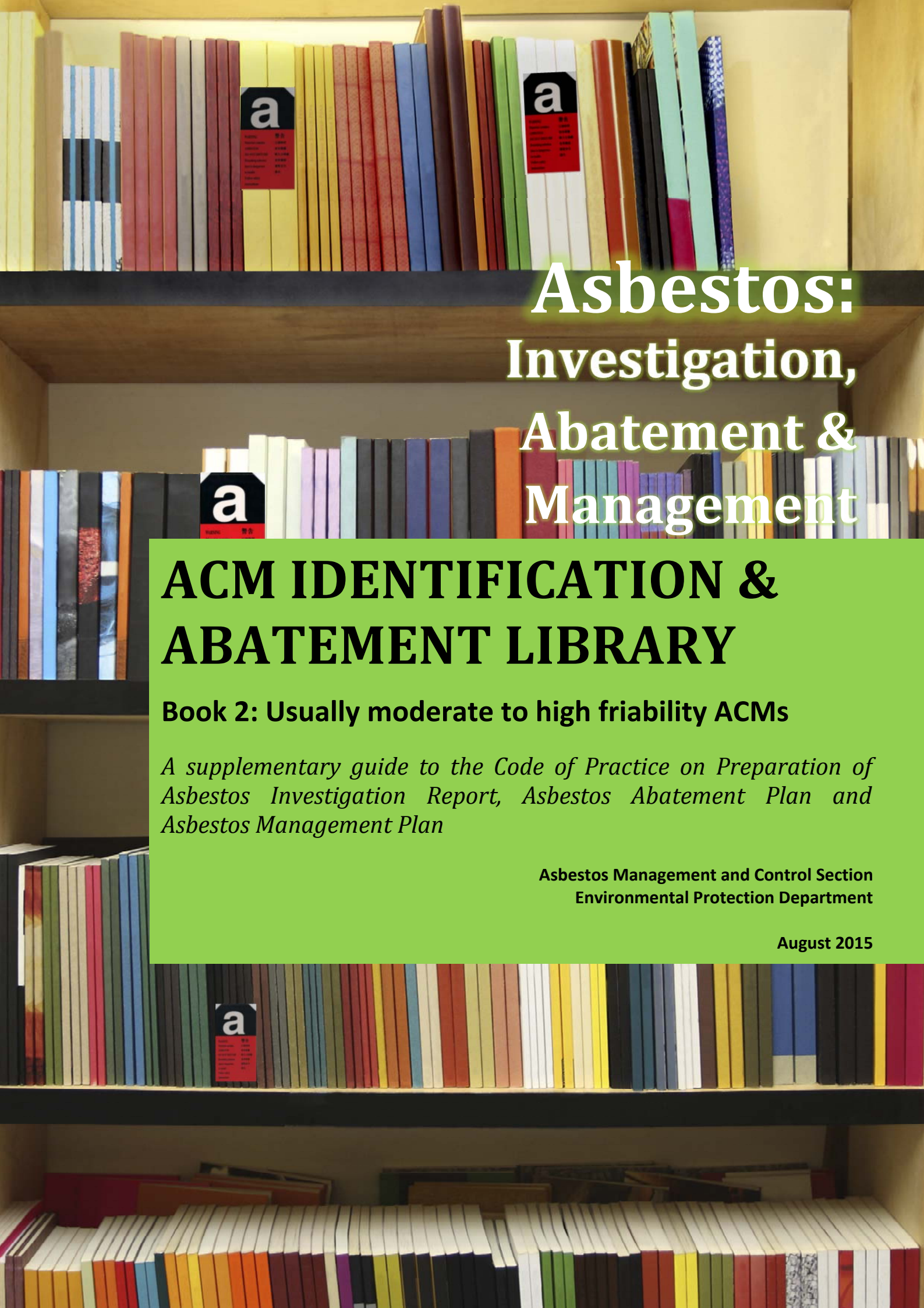


Asbestos: Investigation, Abatement & Management

ACM IDENTIFICATION & ABATEMENT LIBRARY

Book 2: Usually moderate to high friability ACMs

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

ACM IDENTIFICATION & ABATEMENT LIBRARY

Contents

These ACM Library sheets are to be read in association with the building modules and general guidelines. They have been categorized as low friability or moderate/high friability ACMs – although it is recognized that some ACM occurrences can occur in both categories of material. Where many similar products can contain asbestos they have been grouped into an ACM Library sheet for a category, e.g. asbestos cloth and paper products. However, if the ACM is sufficiently common in Hong Kong a separate ACM Library sheet has been produced to provide more in depth detail on identification and abatement, eg. fuse boxes

IDENTIFICATION

A. Occurrence and types of asbestos

Asbestos sprayed coatings – to ceilings, soffits, support beams and columns are now relatively rare in Hong Kong – which is fortunate since they are amongst the most hazardous ACM occurrences, and the most difficult to satisfactorily maintain or remove. However, they can still occur and the asbestos investigation must make all efforts to identify them. ACM coatings may not be all sprayed on but applied during a manufacturing process or applied by hand after installation. All asbestos mineral types can occur in sprayed and applied coatings: chrysotile and combinations of all amphibole types.

B. Identification of sprayed and applied coatings

The use of non-ACM sprayed coatings is now quite popular – for both acoustic and fire protection purposes. Unfortunately, some of these newer products – particularly those containing vermiculite can be naturally contaminated with asbestos. Therefore all sprayed coatings – no matter their age – must be bulk sampled.

Sprayed coatings are usually easy to identify because they are textured and not a plain surface like painted concrete. However, rare occurrences of un-textured sprayed coatings have been found and they are difficult to distinguish from a concrete surface – they tend to have more minor cracking than concrete and not have the imperfections of a cast concrete surface. The sound of them when hit is not as solid as a concrete surface though this cannot be relied on and after close inspection of surfaces if doubts remain then bulk sampling should be carried out.

Sprayed coatings can be concealed by newer fixtures and fittings such as suspended ceilings or wall panels. When inspecting a building consider its use or previous uses. If acoustic protection or fire protection was desirable in that sort of premises – eg. cinemas, sports halls, hospitals, public gathering places, fire escape routes from buildings – then checks should be made above all false ceilings and behind wall paneling.

ACM coatings can not only be sprayed on surfaces but also applied during a manufacturing process. An example that occurs in Hong Kong is "Galbestos" profiled metal wall and roof sheeting which has had a powdered asbestos finish bonded to the metal surface. This is difficult to detect from a distance and requires close up inspection of all profiled metal sheet – it is slightly thicker than a normal paint finish. All such suspect coatings should be bulk sampled.

C. Recommended good practice

Carry out a close up inspection of profiled metal sheet for surface coatings – if in doubt take a bulk sample. If building records indicate that sprayed coatings were present to ceilings or structural steel beams, but have since been removed - check that adjacent surfaces do not have an "overspray" residue from the application process. Always arrange for the removal of obscuring wall or ceiling panels if a buildings use is such that acoustic or fire protection should be present - check not only for the presence of coatings but also for overspray residue. Some sprayed coatings contain less than 1% asbestos but, because of the high friability of the material, should still be classified and handled as an ACM.

D. Associated ACMs

ACMs associated with sprayed coatings include asbestos cement sheet and insulation board that has also been used for similar fire/acoustic protection

Coarse textured sprayed ceiling coating

Fine textured sprayed ceiling coating

Sprayed coating to steel beams

ABATEMENT

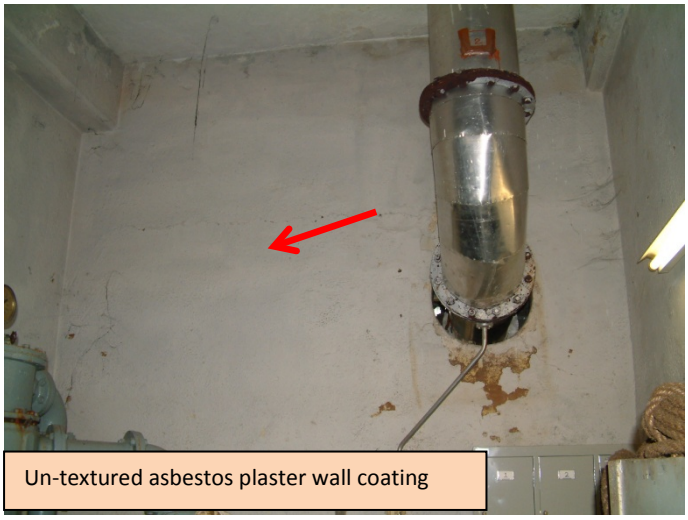
A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of sprayed and applied coatings are not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AIR/AAP must be prepared and submitted to EPD for approval. Removal work for all coatings must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall depend on the friability of the coating. Applied coatings such as "Galbestos" that are fused to metal can be removed using open segregation. All plaster coatings must be removed using full containment. The AAP method statement shall include the following requirements:

- For removal of low friability coatings such as "Galbestos" in an open segregated work zone all work zone erection, inspection and removal procedures shall be the same as described for corrugated asbestos cement sheeting (cacs) – refer to the ACM Library sheet 1-1 for cacs.
- For removal of sprayed coatings in a full containment work zone, detail the erection of the work zone. All surface areas in the work zone shall be sealed with polythene sheeting. Ensure that overspray areas are included in the work zone and not covered by polythene sheeting. It is advisable to allow at least 0.5m of uncovered wall surface beneath a sprayed ceiling to allow cleaning. If wall or ceiling panels are covering the sprayed coatings they are not to be removed until the work zone is fully erected. All covering panels shall be disposed of as asbestos waste during the asbesos abatement works. An elevated work platform is normally required for removal work from ceilings. If walls are also coated mobile work platforms offering access to all areas may be a better option. All platforms used must be protected from contamination or disposed of as asbestos waste at the end of the works period.
- Detail the requirement for decontamination units – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems. Ensure that there are no space constraints for siting a 3mx1m unit.
- Include a drawing to show the layout of the work zone and siting of decontamination units. A section view drawing aided with photographs should be included to detail work platform arrangement and access.
- Detail pre-cleaning measures and protective equipment for workers.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of smoke testing of the work zone.
- Removal of sprayed coatings can take a long time – especially if an underlying adhesive has been used to fix the coating to ceiling/walls. A full containment work zone may remain in place for days or weeks. Specify that the asbestos removal contractor inspects the polythene sheeting daily to check for integrity. Additional smoke tests after a few days work may be advisable if negative pressure drops substantially.
- Detail method of removal. Hand tools are required. Adequate wetting should be carried out first. The plaster coating shold be thoroughly wetted and allowed to soak – but the removal contractor should be made aware of the possibility of delamination and dropping of plaster if it becomes too heavy with added amended water. Removal shall proceed from the decontamination unit towards the air mover. Some sprayed coatings have an underlying bituminous fixing layer which must also be removed and disposed of as asbestos waste. The removal contractor shall dig out using hand tools all plaster residue from cracks and small holes in the concrete surface.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all exposed surfaces.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris and no plaster residue left in cracks and pits in the underlying concrete/metal surface.
- Leak and personal air testing is required during work and clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail location of the waste store.

B. WORK ACCEPTANCE

- A thorough close-up inspection of the cleaned concrete surface is essential. It is very difficult to remove all plaster residue from cracks and pits in the concrete surface – there should be clear evidence of tool marks and enlarged holes to show that the removal contractor has done this work.
- After satisfactory visual inspection and clearance air tests check behind polythene wall sheeting to ensure that debris has not fallen down behind the sheeting.

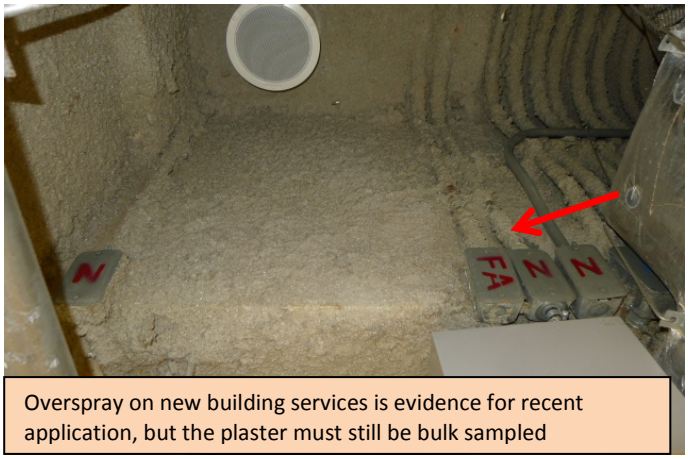


Un-textured asbestos plaster wall coating

Un-textured asbestos plaster can be detected by inspecting walls and ceilings for impact damage showing plaster layers beneath painted surface

Non-asbestos vermiculite-type sprayed plaster – this should be bulk sampled as natural asbestos contamination can occur

"Galbestos" asbestos coating to profiled metal wall sheeting to industrial building



Overspray on new building services is evidence for recent application, but the plaster must still be bulk sampled

"Galbestos" asbestos coating to profiled metal wall sheeting is only discernable with close-up inspection as a slightly thickened textured outer layer to the metal sheet

IDENTIFICATION

A. Occurrence and types of asbestos

Asbestos pipe insulation is common in buildings in Hong Kong. It has been found in all types of buildings, both internally, externally and in service tunnels/ducts/underground. Insulation types include plaster insulation (chrysotile and combinations of all amphibole types) and woven chrysotile cloth and rope insulation. Plaster insulation can be hand applied or purpose-made sectional insulation.

B. Identification of pipe insulation

Wherever hot water provision is made in a building, the pipe insulation should be checked for asbestos content. The important principle for successful identification of all asbestos pipe insulation occurrences is to trace the hot water pipes from source (heater /boiler etc.) to outlet (wash basin / bath/shower etc.). Premises can have both current and redundant hot water pipes present and they can be located internally and externally. Hot water pipes can often be buried in walls or concealed in service voids without obvious access panels or in old service tunnels no longer in use or accessible. If the existing hot water supply is visible, the RAC must carry out checks to ensure that a redundant buried supply is not missed during the investigation. Use survey pre-planning to identify as-built pipe layouts. Inspect for old pipe valves in walls. Metal detectors and bore scopes can help identify buried or concealed pipes.

Closely investigate insulation and assess how homogeneous the material is. It is common that, during the lifetime of a premises, engineering alteration works, plant replacement or repairs through water leakage, valve replacement or impact damage, may have resulted in replacement or repairs to short lengths or areas of insulation. This can result in a mix of ACM and non-ACM insulation materials being present. Differing surface hardness, variations in insulation thickness or smoothness of outer coating, or differing paint colour can all indicate that replacement insulation is present. Differing insulation is common to pipe elbows – particularly where preformed lengths of insulation have been used for straight pipe runs. All of these areas should be visually checked and bulk sampled if different insulation is suspected to be present. Full depth bulk samples should be taken to ensure that differing insulation layers are identified and are all sampled. The most common asbestos pipe insulation in Hong Kong is cloth/rope and plaster, but the RAC should check all other varieties of insulation or wrap to pipework – asbestos paper, felt and bituminous coatings have all been identified.

The building modules for plant rooms/industrial premises, hotels and restaurants contain further advice on identifying asbestos insulated pipes, particularly the pre-planning and assessment stages of a survey. It is extremely important to try and obtain as-built drawings showing original pipe layouts and the presence of service tunnels and concealed service ducts.

C. Recommended good practice

It is common in Hong Kong that pipe insulation can have two or more types/layers of different insulation. Therefore, whilst pipe insulation that is visibly, or by analysis, confirmed to be ACM should be left undisturbed, insulation that is visibly non-ACM, eg. canvas, glass fibre, polystyrene, foam etc., should be subjected to further inspection.

Asbestos rope pipe insulation

Asbestos plaster pipe insulation


Asbestos plaster pipe insulation

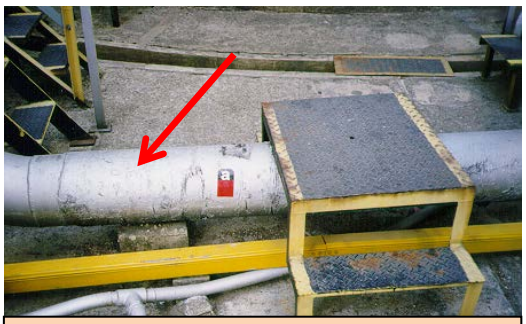

Sectional asbestos plaster pipe insulation

Plaster insulation confirmed by analysis to be non-ACM should also be included in these further inspections as follows:

- A sharp edged tool, such as a screwdriver or knife, should be used at very regular intervals to check for concealed layers of different insulation. Inspection should be made down to the metal of the pipe/plant. Glass fibre insulation with an inner layer of asbestos rope or cloth is particularly common in Hong Kong, and glass fibre insulation with asbestos plaster to pipe elbows also occurs. The RAC should make enough inspections to ensure that these materials are not missed. Glass fibre insulation is commonly covered by an outer canvas wrap. The string used to stitch the edges of the canvas wrapping together can be asbestos string and should be checked. Pipe valves in particular are prone to replacement or repair and can have differing insulation to pipes either side.
- Pipes may have had previous insulation removed and newer insulation installed. Sufficient areas of non-ACM insulation should be removed to check for any remnant insulation on the metal pipe/plant.
- Modern, preformed sections of outer metal cladding to pipes and plant are common in some plant rooms and can give the impression that the insulation materials beneath are of recent installation. This is very misleading and older ACM insulation materials can be present. The RAC should arrange to remove sufficient metal cladding to enable a full inspection. This may require arrangement with the client and an engineering contractor employed to re-install cladding – particularly where fixed by rivets.
- Liaise with site engineers and identify all pipe types, e.g. hot water and steam – both flow and return, chiller pipes, drain etc. Pipes can have differing insulation dependent on their function – even when they may be painted the same colour or have the same outer metal cladding or canvas wrap. All pipe types should be visibly inspected and bulk sampled as appropriate.
- Even when pipe insulation is visibly non-ACM and inspections show no concealed layers, asbestos cloth or asbestos sheet gasket material has sometimes been used to line the metal pipe support brackets. Therefore, both exposed brackets and those covered by insulation should be checked.

Unfortunately, it is common for pipes to be accidentally damaged during inspection of buried pipes and water leaks can occur. The RAC should ensure that they are redundant, or the water supply has been turned off, or a plumber is on standby in case of accidents.

Cut off remnants of pipes through floor slab with asbestos plaster pipe insulation



Bituminous asbestos and hessian wrap to external pipes

Asbestos rope pipe insulation beneath glass fibre insulation

Asbestos cloth pipe insulation beneath glass fibre insulation partially wrapped in metal foil

D. Associated ACMs

ACMs associated with asbestos pipe insulation include any insulation or gaskets to the hot water source – water heaters, boilers, calorifers etc. ACM gaskets can be present to pipe flange joints. ACMs can be present as sheet lining to plant plinths, linings to pipe support brackets, and as packing around pipes as they pass through floor and wall slabs.

ABATEMENT

A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of pipe insulation is not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AAP must be prepared and submitted to EPD for approval. Removal work for all pipe insulation must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall usually be full containment. The AAP method statement shall include the following requirements:

- Although the EPD CoP provides details for removal work using mini-containment or by glove bag, they are rarely used in Hong Kong. Under exceptional circumstances EPD may approve this method, but the RAC shall provide strong justification for their use. Very low friable insulation such as asbestos bituminous wrap pipe insulation may be considered for removal in segregated work zones. However, the majority of abatement to asbestos insulated pipes shall be by the full containment method. Because of past problems obtaining an acceptable standard of cleaning – particularly to pipe joints, EPD prefer that the pipes are removed using a "cut and wrap method" whereby pipes sections are removed whole with the insulation intact and wrapped for disposal as asbestos waste.
- **Work zone design** Preferably at the asbestos investigation stage whilst still on site, decide on the best design of the work zone. Consider access – how will all the pipe insulation be removed and are there any access constraints? Is there space for a full size decontamination unit? Asbestos removal contractors prefer to erect one large work zone rather than many adjacent smaller ones – it is more economical, faster and less use of air movers. Consider how to combine ACM occurrences into one work zone. Horizontal pipe runs between rooms can be incorporated into one work zone if wall partitions can be removed without disturbing the pipe insulation. Consider the amount of HEPA plant available to asbestos removal contractors. Removal from a vertical pipe duct in a tower block will usually have to be done in phases of 5 to 10 work zones per time. Consider how to protect non-work areas from disturbance or contamination from adjacent work zones. A buffer system using an in-situ full containment work zone is one solution. Box seals around pipe ends is another – if an ACM insulated pipe just extends through a wall then ends it can be preferable to seal the outside end with a box seal and carry out all removal work from the other side of the wall, removing concrete/bricks as required for access. Consider the preferred method of cut and wrap – is it suitable or must the pipe stay in-situ? Request the owner to provide written justification for remaining in-situ. If so, will the pipes remain in use? Will removal of insulation cause damage or water leaks? If the pipes remain in use and are hot, will heat stress become a problem for removal operatives? Is there a possibility of buried pipe insulation in the work zone – allow sufficient space inside the work zone, including outlets such as wash basins, for further investigation of all buried pipes. Will the available locations for siting of air movers allow proper air flow across the work zone or will dead areas of no air flow be created? Specify additional air movers, or use of internal flexible tubing to better direct air flow. If doubts remain then provisional standby air movers can be specified and used if necessary. For work zones erected on work platforms provide details of the work platform design. Ensure that uninterrupted air flow is possible down a scaffolded work zone. Ensure that an external staircase is provided for inspectors to view the removal works at height. Carefully inspect adjacent wall and floor surfaces where very friable plaster insulation or any damaged pipe insulation may have caused debris to be present. Very minor amounts can be removed during the pre-clean. However, if significant quantities of debris are present the walls and floors should be left undisturbed and not covered by polythene sheeting and decontaminated and cleaned during asbestos abatement work.

  Work zone erection Detail the erection of the work zone. All surface areas in the work zone shall be sealed with polythene sheeting. If buried pipes are to be excavated, spray paint their location and ensure they are not covered by polythene sheeting. If an entire pipe run is not being removed – detail the sealing and precaution measures as pipes exit the work zone. Ensure that ACM debris cannot drop unimpeded when removing vertical pipe runs – temporary catch fans of polythene sheeting can be installed.
- Detail the requirement for decontamination units – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems. Ensure that there are no space constraints for siting a 3mx1m unit.
- Include a drawing to show the layout of the work zone and siting of decontamination units and air movers. A section view drawing perhaps aided with photographs should be included for vertical work zones, containments on work platforms and any complicated work process.
- Detail pre-cleaning measures and protective equipment for workers. Substantial pipe insulation debris must be left undisturbed until after erection of the work zone.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of smoke tests on full containment zones.

- Detail method of removal. All pipe insulation should be wetted with amended water and allowed to soak and re-wetted if left for any period of time. For cut and wrap method the pipe lengths should be dismantled or cut where insulation is not present. The pipes should not be wrapped in polythene sheeting until after satisfactory smoke testing and commencement of asbestos removal work. Hand tools are required for all removal works. If insulation is to be removed off in-situ pipes the RAC should ensure adequate wetting is carried out first – this can be specified and witnessed on site after completion of smoke testing. Specify how the pipes are to be cleaned – wet wiping and vacuum clenaing followed by wire brushing and further wet wiping is required. Detail the requirements for disposal of all pipe support brackets as asbestos waste – they must be dug out of walls or cut off flush with the wall. All concrete and brick surfaces that pipes pass through must be cleaned – by wire brushing the brick/concrete that has been in contact with the ACM or by digging it out and dispose as asbestos waste. All contaminated wall andfloor surfaces must be cleaned by wet wiping and wire brushing. It is very difficult to remove ACM plaster debris from rough brick or concrete surfaces and thorough cleaning is essential – wet wiping and vacuum cleaning may not be sufficient. If visual inspection still shows small pieces of debris – usually bright white against the darker brick/concrete surface, then hand chisels should be used to remove the surface.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all exposed surfaces.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris. Inspection of all metal surfaces that have been in contact with the asbestos insulation and confirmation that no fine remnants remain shall form part of this inspection.
- Leak and personal air testing is required during work and clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail location of the waste store.

B. WORK ACCEPTANCE

- Metal pipe surfaces shall have clear evidence of wire brush cleaning and be free of dust. Check the pipe flanges carefully to ensure that no fine debris remains. If inspection in ducts or other small places is difficult- use an extendible mirror to inspect hidden surfaces. Common locations to find debris left is on horizontal surfaces beneath pipes – window ledges, tops of light switches, pipe brackets left in-situ, etc.
- Bad practice by removal contractors is to use water hose pipes to wash work zones down after removal. Any plaster debris can be scattered everywhere by the water pressure. Inspect nearby walls for evidence of splash marks and debris. Inspect drains and drainage channels for debris.
- For removal through wall/floor slabs check that concrete/brick surfaces are clean and free of debris – any pipe sleeves should have been removed.
- For pipes exiting work zones check that the seals outside of the full containment area are still in-situ and the ACM insulated pipes are hazard labelled. Inside the work zone do not allow any sealing of cut off pipes (by cement/foam/mastic etc.) until after RAC inspection. Take photographs to show the standard of removal up to the wall/floor surface and how any cut off pipe insulation has been left in-situ before sealing.
- Check that the removal contractor has traced and removed all pipes and dug out walls/floors to expose any buried pipes. Trace the pipe from source to outlet to confirm this has been done. If buried pipes are not ACM insulated and are to be left in-situ, take photographs for record.

Breaking out pipes to check for buried insulation

ACM plaster debris left behind after removal of buried ACM insulated pipes

IDENTIFICATION

A. Occurrence and types of asbestos

To define the terms used, a flue refers to an actual pipe containing exhaust gases from an item of plant, whilst a chimney provides a conduit for exhaust gases up to the roof level of a building, either enclosing a flue or without any internal flue pipe. Asbestos flue pipe insulation is common in buildings in Hong Kong, but chimneys constructed with ACMs are rare. Flue insulation is found in all types of buildings in Hong Kong, not only to hot water systems, but also to diesel generators, kitchen cooking range extract systems and incinerators. Insulation types include plaster insulation (chrysotile and combinations of all amphibole types) and woven chrysotile cloth and rope insulation.

Chimney consisting of external non-asbestos cement render (1) on top of compressed timber board (2) with asbestos plaster to rectangular flue inside (3)

B. Identification of flue and chimney insulation

The building modules for plant rooms/industrial premises, hotels and restaurants contain further advice on identifying asbestos insulated flues and chimneys, particularly the pre-planning and assessment stages of a survey. Survey pre-planning to identify presence of flues, construction materials of chimneys and location of redundant items – particularly those concealed in walls - can help identify associated ACMs. Chimneys can be incorporated into walls and redundant ones capped-off at roof level making them difficult to identify on site without prior knowledge.

The identification measures to identify ACM flue insulation are very similar to those for hot water pipe insulation, and the pipe insulation library sheet 2-2 should also be referred to. Measures such as assessing homogeneity of insulation, finding differing insulation along flue length, bulk sampling procedures etc., should all be followed.

Chimneys will always require some intrusive inspection through the outer walls to carry out an inspection for internal linings or a flue pipe. Inspection from access hatches or ash pits at the base of chimneys is not sufficient – insulation materials may vary up the chimney. However, all access hatches and joint flanges should be inspected for ACM door seals and gaskets. Inspections should be carried near the exhaust gas source, half way along the chimney and near the outlet to establish there are no differing materials in use. Inspect for plaster linings or packing materials that have been used to prevent smoke leaks. The common firebrick plaster installed does usually contain asbestos, but some instances are ACM. Inspect chimney brickwork, normally they are standard non-ACM red construction bricks, but they should be broken open for inspection and any of unusual colour or texture bulk sampled.

Asbestos cloth remnants on flue that has been re-insulated with non-asbestos cement render and glass fibre insulation

C. Recommended good practice

Best practice to identify ACM flue insulation is very similar to those for hot water pipe insulation, and the pipe insulation library sheet 2-2 should also be referred to. Inspection procedures, removal of covering materials, checking support brackets should all be followed.

Asbestos plaster flue insulation covered by glass fibre insulation

D. Associated ACMs

ACMs associated with asbestos flue/chimney insulation include any insulation or gaskets to the exhaust gas source – water heaters, boilers, calorifers. ACM gaskets can be present to flange joints and present as seals to flue/chimney inspection hatches and joints and brackets.

ABATEMENT

A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of flue and chimney insulation is not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AAP must be prepared and submitted to EPD for approval. Removal work for all insulation and gaskets must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall usually be full containment. The AAP method statement shall include the following requirements:

- Although the EPD CoP provides details for removal work using mini-containment or by glove bag, they are rarely used in Hong Kong. Under exceptional circumstances EPD may approve their use, but the RAC shall provide strong justification for their use. Very low friable insulation such as asbestos bituminous wrap flue insulation may be considered for removal in segregated work zones. However, the majority of abatement to asbestos insulated flues and chimneys shall be by the full containment method. Because of past problems obtaining an acceptable standard of cleaning – particularly to flue joints, EPD prefer that the flues pipes are removed where possible using a "cut and wrap method" whereby flue sections are removed whole with the insulation intact and wrapped for disposal as asbestos waste.
- **Work zone design** Preferably at the asbestos investigation stage whilst still on site, decide on the best design of the work zone. Consider access – how will all the flue/chimney insulation be removed and are there any access constraints? Is there space for a full size decontamination unit? External work zones should be erected using metal scaffold work platforms – rather than bamboo - to reduce movement during high winds and movement of workers on the scaffold that can affect the integrity of the full containment polythene sheet seals. Consider if an entire flue can be include in one work zone – or will internal or horizontal elements require additional work zones. Detail if this requires phased removal work and the extent of sealing between work zones. Consider the preferred method of cut and wrap – is it suitable or impractical for the flue concerned? Will the available locations for siting of air movers allow proper air flow across the work zone or will dead areas of no air flow be created? Specify additional air movers, or use of internal flexible tubing to better direct air flow. If doubts remain then provisional standby air movers can be specified and used if necessary. For work zones erected on work platforms provide details of the work platform design. The scaffold design should allow for the additonal loading of flue/chimney parts as they are stored on work platforms before transfer. Ensure that uninterrupted air flow is possible down a scaffolded work zone. Ensure that an external staircase is provided for inspectors to view the removal works at height. Carefully inspect adjacent wall and floor surfaces where very friable plaster insulation or any damaged flue pipe insulation may have caused debris to be present. Very minor amounts can be removed during the pre-clean. However, if significant quantities of debris are present the walls and floors should be left undisturbed and not covered by polythene sheeting and decontaminated and cleaned during asbestos abatement work.

  Work zone erection Detail the erection of the work zone. All surface areas in the work zone shall be sealed with polythene sheeting. If an entire flue or chimney is not being removed – detail the sealing and precaution measures as ACMs exit the work zone. Ensure that ACM debris cannot drop unimpeded when removing vertical occurrences – temporary catch fans of polythene sheeting can be installed.
- Detail the requirement for decontamination units – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems. Ensure that there are no space constraints for siting a 3mx1m unit.
- Include a drawing to show the layout of the work zone and siting of decontamination units and air movers. A section view drawing perhaps aided with photographs should be included for all vertical work zones, containments on work platforms and any complicated work process.
- Detail pre-cleaning measures and protective equipment for workers.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of smoke tests on full containment zones.
- Detail method of removal. All flue/chimney insulation should be wetted with amended water and allowed to soak and re-wetted if left for any period of time. For cut and wrap method the flue pipe lengths should be dismantled or cut where insulation is not present. The flue pipes should not be wrapped in polythene sheeting until after satisfactory smoke testing and commencement of asbestos removal work. Hand tools are required for all removal works. If insulation is to be removed off in-situ flue pipes the RAC should ensure adequate wetting is carried out first – this can be specified and witnessed on site after completion of smoke testing. Specify how the flues are to be cleaned – wet wiping and vacuum cleaning followed by wire brushing and further wet wiping is required. Flue pipe joints may have asbestos jooint gaskets, the flue joints should be unbolted and the gaskets removed. Alternatively, the cleaned metal can be cut either side of the joint and the section removed whole with the gasket still in-situ. Use of low powered band saws has

been allowed previously for works defined as non-asbestos – such as to cut metal flues parts for disposal. Any planned use of powered equipment to cut metal should clearly detail how it is not asbestos works, will not disturb ACMs, and be pre-approved by EPD before AAP implementation. Detail the requirements for disposal of all flue pipe support brackets as asbestos waste – they must be dug out of walls or cut off flush with the wall. All concrete and brick surfaces that flue pipes pass through must be cleaned – by either wire brushing the brick/concrete that has been in contact with the ACM or by digging it out and dispose as asbestos waste. It is very difficult to remove ACM plaster debris from rough brick or concrete surfaces and thorough cleaning is essential – wet wiping and vacuum cleaning may not be sufficient. If visual inspection still shows small pieces of debris – usually bright white against the darker brick/concrete surface, then hand chisels should be used to remove the surface.

- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all exposed surfaces.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris. Inspection of all metal surfaces that have been in contact with ACMs and confirmation that no fine remnants remain shall form part of this inspection.
- Leak and personal air testing is required during work, with environmental testing at adjacent sensitive receivers, and clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail location of the waste store.

B. WORK ACCEPTANCE

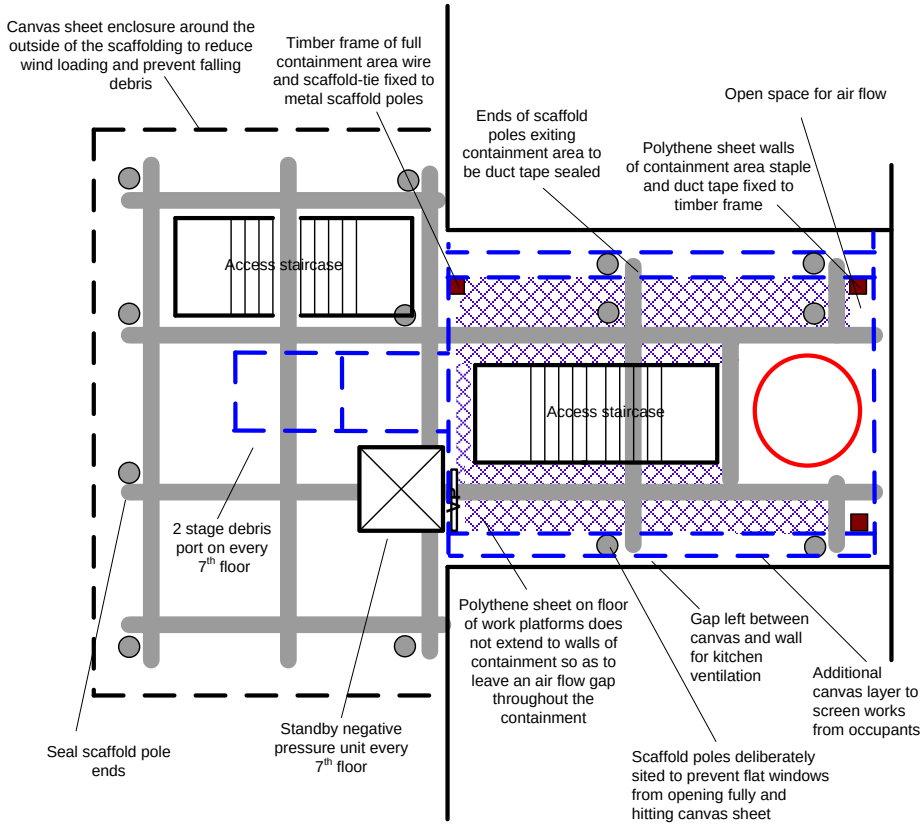
- Metal pipe surfaces shall have clear evidence of wire brush cleaning and be free of dust. Check the flue pipe flanges carefully to ensure that no fine debris remains. Common locations to find debris left is on adjacent horizontal ledges, pipe support brackets of adjacent pipes, etc.
- For removal through wall/floor slabs check that concrete/brick surfaces are clean and free of debris – any pipe sleeves should have been removed.
- For flue pipes exiting work zones check that the seals outside of the full containment area are still in-situ and the ACM insulated flues are hazard labelled. Inside the work zone do not allow any sealing of cut off flue pipes (by cement/foam/ mastic etc.) until after RAC inspection. Take photographs to show the stadard of removal up to the wall/floor surface how any cut off flue pipe insulation has been left in-situ before sealing.

Metal scaffold should be used. Ensure a separate external staircase for access for work inspection

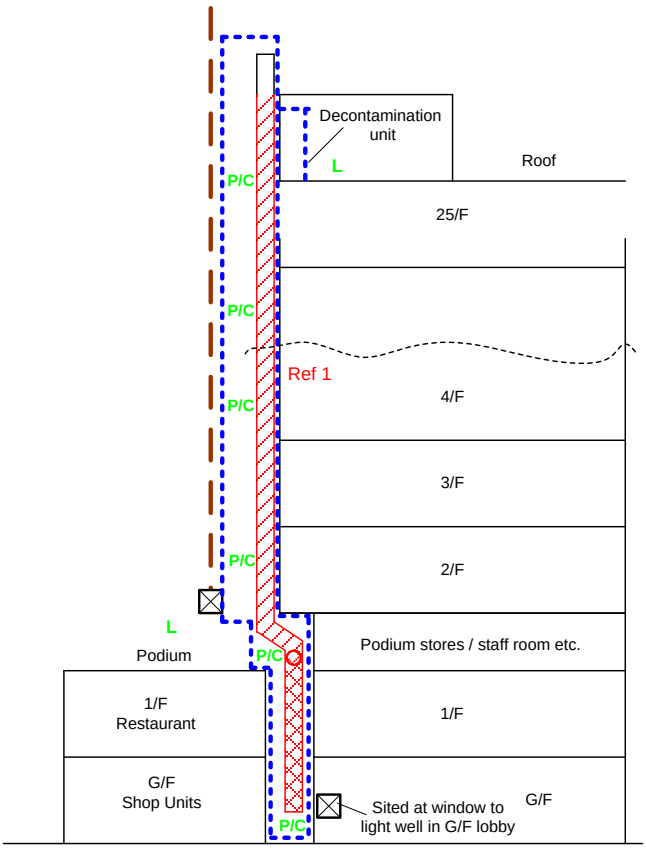
Uninsulated flues – and flues after insulation removal should be dismantled at flange joints to inspect for and remove any asbestos gaskets

Access plates to flues and chimneys can also contain asbestos gasket seals. These can complicate thorough inspection and should not be disturbed until removal

Ensure sufficient open spaces in a vertical work zone for air flow, but ensure debris cannot drop unimpeded



Provide very detailed work zone drawings that consider requirements for external inspection of works, air flow within the containment area and any impact of erection of work zone on nearby residents



As well as plan view of work zone provide section view drawings of work zone with location of decontamination unit and air movers.

Provide separate drawings for location of environmental air tests around the works perimeter at any sensitive receivers.

IDENTIFICATION

A. **Occurrence and types of asbestos**

Asbestos cloth flexible joints are common in buildings throughout Hong Kong – both to air conditioning plant and other plant requiring vibration damping gaskets – such as electric generators. The flexible joints are typically chrysotile woven cloth.

B. **Identification of flexible joints**

Asbestos cloth is relatively easy to visually identify. However, woven glass fibre replacement products commonly occur. Non-ACM canvas is also used for flexible joints, but a type of finely woven asbestos cloth has also been identified which is visually quite similar to non-ACM canvas. Flexible joints can be paint sealed, making positive identification between asbestos cloth and woven glass fibre difficult. Therefore, all woven flexible joints should be sampled for positive identification.

A common replacement product is glass fibre reinforced rubber. It can look like a woven product. Close inspection or feel is often necessary to determine that it is not a woven cloth product.

Flexible joints typically occur between ducting and the plant machinery it is connected to, eg. air handling unit. However, they can also be used at any point along a length of ducting – wherever vibration damping or new connections are required. Therefore, during an asbestos investigation, the entire length of ducting – from source to outlet - should be inspected for joints.

C. **Recommended good practice**

Flexible joints can be concealed by outer insulation layers – typically aluminium sheet, polystyrene sheet or glass fibre mat with aluminium foil outer layer. Therefore, these outer layers should be removed sufficient to inspect the joint. Often, a screwdriver or similar sharp tool can be used to detect the presence of a flexible joint beneath concealing outer layers. However, on air conditioning systems any such holes made should be repaired to prevent condensation leaks.

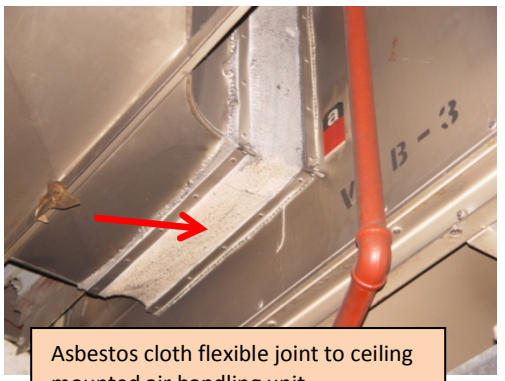
Ceiling mounted fan coil units for air conditioning systems in ceiling voids are a common place to find flexible joints. Unfortunately, foam condensation drip trays can conceal flexible joints from an inspection below the unit. Access to ceiling voids must be made during asbestos investigations, and ladder or work platforms used to inspect at height to check for concealed joints.

Since flexible joints are not just limited to air conditioning systems – emergency electrical generators commonly have flexible joints to their air intake ducting – all plant that is connected to ducts/trunking etc., that may require a flexible connection should be inspected, with removal or inspection through outer coverings as necessary.

D. Associated ACMs

ACMs associated with flexible joints are the adjacent plant flange joints gaskets which can be hard non-woven asbestos gaskets or asbestos cloth/rope. Asbestos sheet lining is sometimes used to line ducting – both internally and externally. Heater boxes to air ducts can have asbestos sheet linings to the box lid and around heating elements.

Asbestos cloth flexible joints to free standing air handling unit.



Asbestos cloth flexible joint to ceiling mounted air handling unit.

Asbestos cloth gaskets to flange plates to connection to flexible tubes for AC supply.

Asbestos cloth flexible joint exposed by removal of glass fibre

ABATEMENT

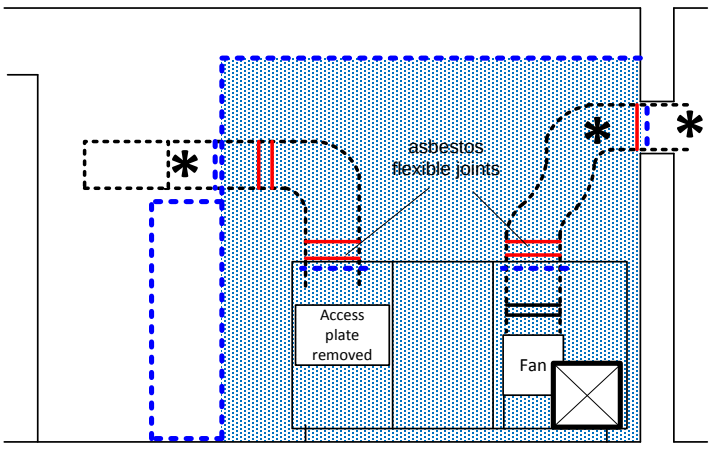
A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of flexible joints and associated cloth flange gaskets are not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AAP must be prepared and submitted to EPD for approval. Removal work for all flexible joints and gaskets must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall be full containment. The AAP method statement shall include the following requirements:

- Detail the erection of the work zone. All surface areas in the work zone shall be sealed with polythene sheeting. For every flexible joint, detail measures to prevent ACM debris from contaminating adjacent lengths of trunking or falling downwards into an air handling unit. This shall require opening of access hatches in air handling units and sealing the trunking opening with polythene sheeting. Similarly, trunking access hatches should be removed (check first that there are no asbestos door seals that will be disturbed) and the inside of the trunking either side of the flexible joint sealed with polythene sheeting. If no convenient hatches are available, then the metal trunking could be dismantled at a convenient flange joint (as long as there are no asbestos gaskets present) or the trunking can be cut with non-electric hand tools and a suitable opening made. This should be done at a distance (~0.5m) from any ACMs to prevent disturbance.
- Detail the requirement for decontamination units – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems. Ensure that there are no space constraints for siting a 3mx1m unit.
- Include a drawing to show the layout of the work zone and siting of decontamination units. A section view drawing aided with photographs should be included to detail the location of hatches for internal sealing of dismantling trunking or cutting access holes.
- Detail pre-cleaning measures and protective equipment for workers.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of any smoke tests on full containment zones.
- Detail method of removal. Hand tools are required. Specify how the flexible joints are to be removed and the reqirements for cleaning/disposal/retention of metal trunking. The cloth is usually fixed by rivets or bolts through metal retaining bars to the adjacent metal flanges. These should be cut or loosened and the cloth removed. Adequate wetting should be carried out first. All metal surfaces that have been in contact with the asbestos cloth should be adequately cleaned by wire brushing and wet wiping, making sure that rivet/bolt holes are properly cleaned. The cloth remnants can be very difficult to totally remove and thorough cleaning is important. If the metal cannot be cleaned to an acceptable standard it should be cut out and disposed as asbestos waste. After removal of the flexible joint, the interior of the trunking up to and including the polythene seals shall be cleaned by wet wiping/vacuum cleaning.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all exposed surfaces.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris. Inspection of all metal surfaces that have been in contact with the asbestos cloth and confirmation that no fine remnants remain shall form part of this inspection.
- Leak and personal air testing is required during work and clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail location of the waste store.

B. WORK ACCEPTANCE

- Metal trunking surfaces shall have clear evidence of wire brush cleaning and be free of dust. Check the metal flanges carefully to ensure that no fine debris remains. If in doubt the metal should be cut out and disposed of as asbestos waste. Pay particular attention to bolt/rivet holes where cloth fragments may be caught on sharp metal edges.
- Check inside the trunking and air handling units to check that no debris remains and surfaces have been cleaned.



* Opening cut in metal trunking to allow polytherne sheet seal to be fixed across the inside of the trunking

IDENTIFICATION

A. Occurrence and types of asbestos

Cable and pipe seals are common in buildings throughout Hong Kong – residential, schools, hospitals and commercial/industrial buildings. The seals, occurring as cables or pipes pass through floor and wall slabs, can be comprised of various ACMs. Both hard and soft asbestos plaster (chrysotile or amphibole asbestos types) and chrysotile rope/cloth are typically used. Mastics or cement reinforced with chrysotile also occur.

B. Identification of seals

ACM seals have been found to hot water pipes and fire services cold water pipes and even pvc drain pipes, so all pipe seals should be checked. Electric cables commonly pass through plastic or metal sleeves embedded in floors/walls. Electric cables contained in metal trunking can often have both internal seals – such as asbestos board jointly used as fire barrier sheets and as cable stays – as well as external plaster/cloth/rope packing around the trunking. Electric bus bars can have similar packing materials.

Plaster and rope/cloth seals can be ACM or non-ACM substitutes, and bulk sample analysis is recommended for positive identification. However, it is often difficult to safely inspect for these materials – particularly on a live electric supply and caution is recommended. All electrical systems have to be regularly inspected by certified electrical workers, and it is recommended that asbestos investigation is carried out at these times or other periods when the electric supply is isolated.

Purpose-made block seals may be used to surround a lot of cables – particularly in premises where additional cables installation/regular re-cabling may be required. Typically made of vermiculite type materials or similar, these should always be bulk sampled even if of recent age.

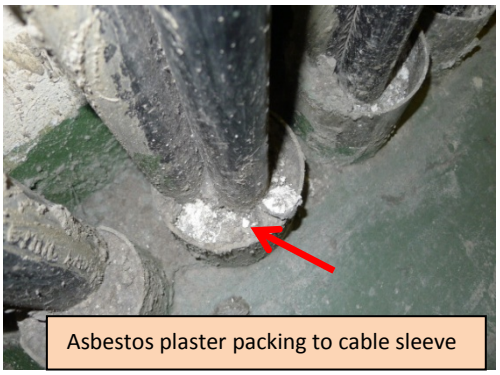
C. Recommended good practice

A thin non-ACM cement or mastic seal can be placed over the top of an inner seal made from a different material, so checks should be made through the top layer to check what material is being used for any inner layers for all of the types of seals encountered. However, top layers that are suspected to be ACM should not be disturbed. Although rare, mastic seals used as the top layer of cable sleeve seals have been found to contain asbestos, and should be bulk sampled during the investigation.

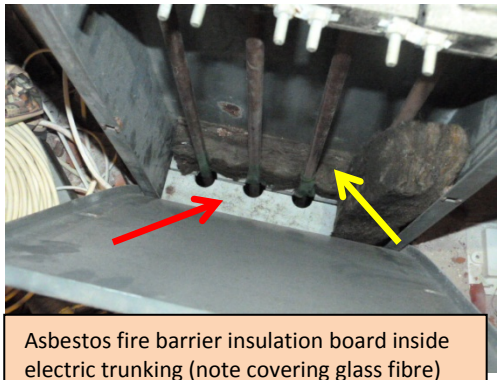
Internal asbestos fire barrier sheeting is such a common occurrence in electrical trunking that, until it can be opened up for inspection, it should always be assumed to contain ACMs if not properly accessed during the asbestos investigation. Note that ACMs can be concealed by glass fibre mat placed on top – remove for thorough inspection.

D. Associated ACMs

ACMs associated with cable and pipe seals can be insulating materials to pipes and cables. Pipes can have asbestos plaster/cloth/rope insulation, whilst cables can have an asbestos cloth outer wrap impregnated with a bituminous coating. Electric trunking can be lined – both internally and externally with asbestos cement sheeting or insulation board. Asbestos containing fuse boxes are commonly associated with electricity supply.

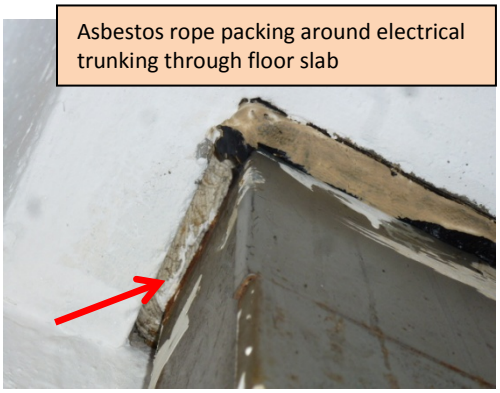


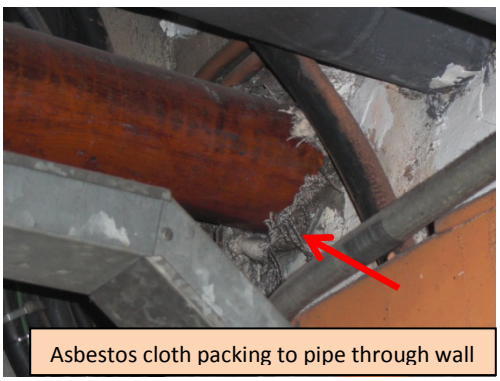
Asbestos plaster packing to cable sleeve



Asbestos fire barrier insulation board inside electric trunking (note covering glass fibre)

Asbestos rope packing around electrical trunking through floor slab





Asbestos cloth packing to pipe through wall

ABATEMENT

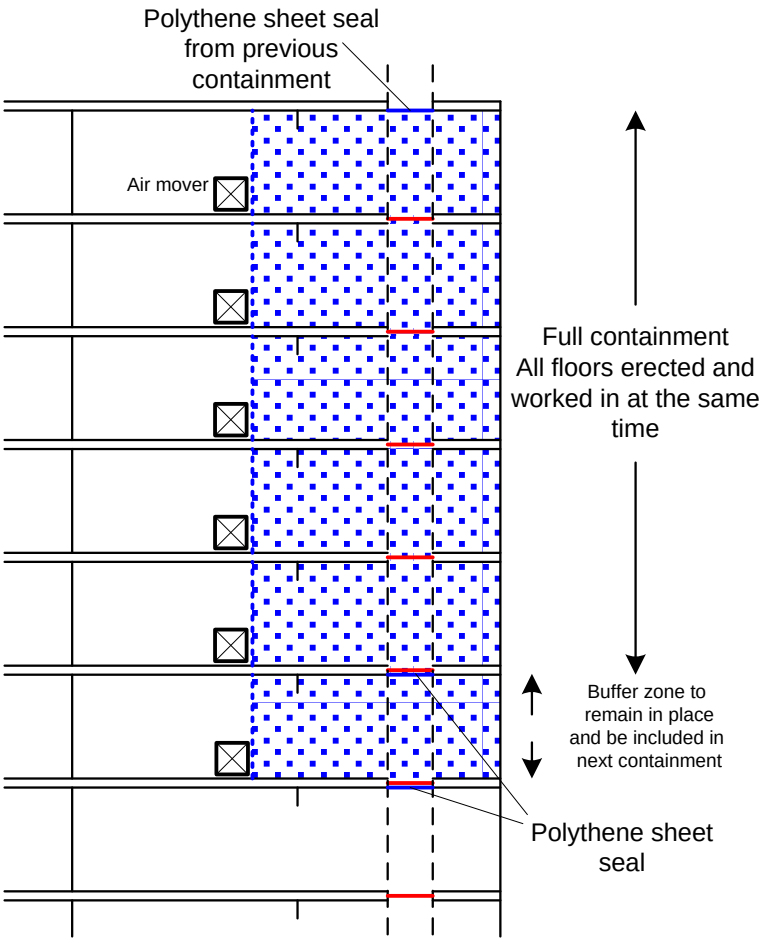
A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

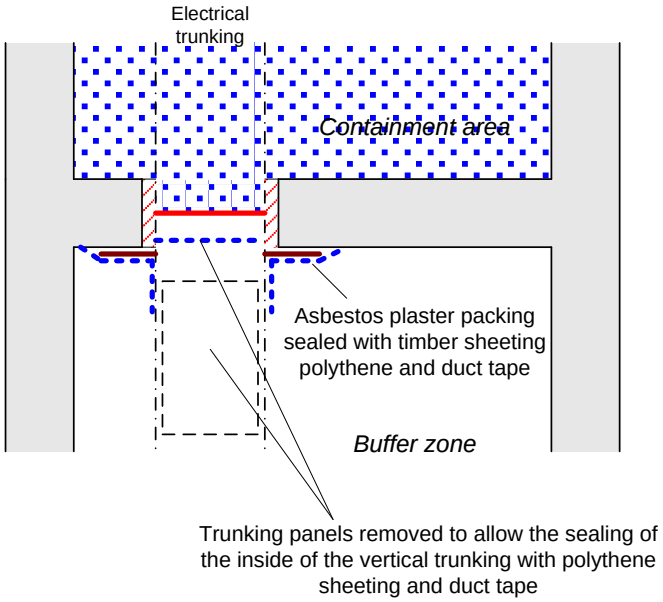
Removal of cable and pipe seals is not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AAP must be prepared and submitted to EPD for approval. Removal work for all cable/pipe seals must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The choice of removal method depends on the friability of the ACM seal. The AAP method statement shall include the following requirements:

- Specify the type of work zone. Low friability cement/mastic seals can be removed in a segregated work zone. Removal of plaster/rope/cloth seals will require full containment. If there are doubts about friability, trial removal of a small area with air testing can be specified to assess the suitability of the work method.
- Detail the erection of the work zone. Both open segregation and full containment will require sealing of all surface areas in the work zone with polythene sheeting. For vertical cable/pipe runs with multiple seals through successive floor slabs, consider the size of the work zone – how many floors can be completed at one time? This may depend on the amount of HEPA equipment that can be provided. If not all seals can be done at the same time then consider how to adequately seal and protect in-situ ACM seals during removal of adjacent occurrences. A buffer zone beneath active work zones - consisting of a sealed completely erected work zone - is one solution. Detail measures to prevent ACM debris falling downwards during work on vertical occurrences.
- Detail the requirement for decontamination units – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems. Ensure that there are no space constraints for siting a 3mx1m unit.
- Include a drawing to show the layout of the work zone and siting of decontamination units. A section view drawing is essential to properly detail the use of any buffer zones, sealing between floors, sequence of work etc.
- Detail pre-cleaning measures and protective equipment for workers.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of any smoke tests on full containment zones.
- Detail method of removal. Hand tools are required. Specify how the seal is to be removed and the reqirements for cleaning/disposal/retention of pipes, cables and any enclosing trunking. Hard plaster packing may be more easily removed with the cable/pipe intact – specify cutting pipe/cables either side of the seal and removal in a whole piece if possible. All plaster packing will create debris – specify measures to prevent falling, such as temporary polythene sheet/duct tape benath the seal. Wherever breakage will occur, mist spraying of water and vacuuming shall be used to minimise fibre release.
- Pipes and metal trunking can be cleaned by wet wiping and wire brushing to remove any debris. Metal bus bars and plastic coated cables can be similarly cleaned. These items should be cleaned and kept inside the work zone for air testing and consultant inspection prior to recycling. All pipes/cables that have been in contact with ACMs but cannot be adequately cleaned, eg. due to surface pitting, should be disposed of as asbestos waste. Specify methods for cleaning concrete wall/floor slabs – wire brushing etc., and the requirement to remove all concrete/brick and pipe/cable sleeves that have been in contact with ACMs and disposal as asbestos waste.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all surfaces.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris.
- Personal air testing is required during work and reassurance/clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene/canvas sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail the location of the temporary asbestos waste store(s). For removal down all floors of a building specify waste transfer routes to the waste stores (not building lifts) and inspection measures after completion of all transfer. The Emergency Measures section of the AAP for spilled ACMs should be tailored for the specific premises being worked in.

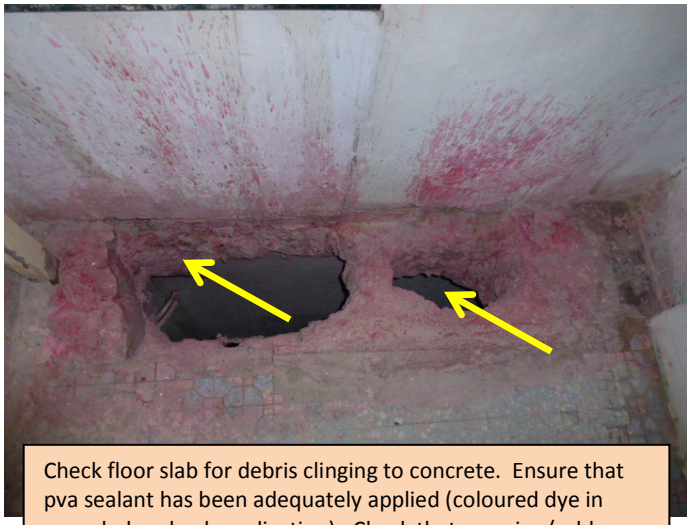
B. WORK ACCEPTANCE

- All retained cables/pipes/metal trunking shall have clear evidence of wire brush cleaning and be free of dust – wipe with a dark cloth to check. Ensure the laboratory dust disturbance measures during air testing includes these items.
- Check wall/floor slab edges very carefully for plaster/cloth/ rope debris clinging to the surfaces. Use a mirror to view difficult access areas for visual inspection. Metal trunkning should not be left in-situ because it obscures full visual inspection for debris.





Use section drawings to indicate layout of work zones and any measures such as buffer zones and sealing measures to prevent ACM disturbance during phased removal works.



Check floor slab for debris clinging to concrete. Ensure that pva sealant has been adequately applied (coloured dye in spray helps check application). Check that any pipe/cable sleeves have been removed.

Check walls beneath slab openings to ensure they have been protected from contamination or properly cleaned afterwards

IDENTIFICATION

A. Occurrence and types of asbestos

Asbestos containing materials – commonly asbestos rope/cloth top plate seals and hard non-woven gaskets - are common in older electrical distribution transformers. This equipment – used to step down transmission voltages to the lower levels used in buildings – is common in building transformer rooms and sub-stations. They are usually the property of the utility company supplying power and their disposal is handled in-house or by sub-contracting to metal recycling companies. The rope and cloth seals and hard non-woven gaskets typically contain chrysotile.

Electrical distribution transformer asbestos hazard labelled prior to disposal

B. Identification of ACMs in distribution transformers

The ACMs are rarely visible by external examination, but should be assumed to be present – both chrysotile rope/cloth and hard gasket seals and listed in the AIR as asbestos containing equipment.

If the equipment is owned by the utility company an AAP is not usually necessary since the utility will remove the equipment from the premises at the end of it life and dispose of in accordance with in-house policy. However, a RAC may be commissioned by a metal recycling company who has taken possession of the equipment to prepare an AAP to remove all ACMs prior to metal recycling.

Each unit should be recorded with its identification number for record and tracing during disposal. If disposal arrangements are already known, the AIR should include details of the storage site of the units and, if they are being transferred to another location for abatement, then details of this location recorded as well as details of the different parties involved in any transfer of ownership and abatement.

Electrical distribution transformers in storage. All units should be uniquely marked to enable tracing during abatement and disposal

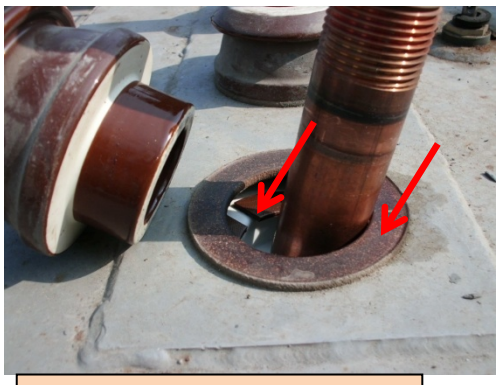
C. Recommended good practice

During the AIR the RAC should establish who owns the equipment and check if it has already been hazard labelled. If not owned by the utility company they should be hazard labelled and the owner detailed in the AIR. The AIR should make recommendations for abatement at the end of the equipment operating life and detail who has responsibility for equipment disposal.

Asbestos rope gasket seal inside top plate

D. Associated ACMs

ACMs associated with distribution transformers are those that typically occur in electrical plant rooms – ACMs inside fuse boxes, electrical control panels, cloth fire blankets to wall louvres, flexible joints and gaskets to ventilation ducting, cable coating and packing.



Hard non-woven gaskets to plant

ABATEMENT

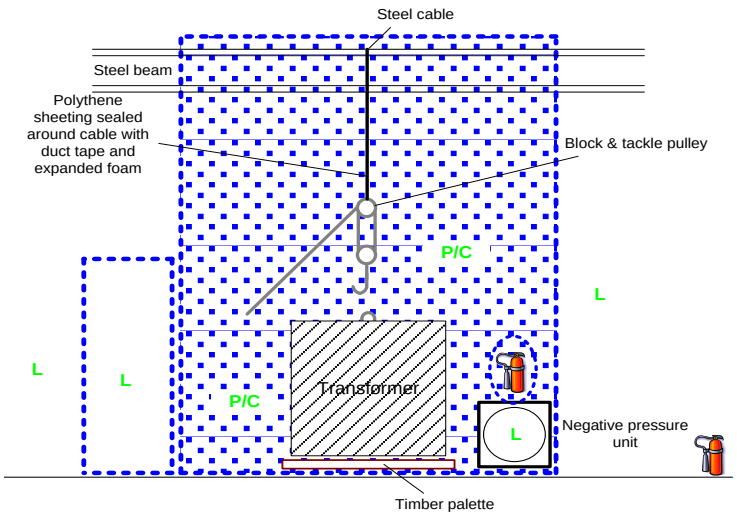
A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of ACMs from distribution transformers are not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AAP must be prepared and submitted to EPD for approval. Removal work for all ACMs must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall be full containment. The AAP method statement shall include the following requirements:

- Detail the erection of the work zone. A purpose built full containment area should be erected around the distribution transformer – or if a number of units are being disposed of, then a purpose built work zone can be erected in the premises of the disposing company.
- A three stage decontamination unit is required and a negative pressure unit (air mover) attached at the opposite end of the containment from the decontamination unit.
- Include a drawing to show the layout of the work zone and siting of decontamination unit. A section view drawing aided with photographs should be included to detail the method of handling the heavy units and lift top plates – hand operated pulley hoist is usually sufficient. This should be totally included in the full containment work zone from a metal support beam protected from contamination.
- The oil in transformers could come into contact with the asbestos seals and become contaminated with asbestos fibres. Previous studies found that analysis of the oil did not contain sufficient fibres to be classed as an asbestos containing material. However, as a precaution the AAP should specify that the oil is to be drained from the transformers and collected by a chemical waste collector for disposal as chemical waste. The filter used for draining shall be placed in a waste bag for disposal as asbestos waste.
- Because the top plates are welded, electric disk cutter have to be used to cut the welds. This can be done without disturbing the asbestos seals inside the unit and can be defined as non-asbestos work. However, it should be carried out inside the full containment area by personnel wearing PPE. Protective measures – fire extinguisher and fibre glass welding blankets should be included to prevent fire from cutting sparks.
- Detail pre-cleaning measures and protective equipment for workers. The units should be wrapped in polythene sheeting apart from plates or pipe connections suspected to have ACM seals and gaskets.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of any smoke tests on full containment zones.
- Detail method of removal. The metal plate welds should be cut with a disk cutter, then the equipment removed from the work zone or sealed in polythene bags. The top plate should be lifted using the hoist sufficient to expose and remove all ACM seals and clean the inside of the unit. The oil shall then be drained from the transformer tank and filtered for removal of particles down to 5µ in suspension prior to disposal. If visible asbestos debris is present inside the transformer tank, then the removal operatives shall be instructed to wet wipe clean the inside of the tank and all component windings etc. After cleaning the windings the inside of the tank shall be sealed with polythene sheet to prevent contamination during the removal of the seals and gaskets. Adequate wetting should be carried out first. The top rope seal and all bushings shall be sprayed with amended water and allowed to soak. The ACM materials shall be removed using hand tools and immediately placed in waste bags for disposal. Where metal surfaces have been in contact with ACMs they shall be wet wiped, wire brushed and vacuum cleaned.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all exposed surfaces.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris. Inspection of all metal surfaces that have been in contact with the asbestos seals and confirmation that no fine remnants remain shall form part of this inspection.
- Leak and personal air testing is required during work and clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail location of the waste store.

B. WORK ACCEPTANCE

- Metal trunking surfaces shall have clear evidence of wire brush cleaning and be free of dust. Check the metal flanges carefully to ensure that no fine debris remains. If in doubt the metal should be cut out and disposed of as asbestos waste. Pay particular attention to areas where cloth fragments may be caught on sharp metal edges.

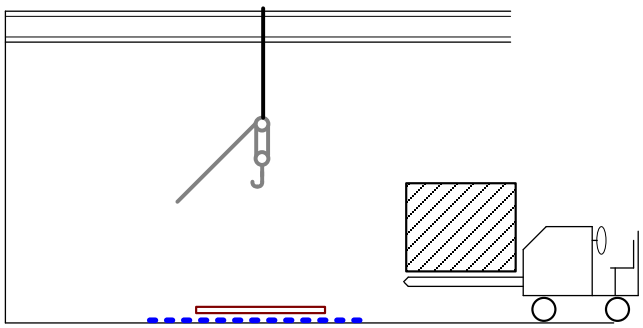


Elevation view of decontamination unit

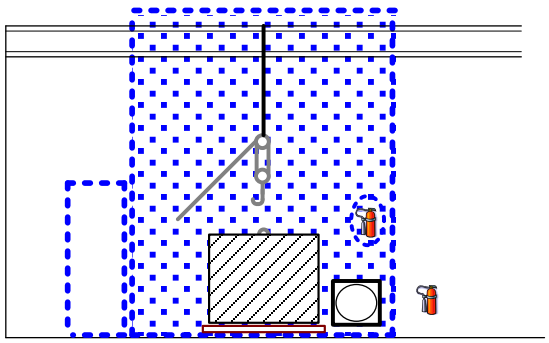
Distribution transformer inside work zone

Provide work zone drawings detailing all work zone elements and lift gear to be used and sequence of works

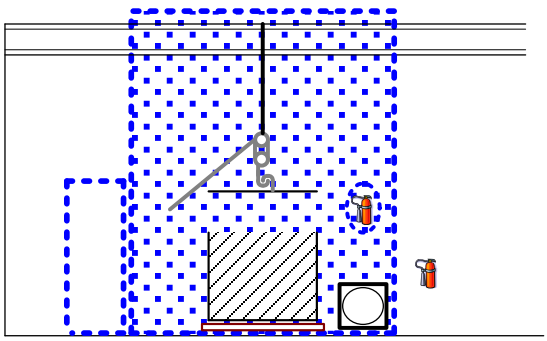
Hoist and pulley system in place to lift heavy parts



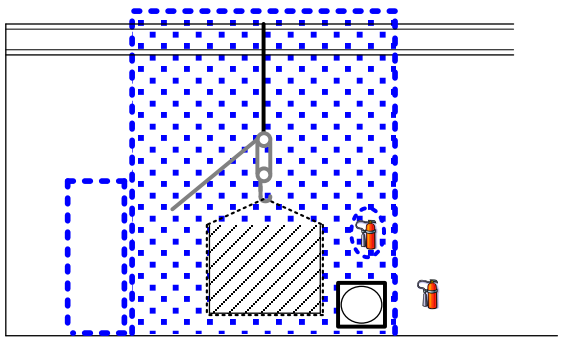
Stage 1 Polythene sheeting laid on the floor with a timber palette placed in the centre and the transformer placed on the palette



Stage 2 Containment area built around the transformer



Stage 3 Top of transformer removed to allow removal of ACMs



Stage 3 Following satisfactory air tests and consultants inspection transformer to be lifted to allow removal of polythene sheeting and timber palette prior to removal of containment

IDENTIFICATION

A. Occurrence and types of asbestos

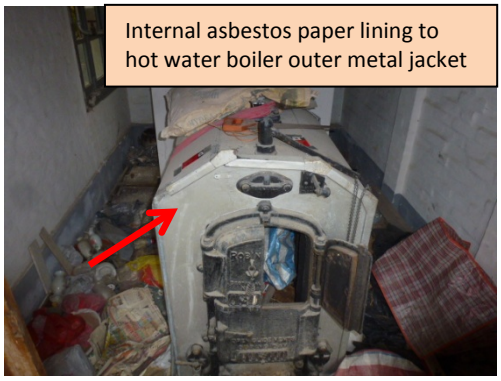
The most common use of asbestos cloth products in Hong Kong is in pipe/flue insulation, cloth flexible joints, joint gaskets to plant, inside fuse boxes, and as packing materials to pipes and electric cables. All of these uses are detailed in separate sheets in this ACM Identification and Abatement Library. This sheet refers to other minor uses of woven cloth and paper products that are found in Hong Kong. The products typically contain chrysotile asbestos.

Asbestos cloth fire blanket in typical red metal container

B. Identification of paper/cloth products

These products can be difficult to identify – particularly asbestos paper products that can appear like normal paper. The use of these materials is very diverse, and not all possible uses can be included in this information sheet. The best method for identification is to consider the location of the material and the properties of asbestos. Any paper product that has been used in a situation where heat/insulation/fire protection may be required should be sampled/analyzed for asbestos. Examples of where these materials have been identified are as follows:

- Paper lining to metal boiler jackets
- Paper lining to fuse boxes and their backing boards
- Paper lining to heater boxes to air ducts
- Paper linings inside wall mounted hot water heaters
- Paper lining beneath vinyl floor sheeting
- String stitching used on non-ACM canvas/glass fibre wrap to flue/pipe insulation
- String inside flexible metal electric cable conduit
- Wall mounted cloth fire blanket (usually in red metal container)
- Cloth blankets to ventilation grilles in electric sub stations
- Rope packing to top of partition walls
- Rope packing inside building expansion joints
- Woven cloth outer layer to electric wiring to lift control panels, hot water heaters, electric mains cable inlets to buildings.



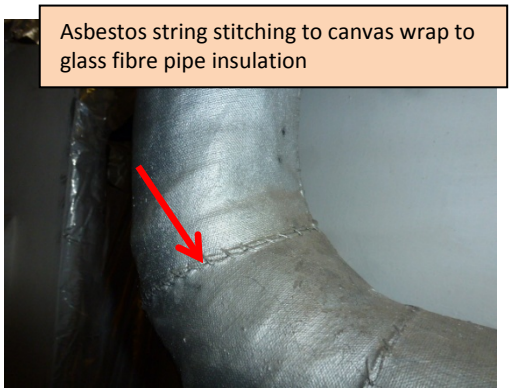
Internal asbestos paper lining to hot water boiler outer metal jacket

Asbestos cloth blanket covering wall louvre panel in electric sub-station

C. Recommended good practice

Always consider the location of the suspect material. Ordinary paper or cloth would not have been used in the many locations where asbestos paper/cloth has been installed because of fire risk or risk of electric arc discharges. If inspection of any plant or cable/pipe identifies a paper or woven product has been used, it is recommended to take a bulk sample.

Many companies made asbestos paper products – both plain paper and corrugated cardboard types - and these products are often branded. Carry out an Internet search for any brand names observed on suspect products for any information that could confirm asbestos content.



Asbestos string stitching to canvas wrap to glass fibre pipe insulation

D. Associated ACMs

ACMs associated with asbestos paper and cloth products are usually with the adjacent plant items – such as pipe/flue insulation, fuse boxes, flange joint gaskets, lift brakes, electric cable seals etc.

ABATEMENT

A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of asbestos cloth and paper products are not usually exempt from the reporting requirements of the Air Pollution Control Ordinance, unless they have been gazetted as such. Exempt items include asbestos in fuse boxes and asbestos rope/cloth gland and valve packing. For all other products an AIR and AAP must be prepared and submitted to EPD for approval. Abatement work for these products must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall depend on the item and whether it can be collected and disposed of without fibre release. Asbestos fire blankets in their container, small ovens with asbestos door seals etc., can usually just be disposed of direct to landfill by a registered chemical (asbestos) waste collector. However, the RAC should consult EPD for their current requirements – particularly for unusual or rare occurrences. Occurrences that cannot be handled without some disturbance to the ACMs shall usually require a segregated or full containment work zone. The AAP method statement shall include the following requirements:

- Detail the erection of the work zone. All surface areas in the work zone shall be sealed with polythene sheeting. For every ACM occurrence, detail measures to prevent ACM debris from contaminating adjacent plant or surfaces during removal. This may require opening of plant and sealing the areas with polythene sheeting.
- Detail the requirement for decontamination units – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems. Ensure that there are no space constraints for siting a 3mx1m unit.
- Include a drawing to show the layout of the work zone and siting of decontamination units. A section view drawing aided with photographs should be included to detail the location of any required sealing works to adjacent areas.
- Detail pre-cleaning measures and protective equipment for workers.
- The asbestos consultant shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. EPD shall be notified 24 hours in advance of any smoke tests on full containment zones.
- Detail method of removal. Hand tools are required. Loose items such as fire blankets still in their container, or gland packing in boxes/bags, or small ovens can be wrapped with polythene sheeting and disposed of whole as asbestos waste. Specify how the ACMs are to be removed and the reqirements for cleaning/disposal/retention of metal fixtures. Cloth or paper products are usually glued or fixed by rivets or bolts or metal retaining bars to the Plant items or wall/floor fixtures. If multiple ACM occurrences are present, categorise their abatement method by ease of removal without disturbing ACMs.

  Disposal of whole items: Occurrences that have been glued to other items – such as oven door seals, or loose items such as fire blankets, loose gaskets and packing, etc. - should be categorised as whole items to be wrapped for disposal as asbestos waste (reduce waste by specifying partial dismantling and retention of equipment where possible without disturbing ACMs). Such easily disposable items may require no work zone at all, but the RAC shall inspect to ensure no debris benath or adjacent to items: some decontamination cleaning and reassurance air tests may be advisable. As a minimum, the personnel collecting the ACMs shall wear Personal Protective Equipment (PPE) and wet wipe surrounding areas – disposing of PPE and cloths as asbestos waste.

  Removal of ACMs from other fixtures: ACMs that cannot be immediately wrapped for removal without some disturbance to the ACMs or surrounding areas will require cleaning during and after removal – such as cloth blankets fixed to wall louvre grilles, ACM coatings to electrical wirings, asbestos string occurrences, loose unpainted articles stored on shelves and in drawers etc., shall require a work zone for abatement. Minor occurrences, or where ACM disturbance is miminal can be removed in a segregated work zone, but all other ACM abatement should be done in a full containment area – particularly where cloth and paper products will be extensively handled, screw and nail fixings pulled out, folded etc., during removal and surrounding surfaces comprehensively cleaned with wire brushing and vacuum cleaning.

  Work zone specification: Using the guidelines above the RAC shall specify the type of work zone and provide justification for selection.

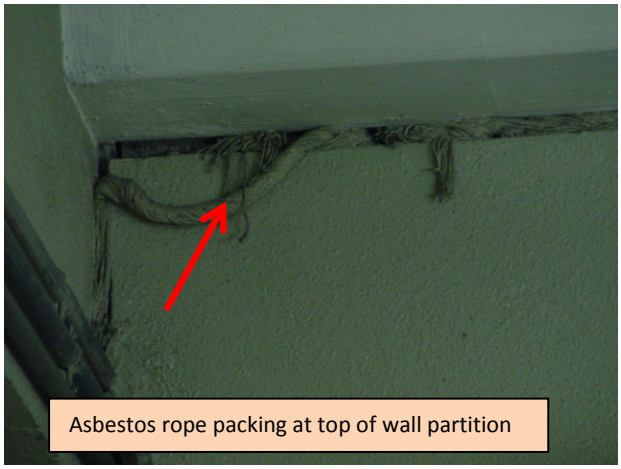
  Removal methods: Adequate wetting should be carried out first. If the ACMs are part of electrical equipment to be retained consider how this can be cleaned and protected from excessive water. All metal surfaces that have been in contact with asbestos cloth/rope or paper should be adequately cleaned by wire brushing and wet wiping, making sure that rivet/bolt holes are properly cleaned. The remnants can be very difficult to totally remove and thorough cleaning is important. If the metal cannot be cleaned to an acceptable standard it should be cut out and disposed as asbestos waste. After removal of the ACM products, the adjacent areas and plant shall be cleaned by wet wiping/wire brushing and vacuum cleaning.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all exposed surfaces.

- The RAC shall inspect the completed removal works. Written inspection records are required. Acceptance criteria is the absence of visible dust & debris.
- Inspection of all metal surfaces that have been in contact with asbestos products and confirmation that no fine remnants remain shall form part of this inspection.
- Leak and personal air testing is required during work and reassurance or clearance air tests afterwards. The number of air tests to be taken depends on the square metre or cubic metre area of the work zone, this should be calculated in accordance with the guidelines in the EPD CoP.
- Detail the dismantling of the work zone and the disposal of all polythene sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail location of the waste store.

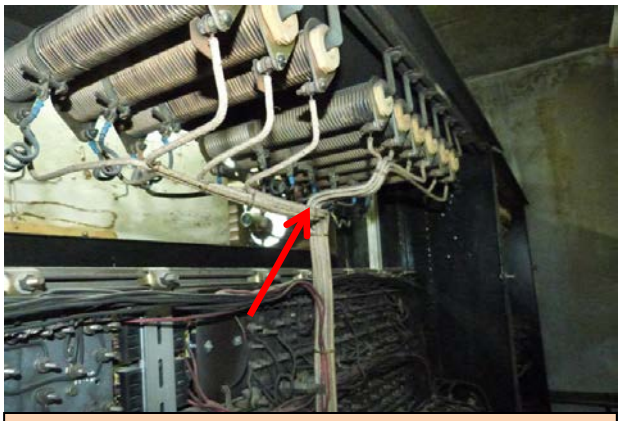
B. WORK ACCEPTANCE

- Metal surfaces shall have clear evidence of wire brush cleaning and be free of dust. Check the metal flanges carefully to ensure that no fine debris remains. If in doubt the metal should be cut out and disposed of as asbestos waste. Pay particular attention to bolt/rivet holes where ACM fragments may be caught on sharp metal edges.
- Check inside adjacent plant to check that no debris remains and surfaces have been cleaned.
- Where loose items have been collected check that there is no debris in the surrounding area and that shelves, drawers etc., have been wet wiped.

Asbestos rope inside building expansion joint


Asbestos rope packing at top of wall partition


Asbestos string wrapped inside flexible metal cable conduit


Asbestos cable insulation inside lift machine control panel