises plans to record sample locations. This is not only the suitable location for access, but also to ensure that representative sampling of a suspect ACM can be carried out. Note any special sampling requirements, eg. safety requirements, breaking out, access provision, need for full depth sampling etc. Record location, quantity, condition, type of suspect ACMs to prepare AIR details such as ACM inventory and hazard assessment. If ACM identification is almost certain, record details for preparation of AAP and AMP – work zone layouts, requirements for in-situ management/protection etc. Fix ACM hazard labels to ACM occurrences. All ACMs

	recorded should be classified by the manner of identification – by bulk sampling or visually assumed to be ACM. Justifications should be recorded for visual identification, eg. similar to sampled materials, common ACM extensively investigated and sampled in other premises, already ACM hazard labeled etc.
D. Recording of assumed ACMs and no access areas	Areas not inspected shall be clearly marked on the premises plans and notes made for any further action/access. The default action for un-inspected areas shall be to assume ACMs are present. The assumptions made should be consistent with the type and quantity of ACMs identified elsewhere in the premises and use of the inaccessible area. Note with reason(s) why a material has been inspected and dismissed as non-ACM. Take sufficient site notes to later record in the AIR all areas of uncertainty.

Section 3 - ACM Identification

3.1 The ACMs that may be present in premises depends on their manner of construction, use, and maintenance history.

3.2 The modules included in this guide provide in-depth details for the inspection and identification of ACMs in Hotels, Residential Blocks, Restaurants, Factories and Plant Rooms, Fire Sites and Transformer/electrical sub-stations. In each module a list is provided of the most common ACMs associated with that premises type. The RAC should consult the module for the list of associated ACMs and refer to the relevant sheets in the ACM Identification and Abatement Library to assist them in ACM identification on site.

3.3 **The RAC should bear in mind that the ACM Identification and Abatement Library is not a definitive list of ACMs in Hong Kong and they must use their knowledge, experience and a thorough inspection to identify all ACMs on site**. If an unusual or not previously encountered suspect material is encountered the RAC should arrange for bulk sampling, especially if inspection – using a magnifying glass where necessary - of edges or damaged areas of the material shows visible fibres.

3.4 The majority of ACMs in Hong Kong occur in premises constructed from the 1930s through to the late 1980's. However, the RAC must be careful when inspecting younger premises because ACMs have been found to be present in premises constructed up to the present day. Suspect materials that should be investigated include prefabricated building products of cementitious or plaster nature, fireproof cloth materials, and hard non-woven asbestos gaskets used in plant flange joints and friction products. Recent-build premises that were constructed ACM-free can have had these types of ACMs introduced during refurbishment and maintenance works. As part of the asbestos investigation of recent age premises, the RAC should check with the Employer on their use/reuse of products containing asbestos which is illegal under the APCO (Amendment in 2014) in respect of the total ban on all forms of asbestos since April 2014. Based on the type of premises, the RAC should make recommendations to the owner on how to monitor and prevent installation of new ACM products. This can include requirement for asbestos-free certificates for products and bulk sampling when products have been imported from countries known to be still manufacturing ACMs, or doubts about asbestos-free certification.

Section 4 - Bulk sampling

4.1 Bulk sampling precautions and number of samples taken shall be carried out in compliance with sections 3.3 to 3.7 of the CoP, and these requirements are reproduced in Table 3 below. Bulk sampling should always be carried out by a Registered Asbestos Laboratory (RAL),

which will determine the presence of ACM in compliance with the Gazette Method under APCO. The RAC can also obtain a copy of the RAL in-house sampling method for on-site auditing and reference.

4.2 The RAC must consider how to ensure representative sampling can be done to prove the presence of ACM in a given material. For example, pipe insulation can differ along its length or have different layers. Asbestos insulation can be concealed beneath non-asbestos insulation and differing insulation can be used for pipe bends than for straight lengths. Previous improper removal of asbestos insulation can leave remnant debris on metal pipe surfaces that are concealed beneath newer insulation. Similarly, vinyl floor tiles can have multiple layers, or random patches of remnant asbestos adhesive beneath newer floor coverings. Chalkboards can have multiple layers with asbestos cement boards concealed beneath newer timber or resin boards. Therefore, the RAC must not just rely on bulk sample points to identify ACMs, but must carry out a physical inspection in tandem with bulk sampling, removing non-ACM layers to inspect beneath at regular intervals.

4.3 Close supervision of the RAL must be made to ensure that full depth samples are taken of suspect materials and checks made for differing layers of material or for remnants of older materials left on surfaces beneath.

4.4 Best practice advice for bulk sampling is included where necessary in individual ACM Identification and Abatement Library sheets for the associated ACMs.

4.5 The RAC shall ensure that during bulk sampling the damage to any plant or the equipment under inspection are minimal.

4.6 The priority of Asbestos Investigation is to ensure that all ACM shall be identified before any works takes place. All equipment and plant in the premises should be dismantled sufficiently and safely for the RAC to identify all suspect materials inside and allow access for sampling by the RAL. The RAC should attend all dismantling of plant and stop the procedure before any suspect ACMs are disturbed. Partially dismantled equipment with ACMs identified can be listed as maybe containing further concealed ACMs.

4.7 Making good of sample points can be a sensitive issue in some premises. The RAC should ensure that the Employer is aware of the sampling procedure, the extent of damage caused by bulk sampling, and agree the quality of making good.

4.8 Breaking out of walls to check buried services will require close supervision by the RAC and possible assistance from a general building works contractor to supply tools and make good. The RAC should closely supervise the breaking out and stop work if ACMs are uncovered and before they are damaged. Trying to identify the location of buried services can be difficult – particularly if buried deeply in a wall or floor. Metal detectors are useful up to a certain depth, but obtaining as-built building services drawings can be very helpful in locating services. Damage to water pipes is always a possibility during this type of work and it is recommended to have a plumber on standby to make emergency repairs if required.

4.9 The investigation planning stage should have identified any constraints on bulk sampling locations and measures required to prevent ACM disturbance. If damaged suspect ACMs are identified during the investigation that require bulk sampling for confirmation, the RAC shall brief the RAL on safety procedures and arrange for the supply of any necessary personal protective equipment and decontamination/washing facilities for access to the affected area.

The areas to be sampled inside premises should be unoccupied as far as possible. Out of hours sampling should be considered for occupied areas that cannot be vacated during normal hours.

4.10 During the bulk sampling exercise, the RAC should record the locations of all samples on building plans for future reference. At the end of the sampling exercise the RAC should check with the RAL and tally samples numbers and check descriptions etc. Table 3 is duplicated from the CoP, and details the required number of bulk samples for various materials. However, the RAC should bear in mind that this is a minimum requirement and actual site conditions, differing age of installation of fittings, differing appearance of suspect ACMs etc., may dictate that bulk sampling numbers should be much greater. The number of bulk samples taken should be sufficient to identify all suspect ACMs in the premises.

TABLE 3 : Minimum Bulk sample quantity requirements (from EPD CoP)	
Type of material	*No. of samples*
1A. For homogeneous surface materials up to 100m²	At least 3 samples (full depth and minimum 25mm x 25mm each)
1B. For homogeneous surface materials of 100m² to500m²	At least 5 samples
1C. For homogeneous surface materials larger than 500m²	At least 7 samples
2. For miscellaneous items	A minimum 2 samples from miscellaneous items such as chalkboards, bench mats, PVC floor tiles and insulation boards
3. For thermal insulation	A minimum of 3 samples from each homogeneous run of pipe; at least 2 samples from each pipe elbow, valve and flange suspected of having different insulation material; and at least 2 samples from any patched insulation of less than 2m in length

Section 5 – Material and Hazard Assessment

5.1 Throughout the investigation the RAC should record all details necessary for a material and hazard assessment. The assessment should record the current condition of ACMs (material assessment) and the likelihood of present or future fibre release (hazard assessment) based both on condition and factors such as location and nearby activities that could impact on the potential for fibre release. The purpose of the assessments is as follows:

- highlight any ACMs that need urgent remedial action, a simple material assessment is sufficient for this purpose;
- help the RAC and premises owner to prioritise remedial action where more than one ACM occurrence is concerned, a simple hazard ranking order is required for this purpose; and
- if ACMs are to remain in-situ for any length of time, allow the premises owner to formulate a useful management strategy including prioritising remedial actions.

5.2 The majority of AIR/AAPs prepared in Hong Kong are for buildings requiring imminent removal of ACMs for purposes of building demolition or renovation. These AIR/AAP require only a simple material and hazard assessment. The emphasis should be on identifying any ACMs in poor condition requiring immediate remediation and identifying hazards that could impact the ACMs before abatement. For cases of ACMs in poor condition the assessment

may identify the need for action – such as vacating areas or enclosure – prior to ACM abatement and require decontamination works as an initial phase of the AAP.

5.3 EPD advise that premises owners who commission an AIR, but do not immediately arrange ACM removal, to implement an asbestos management plan to safely maintain the ACMs in-situ. Dependent on the type and quantity of ACMs present, and activities within the premises, a comprehensive hazard assessment may be required to assist the management strategies selected. Therefore, the RAC should select a hazard assessment format that is suitable for the premises, types and quantity of ACMs.

5.4 RAC should aim to have a consistent approach to assessments for all premises types. Material and hazard assessments can be very subjective, and in-house rules should be formulated to reduce subjectivity to a minimum. Studies have shown that assessments can differ markedly between individuals and within premises types. RAC should establish training and audit procedures to improve consistency of assessments between premises and individual RAC where appropriate.

5.5 Assessment procedures can be numerical based scoring systems or an objective assessment based on more general terms - dependent on RAC preference. Scoring based systems using simple algorithms are popular and recommended by some countries and can be referenced via the Internet [(3)]. An example is the algorithm contained in the UK Health and Safety Executive guide "HSG264 Asbestos: The Survey Guide" (2012). All types of assessment procedures have advantages and disadvantages. Assessment systems that have been in use for a few years are currently subject to reassessment - doubts have been raised about current scoring systems not being a true reflection of comparative risk - both from the toxicity of different asbestos types, and from the use of premises where some, eg. schools, may be more at risk of damage to ACMs in a particular location than in other types of premises [(4) (5)]. Objective assessments not using scoring systems are subject to the same problems, and subjectivity and inconsistency between assessments may have more of an influence than in scoring systems. Therefore, RAC are advised to research carefully the hazard assessment system they use and monitor its usefulness and implement differing systems as premises circumstances require.

5.6 Whichever system is used, the following guidelines for recording the various parameters that contribute to a proper material and hazard assessment are common to most situations and should be recorded. Where scoring systems are used the numerical algorithm used should be included for reference as an appendix in the AIR.

5.7 **Material Assessment.**

Material assessment records the ease with which an ACM can release fibres. The following factors should be recorded for each ACM type:

i) **Friability of the ACM.** An assessment of the ease with which an ACM can release fibres. Typically softer materials such as cloth/rope and plaster materials can release fibres more easily than a hard material such as asbestos cement where the fibres are firmly bonded into the material matrix. Suggested friability recording is as follows:

- Low friability (or 1 on a scoring system) for ACMs such as asbestos cement, vinyl floor tiles, hard non-woven gaskets, resin/plastic composites etc.;
- Medium friability (or 2 on a scoring system) for ACMs such as asbestos cloth, rope, insulation boards, paper products etc., and;

- High friability (or 3 on a scoring system) for ACMs such as sprayed coatings, plaster pipe/boiler insulation, loose packing material etc.

ii) **Physical condition**. Assess extent of any damage. This factor is one of the most subjective assessments recorded, and the RAC should develop in-house guidelines to try and eliminate as much subjectivity as possible and ensure consistency in reporting. Suggested condition recording is as follows:

- Good condition (or 0 on a scoring system) no visible damage;
- Fair condition (or 1 to 2 on a scoring system) minor scratches or broken edges up to damage amounting to less than 10% of area/length; and
- Poor condition (or 3 on a scoring system) greater than 10% of ACM broken or impact damaged. Any visible debris should be recorded as poor.

iii) **Surface treatment.** Make a distinction where necessary between condition of the ACM and any enclosing/encapsulating materials. Suggested surface treatment recording is as follows:

- Inherent Seal (or 0 on a scoring system) for composite materials with built-in surface treatments such as vinyl floor tiles, resin/plastic composites etc.;
- Sealed (or 1 on a scoring system) well bonded materials such as asbestos cement, and paint sealed ACMs or those covered with outer impermeable wrap material such as metal sheet/foil, cement render etc. Fully enclosed ACMs would be in this category as well;
- Untreated (or 2 on a scoring system) for uncovered medium friability ACMs such as asbestos cloth/rope etc; and
- Unsealed (or 3 on a scoring system) for high friable ACMs such as sprayed coatings, plaster pipe/boiler insulation, loose packing material etc.

iv) **Type of asbestos present**. A distinction is made between the lower toxicity of chrysotile asbestos compared to amphibole asbestos types such as amosite, tremolite, actinolite and crocidolite. Record the type of asbestos material present. If using a scoring based system typical values are chrysotile (1) amosite and other amphibole asbestos (2) and crocidolite (3). Monitor international research being done. The scoring for amphibole asbestos may be significantly increased compared to chrysotile asbestos.

5.8 **Hazard Assessment.**

Hazard assessment records the likelihood of ACM releasing fibres. For ACMs this mainly depends on accessibility factors and can be called an accessiblity assessment. This depends on external factors such as location, activities in area etc. For an AIR produced for immediate removal of ACMs prior to demolition or renovation, a simple hazard assessment is sufficient – reported as low, moderate or high hazard, but still based on the following factors. A more comprehensive hazard assessment should be undertaken for ACMs that are to be managed in-situ as part of an asbestos management plan. The following factors should be recorded:

i) **Occupancy.** Extent of occupancy of an area and frequency of activity. Suggested recording is as follows:

- Rare (or 0 on a scoring system) for little used areas such as store rooms;

- Low (or 1 on a scoring system) for office areas with little activity that could disturb ACMs;
- Moderate (or 2 on a scoring system) for activities that could periodically disturb ACMs such as in an industrial setting with vehicle/stock movements etc.; and
- High (or 3 on a scoring system) for areas in constant use with likelihood of impact damage, eg. wall partitions in a hotel/hospital corridor.

ii) **Likelihood of disturbance**. Depends on various factors including the location of an ACM in an area and the size of the space. Suggested recording is as follows:

- Unlikely (or 0 on scoring system) locations not usually accessed, such as outdoor canopy and roof sheeting;
- Low (or 1 on a scoring system)large rooms over 100m^2 or well ventilated areas;
- Moderate (or 2 on a scoring system)smaller rooms below 100m^2 in size; and
- High (or 3 on a scoring system) in confined spaces.

ACM location and accessibility. Depends on how easily the ACM can be disturbed. Suggested recording is as follows:

- Inaccessible (or 0 on scoring system);
- Occasionally disturbed (or 1 on a scoring system);
- Easily disturbed (or 2 on a scoring system);and
- Routinely disturbed (or 3 on a scoring system).

Amount of ACM present. Suggested recording is as follows:

- Small amounts (or 0 on scoring system)such as a few gaskets, single flexible joint etc.;
- Minor amounts (or 1 on a scoring system) eg. less than 15m^2 of cement sheet or less than 5m pipe run etc.;
- Moderate amounts (or 2 on a scoring system) eg. greater than 15m^2 of cement sheeting or greater than 5m pipe run etc.;
- Large amounts (or 3 on a scoring system) eg. greater than 50m^2 of cement sheeting or greater than 20m of pipe run.

Scoring system takes the average of the above three factors for a combined maximum score of 3.

iii) **Human activities.** The amount and type of human activity can dictate likelihood of disturbance to ACMs. Suggested recording is as follows:

No. of persons present in an area. Suggested recording is as follows:

- None (or 0 on a scoring system);
- Few (or 1 on a scoring system) meaning less than 3 or 4 persons;
- Moderate (or 2 on a scoring system) meaning up to 10 persons; and
- Many (or 3 on a scoring system) meaning greater than 10 persons present.

Frequency of use of an area. Suggested recording is as follows:

- None (or 0 on a scoring system);
- Infrequent (or 1 on a scoring system) meaning less than once a month;
- Frequent (or 2 on a scoring system) meaning weekly; and
- Constant (or 3 on a scoring system) meaning daily.

Average time in use. Suggested recording is as follows:

- Very low (or 0 on a scoring system) meaning less than one hour;
- Low (or 1 on a scoring system); meaning between 1 and $\leq$3 hours;
- Moderate (or 2 on a scoring system) meaning between 4 and $\leq$6 hours; and
- High (or 3 on a scoring system) meaning greater than 6 hours.

Scoring system takes the average of the above three factors for a combined maximum score of 3.

iv) **Maintenance activity likely to disturb ACMs.** The amount and type of maintenance work in an area can dictate likelihood of disturbance to ACMs. Suggested recording is as follows:

Type of maintenance activity. Suggested recording is as follows:

- Minor (or 0 on a scoring system) meaning only possibility of some contact to ACMs when gaining access for maintenance;
- Low (or 1 on a scoring system) meaning maintenance activities such as scaffolding a building with asbestos canopies which may impact on ACMs;
- Moderate (or 2 on a scoring system) meaning activities such as boiler or plant valve maintenance that may impact adjacent ACM pipe insulation; and
- High (or 3 on a scoring system) meaning activities such as electric re-cabling that may directly impact associated asbestos packing.

Frequency of maintenance activity. Suggested recording is as follows:

- No disturbance to ACMs (or 0 on scoring system);
- Low (or 1 on scoring system) meaning less than once a year;
- Moderate (or 2 on scoring system) meaning greater than once a year; and
- High (or 3 on scoring system) meaning greater than once a month.

Scoring system takes the average of the above two factors for a combined maximum score of 3.

5.9 Combining the scores for material assessment and hazard (accessibility) assessment provides a priority assessment result for managing in-situ ACMs. For a proper hazard assessment to be made, the input of building management personnel able to provide an accurate record of the various factors that make up the assessment, eg. rates of access, usage of areas etc., is essential and the RAC must seek their assistance in preparing the assessment.

5.10 To assist in proper assessment, the RAC should record any differing criteria for a particular ACM that occurs in various different function rooms with different conditions/quantities so as to not make too general an assessment. Differing assessments for differing areas may be necessary. It may therefore be helpful for material and hazard assessments to detail assumptions made and opinions held so that the assessment is more understandable and any disputes over the assessment can be more easily discussed.

5.11 However the assessments are recorded, the guiding principle of the material and hazard assessment is to help the RAC provide the premises owner with sufficient information to decide on any immediate remedial measures necessary and plan any future remedial actions, or changes in human activity to reduce the likelihood of exposure to asbestos fibres. Premises owners may require a priority assessment so as to be able to target remedial measures at the most high risk ACMs.

5.12 For ease of use on site, the material and hazard assessment categories are included in table form in Appendix B.

Section 6 – Format of AIR Report

6.1 The requirements of section 8 of the CoP should be followed for the expected format and contents of the AIR, which is outlined in Table 4.

TABLE 4: Requirements for AIR Format	
Requirement	**Information to be included**
A. Title pages	Title pages will be included which clearly identify the subject premises, its location and the type of report, e.g. AIR, AIR & AAP etc. A report reference number shall be included and date of report.
B. Particulars of the owner and parties involved in the investigation	Although often employed by other parties to carry out an asbestos investigation, the RAC must include the actual premises owner details in the AIR including name of owner (and ID if a person), address, contact person, business registration number, and tel./fax/email details. The particulars of the Employer can also be included when not the actual premises owner. The name and contact details of the RAC and RAL involved in the investigation shall also be included.
C. Description of premises	A detailed description of the premises shall be given at the start of the report, including the type of premises, number of structures present, their function and size (building storey height etc.). A description shall be given of any surrounding premises (particularly those which can be classified as an environmentally sensitive receiver). The state of the premises at time of investigation shall be provided – e.g., vacant, occupied, normal work activities, condition of premises etc.
D. Purpose of asbestos investigation and scope of works	The purpose of the asbestos investigation shall be given – e.g. prior to refurbishment works, demolition etc. The scope of investigation shall be clearly stated – whether all areas of the premises or selected areas only. If only a partial inspection has taken place, the inspected areas shall be clearly listed – using attached drawing plans for clarity.
E. Description of asbestos investigation	A detailed description of the asbestos investigation shall include: i. Details of investigation planning and desktop study. Details of any previous asbestos investigations carried out. ii. Details of risk assessments made and precautions taken to investigate the premises. iii. Description of investigation and the building elements,

	services and fixtures present and whether they include suspect ACMs or not. Describe inspections of concealed spaces such as ducts and voids. Include descriptions on any dismantling of plant or breaking out of walls to expose concealed or buried services. Include photographs of the inspection – not only of ACMs identified, but also photographs of plant dismantling, breaking out, and building elements, services and fixtures inspected but found to not contain ACMs. iv. Details of bulk sampling programme. Sufficient details shall be included to demonstrate to interested parties that determined efforts have been made to identify all ACMs.
F. Statement on how comprehensive the asbestos investigation is and any inaccessible areas	The description of the asbestos investigation shall end with a statement detailing how comprehensive the investigation has been and whether **all areas have been accessed and inspected and that all ACMs have been identified during the investigation**. All uninspected areas shall be identified and summarized in this section, the RAC shall give justification for not gaining access to those areas and shall give recommendation for the uninspected areas including any assumptions about the presence of ACMs – using drawing plans for clarity.
TABLE 4: Requirements for AIR Format - *Continued*	
G. Summary table of suspect items inspected (ACM Inventory)	A summary table shall be included which lists all the suspect materials inspected and whether they are ACM or not. Details shall include: i. Unique reference number for clear identification. ii. Description of material and location in premises. iii. Height above floor. iv. Quantity and condition. v. Confirmation as ACM or non-ACM and details of confirmation method – sampling or visual inspection. Type of asbestos. For smaller premises this table can be referred to as the ACM Inventory for the premises. However, for larger premises or premises with numerous ACMs a separate ACM Inventory Table is recommended which does not include the non-ACM materials but also includes reference to photos of the ACM and waste classification.
H. Material and Hazard Assessment	A table shall be included which details the material assessment carried out on the groups of identified ACMs and a hazard (risk) assessment based on the ACMs location and adjacent human activities in the premises. The assessment shall provide the premises owner with sufficient details to identify any immediately required remedial measures and prioritise planning for any future remedial measures. The details to be included are listed in section 5 above.
I. Summary and recommendations	The report shall conclude with a summary section detailing the results of the asbestos investigation. The summary should include: i. Details of ACMs identified, location and quantities. ii. Details of any inaccessible areas and assumed ACMs. iii. Summarise material and hazard assessment and detail any immediately required remedial measures. iv. Summarise the premises owners' responsibility under the Air Pollution Control Ordinance – CAP. 311 for employment of registered specialists and notification to Government prior to any handling or abatement of the identified ACMs Based on the ACMs identified and the material and hazard assessments carried out, the RAC should make recommendations to the premises owners for management and any remedial measures for

	the identified ACMs. Unless premises are due for imminent demolition, implementation of an AMP (comprising an operation and maintenance plan and asbestos abatement plan) should be strongly recommended by the RAC to the premises owner. Brief details of the requirements for a management plan could be included and how implementation can help prevent disturbance to ACMs.
H. Statement on comprehensiveness of AIR and caveat on unidentified materials	Below is a sample of declaration on comprehensiveness of an AIR. The RAC shall include these statements in the summary section of the AIR when submitting to the Employer / EPD. *"This AIR is/is not* considered to be a comprehensive record of all ACMs in the premises. *The AIR is therefore suitable for use prior to major refurbishment/demolition of the premises. *Additional inspections must be carried out by a registered asbestos consultant of inaccessible areas prior to any disturbance in the inaccessible locations marked on the accompanying plans.* (*Delete as required) *"The user of this AIR – both premises owners and building works contractors – should be aware of the possibility that not all concealed ACMs have been identified. All refurbishment/ demolition works should proceed with due care and if any suspect asbestos-containing materials are uncovered then works must stop until the material has been inspected by a registered asbestos consultant."*
TABLE 4: Requirements for AIR Format - *Continued*	
I. Appendices	The appendices should include additional information to support the findings of the AIR. Appendices should include: i. A comprehensive photographic record of the investigation, including general photos of the exterior of the premises, photos of ACMs, photos of suspect materials inspected and found to be non-ACM, photos of plant dismantling and breaking out of buried services. ii. Laboratory bulk sample analysis reports. iii. A site location plan of the premises. iv. Any useful plans, as-built drawings etc., equipment schematics etc., used during the investigation to help identify ACMs. v. Letters/email detailing correspondence with various parties to establish ACM presence in the premises – eg. to lift engineers concerning friction gaskets. vi. Plans showing inaccessible areas, areas not inspected, scope of inspection etc. vii. Bulk sampling location plans and asbestos location plans – these can be on the same floor plan or separate, depending on complexity and clarity of presentation.

6.2 Attention is drawn to the importance of section F in the above Table 4. The RAC must clearly detail how comprehensive the asbestos investigation has been and discuss any uncertainty. List all uninspected areas/equipment, also using drawings and photographs as necessary. The RAC shall, prior to any demolition works, prepare a fully comprehensive AIR/AAP, covering all areas of a premises, which shall be accepted by EPD.

Section 7 Meeting Environmental Requirements and the respective Codes of Practice

7.1 The primary reference material for an asbestos consultant to meet AIR preparation requirements is the EPD Code of Practice on Asbestos Control: Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan (the CoP). The asbestos consultant should initially study the CoP to ensure that all required information is included in the AIR. These general guidelines for preparation of AIR, AAP & AMP should then be studied for further advice and recommendations for preparing the report. Lastly, the specific guidance in the premises-specific modules should be studied to give a site specific AIR for EPD's vetting and comment.

7.2 The Government Gazette Notice (GN) No. 25/1997. G.N. 3021 and G.N. 3022 detail the requirements for submission of AIR/AAP reports and employment of registered specialists. The GN lists the classes of ACM that do not require submission of AIR/AAP, or exempted from the requirement of appointing a Registered Asbestos Contractor for certain types of ACM abatement work. However, the RAC shall bear in mind that the GN does not exempt the need of asbestos investigation, as well as the notification of asbestos abatement works (AAW) to the EPD, if exempted ACMs are found in the investigation.

7.3 The RAC and owner of premises are encouraged to submit AIR to EPD even when the report indicates that the premises has no ACM/exempted ACM are identified.

7.4 The RAC shall ensure that the AAW are carried out in compliance with other environmental / health and safety regulation, and shall include reference to such measures in the AAP/AMP.

7.5 **Register of active premises containing ACMs**

Past experience has shown that ACMs may be disturbed in premises when the AIR / AMP is not available. This can occur for various reasons, including when a premises owner decides not to implement an AMP for in-situ ACMs, when a premises is sold to new owners, when demolition/renovation works are significantly delayed, contracting companies changed, and when personnel acquainted with the presence of ACMs are no longer in post.

7.6 EPD encourages RAC and Premises owners to maintain an in-house record of active premises containing ACMs for which they have prepared AIR/AAP. Since most AIR/AAP in Hong Kong are prepared for ACM removal immediately before demolition/renovation, the amount of AIR/AAP records to retain will not be substantial. If it is the case that the asbestos abatement work (AAW) will not be conducted immediately after the preparation of AIR/AAP, the RAC shall remind the owner to verify the validity of the AIR/AAP before conducting any future AAW.

7.7 RAC shall, during their investigation work, encourage Premises owners to carry out regular inspections of ACMs at least every two years. Quite often the re-inspection will be conducted by a different RAC to that who produced the original AIR. Therefore the owners are encouraged to maintain a copy of AIR for subsequent inspection by another RAC if necessary.

AIR Appendix A: Asbestos Investigation Checklist

TABLE 5 : Asbestos Investigation Checklist		
Item	**Purpose**	✓ / ✕
Scope of Work agreed	Ensure Employer & RAC in agreement over scope of work. Areas not to be investigated have been clearly defined.	
As-Built Drawings of premises	Check of original services and fixtures for installed ACMs and concealed areas.	
Current floor plan drawings	Recording areas inspected and location of suspect ACMs and proposed bulk sampling locations.	
Risk Assessment	Mitigation of risks from electrocution/trip/fall/burn/toxic materials.	
Investigation Equipment	A. Camera – Record investigation and suspect materials inspected B. Torch – Essential for inspection of voids and service areas C. Log Book, Clipboard, Survey Sheets, PC - for recording information D. Step ladder – Access to high level areas E. Keys – For access to all areas (or key holder provided) F. Tools for inspection - Screwdrivers, hammer, pliers/wrench, awls, extensible mirror, knife, metal detector, bore scope. G. Emergency remedial equipment – PPE, duct tape, adhesive, warning tape and labels. H. ACM labeling – hazard labels, adhesive and/or wire/tie fixings.	
ACM Identification	Refer to Premises Module guidelines and ACM Identification & Abatement Library for refresher on ACM identification prior to investigation. Use drawings to record access and inspection of all areas. Record location of suspect ACMs. Trace linear ACM occurrences, such as pipes, from source to outlet. Note suspect material quantity, condition, location	
Record areas of uncertainty	Record how comprehensive investigation is, record all areas not accessed and equipment not inspected. Discuss with Employer for measures to reduce uncertainty – eg. return visits, equipment dismantling, breaking out etc. Consider assuming ACMs present in areas not investigated.	
Bulk Sampling	Record bulk sampling locations and review on completion of investigation. Are sufficient samples being taken of all suspect materials? Refer to Table 3.	
Material & Hazard Assessment	Record all necessary information on material condition of suspect ACMs and location/ activities in premises to prepare assessments for AIR. Check Section 5 for information required.	
AAP (if required)	Record all information necessary to prepare AAP if required by Employer. Note constraints on work zone erection and ACM removal. Prepare draft work zone drawings to check on-site feasibility.	
AMP (if required)	Advise Employer on any recommendation for AMP, discuss elements of Operation & Maintenance Plan, identify constraints, personnel suitable for site implementation etc.	

AIR Appendix B: Material and Hazard Assessment Tables

TABLE 6A : MATERIAL ASSESSMENT CATEGORIES	
A. Friability of the ACM. *An assessment of the ease with which an ACM can release fibres. Typically softer materials such as plaster materials can release fibres more easily than a hard material such as asbestos cement where the fibres are firmly bonded.*	
1 (or low friability)	ACMs such as asbestos cement, vinyl floor tiles, hard non-woven gaskets, resin/plastic composites etc.;
2 (or medium friability)	ACMs such as asbestos cloth, rope, insulation boards, paper products etc.
3 (or high friability)	ACMs such as sprayed coatings, plaster pipe/boiler insulation, loose packing material etc.
B. Physical condition. *Assess extent of any damage. This factor is one of the most subjective assessments recorded, and the RAC should develop in-house guidelines to try and eliminate as much subjectivity as possible and ensure consistency in reporting.*	
0 (or good condition)	No visible damage
1 or 2 (or fair condition)	Minor scratches or broken edges up to damage amounting to less than 10% of area/length
3 (or poor condition)	Greater than 10% of ACM broken or impact damaged. Any visible debris should be recorded as poor.
C. Surface treatment. *Make a distinction where necessary between condition of the ACM and any enclosing/encapsulating materials.*	
0 (or inherent seal)	For composite materials with built-in surface treatments such as vinyl floor tiles, resin/plastic composites etc.;
1 (or sealed)	Well bonded materials such as asbestos cement, and paint sealed ACMs or those covered with outer impermeable wrap material such as metal sheet/foil, cement render etc.
2 (or untreated)	For uncovered medium friability ACMs such as asbestos cloth/rope etc;
3 (or unsealed)	For high friable ACMs such as sprayed coatings, plaster pipe/boiler insulation, loose packing material etc.
D. Type of asbestos present. *A distinction is made between the perceived lower toxicity of chrysotile asbestos compared to amphibole asbestos types such as amosite, tremolite, actinolite and crocidolite.*	
1	Contains chrysotile
2	Contains amosite or other types of amphibole – except crocidolite
3	Contains crocidolite
Total Material Assessment Score (max. 12) **=**	

TABLE 6B : HAZARD ASSESSMENT CATEGORIES	
A. Occupancy. *Extent of occupancy of an area and frequency of activity.*	
0 (or rare)	For little used areas such as store rooms
1 (or low)	For office areas with little activity that could disturb ACMs
2 (or moderate)	For activities that could periodically disturb ACMs such as in an industrial setting with vehicle/stock movements etc.
3 (or high)	For areas in constant use with likelihood of impact damage, eg. wall partitions in a hotel/hospital corridor
Total Score =	
B. Likelihood of disturbance. *Depends on various factors including the location of an ACM in an area and the size of the space.*	
0 (or unlikely)	Locations not usually accessed, eg., outdoor canopy/roof sheeting
1 (or low)	Large rooms over 100m^2 or well ventilated areas
2 (or moderate)	Smaller rooms below 100m^2 in size
3 (or high)	In confined spaces
C. ACM location and accessibility. *Depends on how easily the ACM can be disturbed.*	
0	Inaccessible
1	Occasionally disturbed
2	Easily disturbed
3	Routinely disturbed
D. Amount of ACM present	
0 (or small amounts)	Such as a few gaskets, single flexible joint etc.
1 (or minor amounts)	< 15m^2 cement sheet or <5m pipe run etc.
2 (or moderate amounts)	> 15m^2 cement sheeting or >5m pipe run etc.
3 (or large amounts)	> 50m^2 cement sheeting or >20m of pipe run.
Scoring system takes the average of factors B, C & D for a combined maximum score of 3.	
Total Av. Score =	
E. Human activities. *The amount and type of human activity can dictate likelihood of disturbance to ACMs.*	
0 (or none)	No human activity
1 (or few)	Meaning less than 3 or 4 persons
2 (or moderate)	Meaning up to 10 persons
3 (or high)	Meaning greater than 10 persons present
F. Frequency of use of an area.	
0 (or none)	No use
1 (or infrequent)	Meaning less than once a month
2 (or frequent)	Meaning weekly
3 (or constant)	Meaning daily
G. Average time in use.	
0 (or very low)	Meaning less than one hour
1 (or low)	Meaning between 1 and $\leq$3 hours
2 (or moderate)	Meaning between 4 and $\leq$6 hours
3 (or high)	Meaning greater than 6 hours
Scoring system takes the average of factors E, F & G for a combined maximum score of 3.	
Total Av. Score =	

TABLE 6B : HAZARD ASSESSMENT CATEGORIES Continued	
H. Maintenance activity likely to disturb ACMs. *The amount and type of maintenance work in an area can dictate likelihood of disturbance to ACMs.*	
H1: Type of maintenance activity	
0 (or minor)	Meaning only possibility of some contact to ACMs when gaining access for maintenance
1 (or low)	Meaning maintenance activities such as scaffolding a building with asbestos canopies which may impact on ACMs
2 (or moderate)	Meaning activities such as boiler or plant valve maintenance that may impact adjacent ACM pipe insulation
3 (or high)	Meaning activities such as electric re-cabling that may directly impact associated asbestos packing
H2. Frequency of maintenance activity	
0 (or no disturbance)	No disturbance
1 (or low)	Meaning less than once a year
2 (or moderate)	Meaning greater than once a year
3 (or high)	Meaning greater than once a month
Scoring system takes the average of factors H1 & H2 for a combined maximum score of 3.	
Total Av. Score =	
Total Hazard Assessment Score (max. 12) **=**	

The Hazard Assessment Score is obtained by adding together the scoring results for Category A and the combine average score for categories (B,C,D), (E,F,G) and (H1,H2) for a combined maximum score of 12. This hazard assessment score can then be combined with the material assessment score to give a total score for rating the priority of remedial action of each area/ACM.

Material Assessment Score (maximum score of 12) + Hazard Assessment Score (maximum score of 12) = Combined Priority Rating Score (maximum score of 24).

PART TWO: Preparation of Asbestos Abatement Plan (AAP)

Section 8 – General Requirements

8.1 All Asbestos Abatement Plans (AAP) shall be prepared in accordance with requirements of the Air Pollution Control Ordinance CAP. 311 Section 71(3) and the EPD Code of Practice on Asbestos Control: Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan (the CoP).

8.2 The RAC should agree with the Employer the scope of the Asbestos Abatement Work (AAW) prior to the design of AAP. The RAC is responsible for advising the most appropriate selection of abatement methods based on the Employers requirements and the condition of the identified ACMs in the premises. The CoP, sections 5 and 6, and appendices 1 and 2, detail the available abatement alternatives and the processes for selection of the most appropriate methods. Section 11 of the CoP details the format of the AAP and the information to be included.

8.3 EPD have also produced three CoPs, namely Codes of Practice on Asbestos Control "Asbestos Work Using Full Containment or Mini Containment Method" (Abatement CoP), "Asbestos Work Using Glove Bag Method" (Glove Bag CoP) and "Safe Handling of Low Risk Asbestos Containing Material" (Low Risk CoP), detailing the requirement for various types of abatement work, and these should be referred to during AAP preparation. Classified by ACM friability and scale of work, these CoPs provide details on the equipment requirements, materials for construction of work zones, preliminary decontamination, procedures for asbestos abatement, air monitoring requirements and acceptance of work.

8.4 Recording draft details for an asbestos abatement plan is recommended to be done where possible during the asbestos investigation itself whilst the RAC is on site, and in discussion with the Employer immediately afterwards to ensure the Employer's requirements can be met and identify any site constraints. The recommended general information to be collected /reviewed is detailed in the following table 7.

TABLE 7: AAP preparation (general information)

Objective	Information to be collected/presented
A. Establish scope of AAP	Ensure Employer and RAC agreement over scope of work. For each ACM identified agree on abatement method – deferred action, enclosure, encapsulation or abatement. If damaged ACM are found, the RAC shall inform EPD immediately and plan mitigation measures as well as subsequent asbestos decontamination and abatement. If the AAW involves other building or engineering works (e.g. removal of fixtures and fittings, breaking out, or excavation works to enable work zone erection) the RAC shall discuss and agree with the Employer on the responsibilities for employing other contractors for assistance. The RAC shall also consider detailed methodology so as not to disturb the ACM when carry out the concerned building / engineering works.
B. Employment of registered specialist personnel	If the Employer requires assistance in the appointment of Registered Asbestos Contractors to carry out the abatement works, details for the various registers of specialist personnel, can be obtained from EPD website at : www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/reg_asbestos.html or http://www.epd.gov.hk/epd/tc_chi/environmentinhk/air/guide_ref/reg_asbestos.html

TABLE 7: AAP preparation (general information) - *Continued*	
Objective	**Information to be collected/presented**
C. Obtain premises and specialist personnel information	Identify the actual owner of the premises to include their details in the AAP as well as the employed RAC, Registered Asbestos Contractor and Registered Asbestos Laboratory (RAL), if already appointed. Check if adjacent premises will be affected or concerned by the abatement works. Premises classified as environmentally sensitive receivers may need contacting to arrange environmental air testing adjacent to their premises as a precaution/ reassurance. The AAP should include details of adjacent sensitive receivers and any proposed remedial measures during abatement.
D. Compliance with EPD Codes of Practice on abatement	Dependent on the abatement work being planned, consult the relevant EPD CoP on abatement works: "Asbestos Work Using Full Containment or Mini Containment Method", "Asbestos Work Using Glove Bag Method" and "Safe Handling of Low Risk Asbestos Containing Material". The CoP only sets out minimum requirements for a safe asbestos abatement, the RAC shall propose methods that improve on these requirements for EPD's vetting. The general AAP specifications for materials and equipment, site preparation, decontamination facility, preliminary decontamination, construction and testing of work zone, air monitoring, asbestos abatement, final clean up and work acceptance, decontamination of tools and equipment and emergency procedures specified, should meet the requirements of the relevant CoP.
E. Design Work Zones	The type of work zone – segregated or full containment will depend mainly on the risk associated with the AAW in terms of friability and scale of disturbance to the ACM during abatement. The RAC should decide on the type of work zone at each ACM location. The abatement methods and work zones proposed should be clearly visualized by drawings / photos in the AAP. Refer to the EPD abatement CoPs. The RAC shall design and submit proposals on design of work zones for EPD's vetting. Further details are provided in Table 8 for work zone design.
F. Plan contingency measures	Each AAP requires clauses on emergency procedures and contingency measures, these should be site specific. Review and revise as necessary.
G. Check site constraints / specific arrangements for work	Ask employer, preferably using permit to work procedures, to isolate both electric and gas supply within work zone. Check site access requirements – any particular access restrictions for vehicles, security arrangements for personnel? Are temporary work platforms and/or scaffold erection required? Which type is suitable and what protection measures are necessary to avoid contamination during abatement? Will the Registered Asbestos Contractor be able to store his equipment on site or nearby, how will it be secured during the works?
H. Plan air monitoring strategy	Decide on the air monitoring that will be carried out during abatement works. Consider the economic cost and specify the minimum number of air tests necessary to measure background levels, measure fibre levels around work zones during abatement, and air tests inside the work zone after completion. If there are no sensitive receivers nearby, or leak air testing is already specified, environmental air testing may not be necessary.
I. Plan waste disposal strategy	Review the specification for waste handling and disposal. Carry out a proper assessment of the amount of asbestos waste that will be generated. A realistic estimate of asbestos waste will help Registered Asbestos Contractor cost a tender and properly plan for waste storage and collection.

Section 9 – Method Statements for Asbestos Abatement

9.1 Complying with the EPD's CoPs on abatement measures, and the AAP planning measures detailed in table 7 above will allow the RAC to prepare a general specification which will describe in detail the equipment necessary and procedures to be followed for practical and safe abatement works. However, a general specification by itself is not usually sufficient to describe the whole asbestos abatement process because abatement procedures for specific ACMs, or work in certain locations in premises, can require more detailed information in order for the Registered Asbestos Contractor to safely implement the AAP and achieve the required abatement result – be it enclosure, encapsulation or abatement. Therefore the AAP should include a more detailed section, usually categorized by ACM type or location, a specific abatement work method – this is commonly referred to as a particular specification, project brief, method statements for abatement etc.

9.2 Since the implementation of the Air Pollution Control Ordinance CAP 311 in 1997, and with experience of abatement procedures for a wide range of premises and ACM types, additional measures have been imposed on the industry to ensure safe and efficient asbestos abatement. These additional measures are usually specific to a particular type of ACM, or work in a particular type of premises. Requirements for a particular premises type are provided in the building module guidelines. Requirements for a particular ACM type are provided in the ACM Identification and Abatement Library. The RAC should therefore consult both sources of information during preparation of method statements for asbestos abatement of a particular ACM or in a particular location.

9.3 Method statements detailing abatement works in premises needs to be clear and comprehensive. The method statements shall be step by step plans to carry out the required abatement measures for ACMs in the premises prior to any renovation or demolition works in the premises. The method statement must be specific for each premises/ ACM type and only be produced after a detailed inspection of the site, enabling the RAC to prepare a comprehensive specification for abatement which meets the following criteria:

a) *Practical.* No specification of procedures that would be too difficult or impractical for a Registered Asbestos Contractor to implement. This will avoid unnecessary later revision to the AAP,
b) *Efficient.* Ensure that procedures specified are the most common sense, efficient approach. This will avoid argument and revision to the AAP after a Registered Asbestos Contractor has assessed the AAP and arrived on site to commence work, and lastly and closely related,
c) *Health and Safety compliance.* The abatement work must meet the health and safety requirements of the APCO, Factories and Industrial Undertakings Ordinance (F&IU) and their respective CoPs. The RAC shall check and propose the optimal methodology to carry out the abatement works in a safe and effective manner.

9.4 The asbestos investigation report will have detailed the ACMs present and whether they are accessible or concealed. This may require the production of separate method statements for abatement, e.g., segregated work zones for low risk ACMs and full containment work zones for high risk ACMs. The introduction to the asbestos abatement method statements should summarise the AIR findings and clearly detail any phases of work to secure the site, erect work zones and carry out abatement works. The criteria in table 8 shall be included.

9.5 The AIR material and hazard assessment (section 5) will have identified any poor condition ACMs and the RAC should include decontamination measures in the AAP to mitigate any contamination. The decision matrices in the EPD CoP appendices 1 and 2 should be used to agree with the premises owner the desired abatement options, ie., deferred action, enclosure, encapsulation or removal. Therefore an AAP can potentially include abatement measures for: decontamination, measures to protect in-situ ACMs, and removal methods as follows:

9.6 **Asbestos Decontamination Plan**.

A distinction is made between a work zone pre-clean as detailed in the EPD CoP and an asbestos decontamination plan. A pre-clean is the removal of general dust and debris from an area before erection of an asbestos abatement work zone. The dust and debris removed should be predominantly general dirt and not ACM debris, although minor non-visible amounts may be present. It allows personnel inspecting the area after completion of abatement to check that the area has been cleared to the standard required – no visible dust and debris. Personnel carrying out the pre-clean should use PPE in case minor ACM debris is present. No further protective measures are considered necessary. If however, visible ACM debris is present, the RAC must make an assessment whether additional decontamination measures are necessary. If the pre-clean activities are likely to disturb ACM debris leading to measurable fibre release, then a formal asbestos decontamination plan should take the place of the pre-clean and specify the additional protective measures necessary to protect workers, adjacent building users and the environment from asbestos fibre release as follows:

i) AIR/AAP/AMP Module no. 5 – fire sites – contains comprehensive advice on carrying out an assessment of asbestos contamination and the abatement measures necessary. Most of the procedures are valid for non-fire areas contaminated with asbestos. The assessment of the extent of contamination should follow the guidelines detailed in this module. In each location determine how air or water flow, and persons walking through contaminated areas, may have spread contamination. Dust and air sampling may also be used to determine extent.

ii) The asbestos decontamination plan will form the first stage of the AAP and detail the clean-up of the area prior to other abatement measures such as enclosure or removal. In some instances, particularly where high friable badly damaged ACMs are present, it is preferable for decontamination works and ACM removal to be carried out in the same work zone.

iii) The decontamination plan should detail the erection of a work zone around the area of contamination. For low friable debris this is usually a segregated work zone with decontamination unit attached. The RAC should consider the use of an air mover to control air flow within the work zone if the extent of contamination is large or there are doubts about how friable the debris is. For abatement work in areas contaminated by loose highly friable debris, a full containment work zone should be specified. When erecting a work zone for purposes of decontamination the RAC should specify that floor and wall surfaces that are considered ACM-contaminated should be left undisturbed until all other work zone elements are in place. No polythene sheeting should be used to cover these surfaces during work zone erection, and their cleaning and subsequent air testing should be done with them uncovered.

iv) The decontamination plan should include full details of all materials inside the contaminated zone and the remedial action – whether it is disposal as asbestos waste or cleaning and retention. As a general guide, all hard surface materials – such as metal or plastic sheet – can be wet wiped and wire brushed cleaned and then kept inside the work zone for subsequent air testing and RAC inspection. Soft surface materials – such as paper and cloth products that cannot be satisfactorily cleaned should be disposed of as asbestos waste. Wall and floor surfaces should be cleaned with wet wiping, wire brushing and vacuum cleaning. A summary table in the AAP including photographs of each type of material and cleaning/disposal action provides clear guidance to the abatement contractor. The decontamination plan should include details of the decontamination/debris units to be used, PPE requirements and air testing and clearance inspection measures. Where brickwork or porous concrete surfaces have been contaminated by friable ACMs the removal of all debris can be very difficult with ACM plaster debris typically clinging to surfaces or lodged in small holes in brick/concrete. A very detailed close-up inspection of these surfaces is necessary to identify and remove all material. If these surfaces cannot be satisfactorily cleaned they should be removed using hand tools and disposed of as asbestos waste or, if too difficult to do, encapsulated with a non-porous render within the work zone and recorded in the ACM Inventory as an ACM material and managed in-situ. The RAC should inspect all cleaned and retained materials for visible dust and debris. The air testing laboratory dust disturbance measures should include these cleaned items.

v) Following completion of decontamination, the plan should detail how subsequent abatement works are to be carried out – whether in the same work zone or new zones erected after dismantling of the decontamination work zone.

9.7 Abatement measures for enclosure / encapsulation

If the decision has been made to enclose or encapsulate ACMs, the AAP must include method statements as to how this shall be carried out. The decision should have been made with reference to section 5 of these general guidelines and appendices 1 & 2 of the EPD CoP. The initial decision the RAC must make is if the work to enclose or encapsulate the ACMs is defined as asbestos work or not.

9.7.1 **Enclosure works** can be done without touching the ACMs so sometimes can be done by a general contractor, whilst at other times it is advisable to have the works carried out by an asbestos removal contractor. Therefore, the risk assessment carried out by the RAC prior to implementing enclosure works is very important to establish who is doing the work. When deciding on enclosure of ACMs, consider the following:

- Will the fixing of enclosure cause excessive vibration or other ways of disturbing the ACMs? Screw and nail fixing of enclosure boards may disturb ACMs unless at a sufficient distance from the ACM location. A segregated work zone may be required and works by an asbestos removal contractor. However, sealing of already in-situ panels, eg. duct panels, using duct tape or mastic sealants should not cause excessive vibration and can be done by a general contractor.
- How permanent will the enclosure material be, and will periodic access be required? Polythene sheet or similar materials used to seal ACMs will only stay effective as the long as the materials used to fix them. Polythene sheet stapled to a timber frame will last longer than polythene sheeting just duct tape sealed to walls/floors. Periodic access, or exposure to sunlight, may cause the enclosure seals to degrade

over time. If using polythene sheet seals or periodic access is required through any enclosure material, specify a re-inspection schedule to check seals are still functioning properly.

- Is damage to the ACMs possible behind the enclosure – eg., a water leak, or is the ACM the sort of material that may degrade over time and cause debris which will make opening the enclosure a hazard? If these possibilities exist, is it possible to include view panels, or specify precautions for opening enclosures. Minimal disturbance checking, eg., by borescope, prior to removal of enclosure materials may be advisable.
- For all enclosure works agree with the premises user a re-inspection schedule to check the efficiency of the work. Regular inspections can be carried out by the building user themselves, but periodic inspections should be made by the RAC. Advising the building owner to implement an AMP and have the enclosure works monitored within the setup of a formal operation and maintenance plan will be the most effective way to monitor and repair enclosure seals.
- Whenever enclosure works have been specified that involves input from an asbestos removal contractor, then the enclosure works must be detailed in a method statement within an AAP. The method statement should include the following details:
    - Requirement for and setup details for a work zone around the enclosure point.
    - Detail the PPE required by personnel carrying out the work. For most enclosure work a simple canvas sheet open segregation work zone, with personnel wearing disposable PPE and half-face mask is sufficient precautions. Locate a 3-stage decontamination unit at the work zone entrance.
    - If there are concerns about vibration or other disturbance to the ACMs, specify air testing around and within the work zone. Environmental air tests around the perimeter and reassurance air tests after completion should be sufficient.
    - Specify emergency measures should the enclosure works damage ACMs. HEPA vacuum cleaners should be available for use. Do adjacent areas need decanting?
    - Specify how the enclosure works will be checked for efficiency and by whom. What are the acceptance criteria? Visual checks of seals could be augmented by smoke tests or other means of checking seals. Seals which degrade over time, eg. mastic or foam seals, could be photographed at time of application for comparison with later checks.
    - Specify re-inspection schedule and by whom.

9.7.2 **Encapsulation** inevitably means touching the ACMs, all this type of work should be done by a registered asbestos removal contractor following an AAP method statement prepared by the RAC. Encapsulation by proprietary products is rare in Hong Kong since most AAP are prepared for ACMs requiring imminent removal and the cost of setup works for encapsulation can be similar to the removal cost and therefore not beneficial. The EPD CoP lists the other problems – such as delamination or difficulty in checking efficiency of encapsulation. Encapsulation by mastic/foam/cement seals is the most common used in Hong Kong. Their application should always be done in a work zone – segregated for low friable ACMs and full containment for friable ACMs. The application of encapsulation must be detailed in a method statement within an AAP. The method statement should include the following details:

- All work zone setup details, use of decontamination unit, HEPA appliances, personal PPE etc., similar to that specified in an AAP for ACM removal.
- The application of the encapsulant must specify measures for minimizing fibre release, eg. mist spray of amended water, shadow vacuuming, removal of disturbed ACM/debris, etc.
- Specify the air testing around and within the work zone. The use of environmental and reassurance air tests for segregated works zones and leak and penultimate/clearance air tests for full containment shall be detailed. Work zones should be cleaned after completion of works using vacuum cleaners and wet wiping. Specify how tools and containers used to apply encapsulants will be cleaned or disposed of.
- The RAC shall certify the standard of encapsulation after satisfactory air testing. All ACM shall be covered, with none visible, and to a depth to ensure accidental impact damage does not disturb ACMs. No dust or debris shall be evident in the work zone.
- Specify re-inspection schedule and by whom.

The use of proprietary products for encapsulation will require the prior approval of EPD. A trial implementation may be requested before full use. Successful use in other countries cannot be presumed to be the same in Hong Kong, its high humidity and temperature may affect encapsulants – both their setting time and lifetime usefulness. The RAC should submit full specifications for the product, justifications for use and assessment of how climate will affect it, or trials carried out to justify use.

TABLE 8: AAP preparation (particular specification / method statement)	
Objective	**Information to be collected/presented**
A. Summary of Abatement Measures and description of special measures	Summarise the AIR findings and provide details of ACMs which are to be subject to abatement measures. Define the types of work zones for each ACM occurrence and to which EPD abatement CoP the works shall comply with. Detail any required preparation works prior to work zone erection – scaffolding, work platforms, excavation, removal of building fixtures etc. For all ACMs that are in a very poor or damaged condition such that visible debris is present around the occurrence, the RAC must consider a decontamination procedure prior to the actual asbestos abatement work, and to include such procedure in the AAP.
B. Responsibility of various parties	Where large or complicated abatement projects have numerous parties involved with responsibility for various tasks, list out each party and their responsibility. The RAC shall remind the owner that it is their responsibility to make sure that ACMs in the premises shall be completely removed before any other building work. It is their responsibility to liaise with other Contractors (e.g. General Contractor, E&M Contractor etc) and make sure that they are aware of asbestos in the premises. The RAC shall propose, in their AAP, any precautions to prevent disturbance to ACMs during preparatory works. The RAC should specify in the AAP that a photographic record of such preparations works will be taken and submitted to EPD to prove no disturbance to ACMs. Scaffolding contractors should submit scaffold design drawings for complicated structures, such as around chimneys, to demonstrate that it is fit for purpose, the work zone can be erected in the space available, and it can cope with weight loading from waste generated. Where equipment or plant is being dismantled to check for or remove ACMs, the owner shall liaise and arrange with their contractors to facilitate the RAC to work out the best abatement procedure. The AAP should include details concerning roles and responsibilities and arrangements for prevention of disturbance to ACMs.
C. Work Zone design	Premises drawings shall be used to show the location of all work zones to be used for abatement works. Ensure that elements of the work zone, eg. decontamination unit, air mover etc., are to scale to ensure feasibility of construction. Therefore ensure that elements of the work zone can be positioned as specified, that they are accessible by the contractor and for supervisory personnel wanting to inspect the works. If in doubt, use a tape measure to check that all elements of the work zone will fit in the available space. Consider the practicalities of work zone erection. If adjacent plant or areas of the premises have to be operational during abatement works how are they to be protected? Discuss with the Employer for solutions and detail them in the AAP. Provision of step by step procedures accompanied by drawings will help explain all the necessary procedures to prepare the site for abatement and protect adjacent areas. Ensure during the design of full containment work zones that air movers and decontamination units can be sited to allow proper air flow to ensure no pockets of “dead air” in a work zone. If flexible tubes from air movers are to be used inside work zones for improved air flow, detail how they are to be protected or disposed of as asbestos waste afterwards. Detail how all building elements and fixtures not include in the works shall be protected from contamination during abatement work. Detail the pre-cleaning required prior to work zone erection. Clearly show how the contractor will safely erect work zones. What personnel protection measures need to be used during pre-cleaning and work zone erection? Any work zone built in the open air needs weather protection. Specify support bracings for walls and roofs of work zones. If overhead sheeting is used it should be angled for rain water runoff.

TABLE 8: AAP preparation (particular specification / method statement) - *Continued*	
Objective	**Information to be collected/presented**
C. Work Zone design *(continued)*	Specify the measures to take, and re-inspections to carry out if the work zones are affected by bad weather. The abatement of ACMs may have to be divided up into a series of smaller work zones. Detail the phases of work, do some have to be done before others? Ensure that full containment areas are not too large – not only to comply with the maximum size allowed in the CoP but also to make them easier to erect, brace and maintain. Drawings can help detail the work phases. Calculations on negative pressure unit (air mover) size and air flow should be included for full containment areas. Procedures for continuous running of air movers or shut down at end of shift should be specified (shut down can only occur after an additional one hour of air mover operation at shift end and sealing of decontamination units). Consider additional protection works to adjacent areas. Are additional hoarding arrangements necessary to protect work zones or prevent public access? There are specific recommendations for work zone design for certain ACM occurrences, e.g., working on all floors at the same time for a linear vertical ACM occurrence. The ACM Identification and Abatement Library should be consulted for these recommendations.
D. Method statement for abatement	The ACM Identification and Abatement Library should be consulted for specific recommendations for the preparation of asbestos abatement method statements for types of ACM. Each method statement should include the following information: i. A full description of the work zone setup with accompanying work zone drawings – both plan and sectional view as appropriate. ii. Details of procedure, and responsible party, for work zone inspection and certification prior to commencement of abatement works. iii. Details on measures for minimizing fibre release. Applicable to both segregated and full containment work zones, details must be provided on how the removal contractor will sufficiently wet ACMs to reduce the release of fibres during waste collection, disposal and cleaning of the site. Specify how the ACM is to be treated – whether to remove or to be enclosed etc. For removal, specify unfixing methods, use of tools (non-electric), and treatment of surfaces contaminated by ACMs. Will all fixtures be removed and disposed of as asbestos waste? Detail waste handling procedures. iv. Detail the sequence of abatement work. High level elements should usually be first, work downwards and towards the air mover. v. When ACMs are contained within plant or equipment, detail abatement measures and cleaning of adjacent surfaces. Detail how any plant to be left in-situ can be satisfactorily cleaned and inspected. The RAC should specify the disposal or retention of all materials in the work zone - considering economic cost if various options are available. vi. If the AIR has reported any uncertainty about tracing of linear ACMs from source to outlets, eg. pipe work, the method statement should detail any measures for further tracing and breaking out of suspect ACMs in work zones and remedial measures to be implemented. vii. Detail the method of cleaning of the work zone and all surfaces within. Specify the inspection and clearance procedures and which parties are responsible for certifying satisfactory completion. viii. Detail type of air monitoring to be carried out prior to, during and after asbestos abatement.

TABLE 8: AAP preparation (particular specification / method statement) - *Continued*	
Objective	**Information to be collected/presented**
E. Air monitoring	Either presented with each individual method statement or in a summary table, the RAC should specify the numbers of air tests to be taken prior to, during and after asbestos abatement as follows: i. Background air tests, to be taken at random locations within the premises and at the periphery of proposed work areas. A total number of 5 background air tests within premises are usually sufficient to establish background fibre in air levels. Larger building estates may require more air tests. ii. Leak air tests as stipulated by the Abatement CoP. Usually 4no. per day per full containment work zone. Larger work zones may need additional leak air tests specified by the RAC. iii. Penultimate and clearance air tests as dictated by the Abatement CoP. The number to be specified depends on the square area or volume of the work zone as defined by the abatement CoP. iv. Reassurance air tests / final clearance air tests as dictated by the Low Risk CoP and Abatement CoP respectively, once again dependent on work zone size. v. Environmental air tests at the periphery of adjacent sensitive receivers if considered necessary. Usually 4no. per day. The RAC should consider the cost of air monitoring to the Employer and not specify too many air tests unless there are extenuating circumstances.
F. Waste disposal strategy	The method statements for abatement of ACMs prepared by the RAC should, as an environmental measure, reduce the amount of waste sent to landfill to a minimum. Many fixtures and building services can be recycled if the AAP is able to specify cleaning methods and procedures that will minimize waste - consistent with abatement of all ACM and debris. Assess the routes for waste transfer. Will they be shared with other groups of workers? How will the waste be transported out of the premises? For heavy waste packs/drums will material hoists be used? If so what safety precautions and checks shall be made to ensure no dropping of waste from height? Does out of hours transfer need to be specified? Identify location of temporary waste stores with the Employer – usually an area convenient for vehicle waste collection. Premises drawings should be supplied showing the location of the waste stores(s). For large projects cumulating significant quantities of waste, the RAC should specify regular waste collections to ensure not too large a build-up on site.
G. Appendices or illustrations to the AAP	Each AAP should include various diagrams, tables and illustrations to support the measures specified in both the general abatement requirements and the specific abatement method statements. These should usually include: i. Decontamination unit entry and exit procedures ii. Flow charts or similar for decontamination, work clearance or other procedures which would benefit from such clarification. iii. Hazard labels and notices to be used in and around the work zone iv. Work zone drawings, both plan and section as relevant, sufficiently detailed to show location of decontamination unit, air movers, view panels for inspection, layout of air mover flexible tubes both within full containment work zones and for exhaust outside the premises, air monitoring locations and air test type. v. Notification of asbestos abatement works as required by the EPD and/ or Labour Department. vi. RAC forms for work zone inspection and certification, permits to work. vii. Programme for asbestos abatement. If an actual programme has not yet been decided, then a general programme showing estimated time for all abatement measures shall be produced.

Section 10 – Asbestos Work Zone Drawings

10.1 Detailing the step by step abatement procedures necessary in premises is usually too complicated to be done by text description alone. Drawings should be provided to clarify procedures. At a minimum the following drawings should be included:

i. If abatement work is being carried out in phases, drawings showing each phase of work.

ii. AAP drawings detailing the extent of various work zones and their type (segregation or full containment), including location of decontamination unit, air mover locations, air monitoring locations. As well as plan view drawings, section view drawings should be considered – particularly for high level work zones, or zones of a complicated shape or work sequence. Work zones on scaffold will require drawings to show how unobstructed air flow will be achieved in full containment areas. All work zones erected on scaffold which extend up a number of building storeys will require internal staircase access for removal workers and external staircase access for visiting works inspectors. Scaffold design drawings and load calculations should be included where necessary.

iii. Work zones for vertical occurrences, e.g. inside vertical ducts, should include a section drawing showing all work zones, and any buffer zones if a complete vertical occurrence cannot be removed all at one time.

iv. If removal work to plant or pipes will only be carried out to partial areas, drawings should show extent of work and protective measures to prevent contamination of plant. Pipes passing out of the work zone will have to be sealed properly and drawings should show sealing works, including box seals over pipe ends etc. A clear step by step detail of extent of removal and cleaning/sealing of pipe ends left in-situ should be shown.

v. A drawing detailing waste transfer routes should be provided including any necessary precautions on-route. The location of waste store(s) shall be shown.

AAP Appendix A: AAP Preparation Checklist

TABLE 9 : AAP Checklist		
Item	**Purpose**	✓ / ✕
General AAP information		
Scope of Work agreed	Ensure Employer & RAC agreement over scope of work.	
Condition of ACMs	Any requirement for a comprehensive preliminary decontamination prior to AAP implementation (visible debris around site)	
Identification of parties concerned	Record specialist contractors and any other contractors necessary to allow work zone setup – scaffold, building works, excavation etc.	
Compliance with EPD abatement CoPs	Check requirements of EPD CoPs against proposed abatement measures. If areas of non-compliance, record justifications for selected measures.	
Work Zone design	Check feasibility on site of proposed work zone locations. Check that all elements can be erected in available space.	
Contingency measures	Review emergency measures, make sure they are site specific.	
Specific AAP information (method statements)		
Summary of AIR & ACMs included for abatement	Summarise ACMs identified in AIR and abatement actions. Provide justifications for decision on abatement action.	
Responsibilities of all parties	Record all parties involved in abatement works – specialist personnel, and general contractor assisting set up works. Details their specific responsibilities and any supervision roles of RAC to check on disturbance to ACMs	
Work zone design	Prepare work zone drawings and all supplementary information to detail step by step construction of work zones.	
Method statements	Refer to ACM Identification and Abatement Library to prepare specific abatement measures for each type of ACM.	
Air monitoring	Specify air monitoring requirements and indicate total quantities for use in project tendering.	
Waste disposal	Estimate asbestos waste quantity. Minimise waste quantities where possible. Locate waste transfer routes and temporary waste stores.	
Supplementary information	Prepare tables, diagrams, flow charts, drawings to supplement AAP text. Include work zone drawings, labels and warning notices, AAW notifications forms, permit to work forms, RAC work inspection forms and work zone certification. Prepare abatement works programme.	

PART THREE: Preparation of Asbestos Management Plan (AMP)

Section 11 – Introduction

11.1 All Asbestos Management Plans (AMP) shall be prepared in accordance with requirements of Section 71 of the Air Pollution Control Ordinance (APCO) CAP. 311 and the EPD's Code of Practice on Asbestos Control: "Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan" (the CoP).

11.2 An AMP comprises two parts, an Operation and Maintenance Plan (O&MP) detailing in-situ management of ACMs, and an Asbestos Abatement Plan (AAP) detailing recommended abatement measures – either for enclosure/encapsulation of in-situ ACMs or ACM abatement including emergency decontamination measures. During site survey works and preparation of the AIR, the RAC will have made a material and hazard (accessibility) assessment of the ACMs (refer to section 5 of the AIR guidelines) which will help in determining the remedial action for each ACM. The AAP should include details of all abatement measures. Firstly, this should include protective works – such as enclosure or encapsulation – that are to be implemented and maintained during the period of managing in-situ ACMs. Secondly, the AAP should detail abatement methods for implementation as ACMs are eventually removed. Sections 9, 10 and 12 and appendices 1 to 5 of the CoP provide details on the requirements for the production of an AMP. The appendices 1 & 2 include decision matrices as to whether enclosure, encapsulation or removal of ACMs is advised. The AMP document that the RAC prepares should detail the decision making process that has been carried out to decide remedial action for each ACM. This must be done in discussion with the premises owner and take into account building user requirements and renovation/demolition programmes. Only once this has been completed can an effective AAP and O&MP be produced.

11.3 The essence of the AMP is that the owner of the premises shall work together with the appointed Registered Asbestos Consultant (RAC) to work out a management plan in order to properly manage the ACMs in the premises if they are not to be removed immediately. The RAC should explain the differences between the AMP and AAP, in particular the contents of the documents and agree with the Employer the scope of works required prior to preparing an AMP. If asbestos abatement works planned by a premises owner will leave ACMs in-situ, it is strongly recommended to implement an O&MP to manage the ACMs. The RAC should make this recommendation to their Employer and describe the benefits of such a system, namely:

- Maintain any ACM and suspect ACM in good condition.
- Ensure proper remedial measures of any existing ACM debris.
- Prevent further release of fibres or debris.
- Monitor the condition of ACMs and suspect ACMs.
- Safely handle accidental release of asbestos fibres.

11.4 Guidelines for preparation of AAP are detailed in Part Two of these general guidelines. This Part Three is concerned with preparation of the O&MP.

Section 12 – Preparation of Operation and Maintenance Plan

12.1 Table 11 refers to the requirements of an O&MP, as listed in the EPD CoP, and provides additional advice to help meet these requirements based on the experience of implementing AMPs in premises since the implementation of the APCO. The entire process is summarized in the following flow chart.

Figure 10 – Flow Chart for preparation of AMP

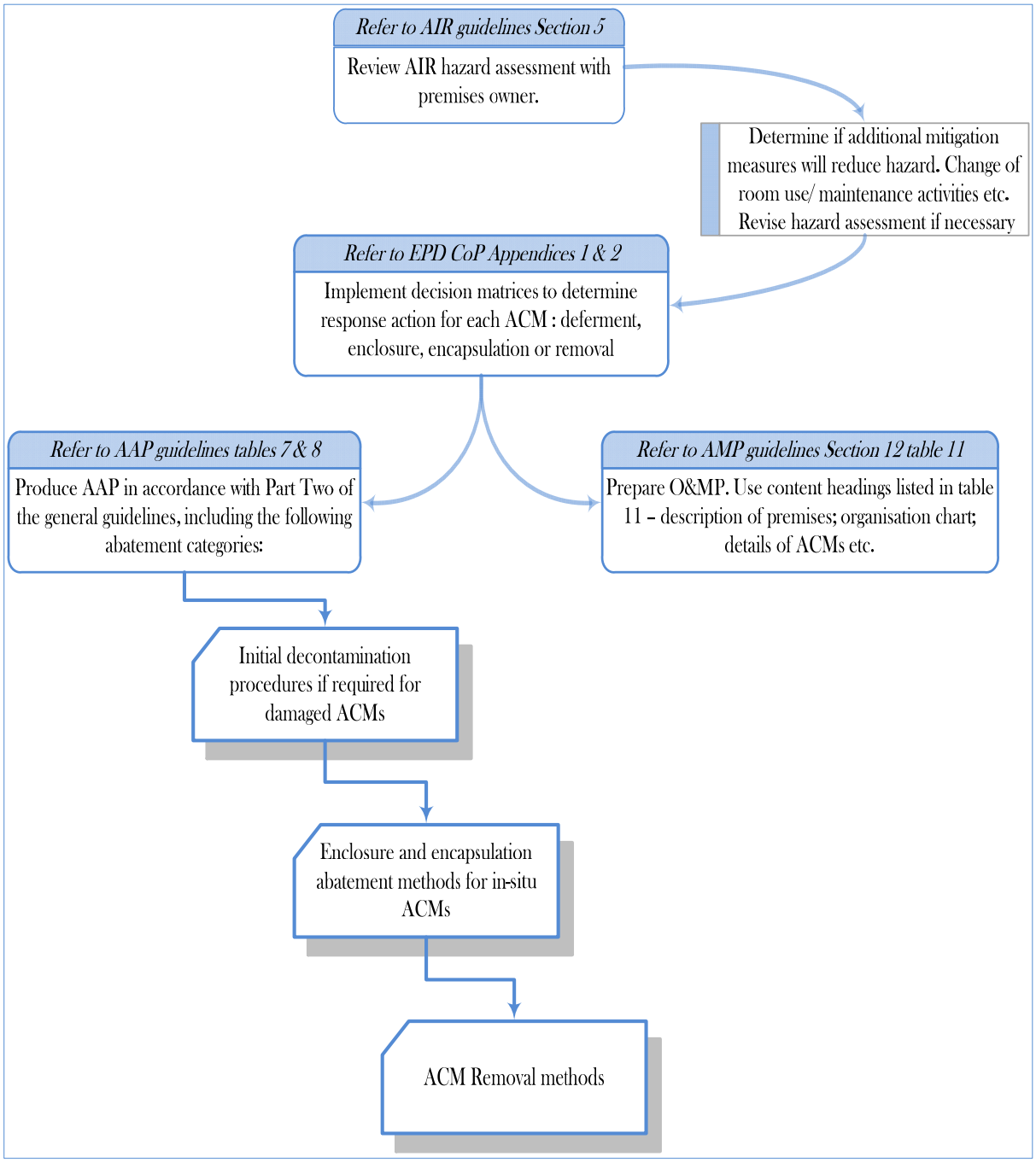

TABLE 11: O&MP preparation	
O&MP Content	**Information to be collected/presented**
A. Detailed description of premises	Premises age, usage and activities are very important when preparing measures to ensure the successful implementation of an O&MP. The location of ACMs in the premises, the current state of repair of premises, and ongoing and planned maintenance activities will impact on successful implementation. The RAC should fully investigate these parameters by discussion with staff directly responsible for premises maintenance. Dependent on the date of AIR preparation, areas where ACMs occur should be re-visited to check current condition, reassess area usage and any activities or maintenance issues that may affect ACMs.
B. Organization chart for O&MP implementation	The Organization Chart to be included in the O&MP must be an accurate record of the persons responsible for O&MP implementation. A template is included as an appendix to this section. The organization chart is meant to be an onsite record for building users to be able to contact staff directly responsible for implementing the O&MP, e.g. being able to report ACM damage immediately to the relevant person to take action. The organization chart should therefore include the actual persons involved in day to day operations and responsibility and their telephone numbers for immediate contact.
C. Details of ACMs and suspect ACMs	Because the AMP is intended to be a standalone document, the O&MP should include a copy of the ACM Inventory and ACM location plans from the AIR. If the AIR is not a fully comprehensive record of all ACMs in the premises, then this section should also include details of areas not inspected, assumptions made about concealed ACMs etc. It is important that the O&MP includes details about areas of uncertainty, so that the premises users are aware of any restrictions on activities and carrying out maintenance works without contacting the RAC for further investigations.
D. Condition of ACMs and suspect ACMs	If the ACM Inventory or additional inspection identifies any poor or potentially deteriorating ACM condition, then the RAC shall record the remedial measures that have already been taken, or planned for implementation. Maintaining an accurate record of the ACM Inventory and condition throughout the AMP implementation period is essential. All ACM abatement should be recorded as it occurs and if condition assessments show ACM deterioration, then remedial action must be implemented.
E. Reasons why ACMs should not be removed	Throughout the AMP implementation period, conditions within the premises – usage, maintenance requirements etc., may change and necessitate remedial action such as enclosure or abatement. This section of the O&MP should be regularly assessed in case original conditions change.
F. Method of labelling ACMs	ACM hazard labels do over time fall off, fade or curl-up until they are illegible. The RAC should determine the environment where the labels are to be fixed and use the most appropriate label to ensure legibility. Labels fixed with plastic ties are best for very humid environments. Outdoor labels will fade rapidly in direct sunlight and need replacement. The fixing and legibility of hazard labels can often need checking regularly to ensure their continued effectiveness.
G. Method of informing people who may be affected	Methods of informing people who may be affected depend on the use of the premises and amount of visitors. For premises with many visitors a site visitor log is recommended to record this requirement. Also notification letters signed by the recipient can be used. For cases where this is not relevant, or premises with few visitors then staff circulars/emails or notice boards can be used. Training courses on general asbestos awareness are recommended. Information shall be carefully designed and arranged/displayed so that other tenants / visitors in the premises are not overly concerned with the presence of ACMs.

TABLE 11: O&MP preparation - *Continued*	
O&MP Content	**Information to be collected/presented**
H. Surveillance scheme	The CoP suggests the RAC to carry out re-inspection and surveillance to all ACMs in the premises at least once every two years. However, the RAC shall take into account the location and condition of ACM, as well as the usage of the premises to determine the optimum surveillance scheme. Key staff shall be involved in the surveillance scheme to perform tasks such as checking ACM labels as well as enclosure integrity etc.
I. Method to avoid disturbing ACMs	This is one of the most important sections of an AMP. The use of permit to work as detailed in Appendices 4 & 5 of the CoP should be implemented. Experience has shown that the permit to work system is effective in avoiding accidental disturbance to ACMs. Since the total ban on ACMs came into effect in April 2014, the RAC must introduce methods to ensure that new ACMs are not introduced into the premises. The premises owner should obtain ACM-free certificates from suppliers and bulk sampling of proposed replacement materials should be encouraged.
J. Record keeping scheme	An up to date record keeping scheme is essential. All permits to work, updates of ACM inventory and any changes in the organization chart shall be comprehensively documented and filed for record. Responsibility for implementation of AMPs can change with new RACs appointed over time. Faults and omissions in records can occur unless updated very regularly. The ACM Inventory should be updated immediately after every change in ACM quantity.
K. Action for handling deteriorating ACMs	Emergency method statements shall be included to handle a situation where an ACM is disturbed or damaged. Some of the staff responsible for implementation of the AMP should be nominated to be members of an Emergency Response Team (ERT) to handle initial remedial measures after reports of ACM damage. These team members should receive additional training in their role including: i. Training in method statement requirements and scale of works. ii. Initial action on report of damaged ACM. iii. Use of personal protective equipment (PPE). iv. Implementing emergency method statement. v. Use of decontamination facilities. vi. Waste storage and disposal. Training should be documented and refresher training carried out regularly. The emergency method statements should be carefully considered and tailored to be relevant to the most likely causes of ACM damage. The RAC should carefully consider the location and type of ACMs and area usage and possible accident scenarios to create meaningful emergency method statements. Clean up and disposal of small quantities of ACM debris is suitable to be undertaken by properly trained site premises staff using PPE. Reaction to large scale damage and debris should be limited to vacating and sealing off an area prior to calling specialist asbestos personnel. All damage incidents and the remedial response should be included in the ACM Records. Repetitive incidents may require the RAC and premises owner to consider further abatement measures.

	General / electrical / mechanical / plumbing and draining contractors may have to be part of the emergency response team to assist in remedial actions for disturbed and damaged ACMs in the premises. Their safety procedures for shut down and isolation of plant should be incorporated into the method statements for likely emergency action, and if necessary they should be included in training drills for use of PPE and ACM cleanup.

Section 13 – Planning AMP implementation with premises owner

13.1 A study of the procedures detailed in table 11 above will show that the preparation of an AMP is not purely a desktop task and will require proactive assistance from the premises owner and staff nominated to implement the AMP. The RAC will need to make site inspections and hold staff meetings to assess actual site conditions and prepare a workable AMP.

13.2 The hazard assessment carried out of ACMs that are to be maintained in-situ is recommended to be a more comprehensive assessment than for ACMs that are to be removed immediately. The premises owner must provide accurate feedback for a realistic assessment to be made of the factors that could affect the condition of ACMs. This is the accessibility categories included in the hazard assessment: likelihood of disturbance; human exposure potential; and maintenance activities. Additionally, past damage to fittings and plant, from storm or water damage for example, should be reviewed and likelihood of re-occurrence discussed and preventative mitigation measures included in the O&MP and AAP if necessary. The preparation of an AMP is therefore an opportunity to review the AIR hazard assessment and produce procedures that are to be implemented to mitigate the hazards. This could include change of room use, changes in methods of transporting materials through rooms or maintenance activities etc. The AMP should include a section of how this has been done and any extra mitigation measures produced.

13.2 Review of the operation of an AMP is an important process in continuous management of ACMs. After each surveillance process, or after incidents that cause/could have caused damage to ACMs, the RAC should review the AMP with the premises owner and decide on any improvements that can be made to the AMP and any changes made to the hazard assessment. Management of in-situ ACMs should be subject to continuous improvements as experience is gained and hazard assessments are refined during the AMP implementation period.

Section 14 – Training

14.1 Training to be carried out as part of the AMP requirements is usually done at three levels of complexity and according to the quantity and type of ACMs present in premises:

i. General asbestos awareness courses are suitable for general staff who are not actively part of implementing the AMP. The RAC shall make use of asbestos awareness course provided by occupational safety and health organization in Hong Kong (e.g. Occupational Safety and Health Council, OSHC). The RAC shall under the

AMP, provide regular internal training course on asbestos to general staff stationed at the premises.

ii. Intensive and comprehensive training towards key staff who are in the O-chart in the AMP, or other key staff who are actively involved in the implementation of the AMP. Those key staffs are encouraged to attend an asbestos management course provided by an occupational safety and health organisation. The key staff shall be well aware of the locations of the ACMs within the premises as well as the necessary procedure in the management and abatement of the ACMs.

iii. Emergency Response Training towards the members of the Emergency Response Team. The training can be provided by the RAC and be specific to the premises and type of ACMs and likely accident scenarios, but should be as realistic as possible with provision of decontamination unit and PPE etc. A typical Emergency Response Training shall contain the following elements:-

a. Training in method statement requirements and scale of works.
b. Initial action on report of damaged ACM.
c. Use of personal protective equipment (PPE).
d. Implementing emergency method statement.
e. Use of decontamination facilities.
f. Waste storage and disposal.

AMP Appendix – Organization Chart Template