

# Asbestos: Investigation, Abatement & Management

## ACM IDENTIFICATION & ABATEMENT LIBRARY

### Book 1: Usually low 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

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# ACM IDENTIFICATION & ABATEMENT LIBRARY

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*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

Corrugated asbestos cement sheeting (cacs) is one of the most common ACMs in Hong Kong, being used as roof sheeting, canopies, and in rural areas as linings to fields and paths. Flat profile sheeting is not as common, but is used as wall and, less commonly, internal partition sheeting and suspended ceiling tiles (refer to separate ACM Library sheet 1-2). Chrysotile is the most common asbestos analyzed in the sheeting, but traces of amphibole asbestos – typically amosite or crocidolite - can occur as well.

### B. Identification of cement sheeting

Corrugated asbestos cement sheet (cacs) is very distinctive with a grey cement colour and corrugated profile. The external surface is typically weathered and stained with moss/lichen growth or even plants growing on it, although painted surfaces can obscure the distinctive colour. The underside of the sheeting has a stippled pattern that is very distinctive. Being cement, the material makes a distinctive sound when hit with a metallic tool.

Misidentification can occur with glass fibre reinforced resinous corrugated sheeting if close inspection is not possible and the material has been stained by weathering. Corrugated cement sheeting can be covered by a sand and cement render that can obscure the material. Corrugated and flat profile metal sheeting is also commonly used in buildings, and often a mix of asbestos and non-asbestos corrugated and flat profile sheeting can occur in one location. As cacs ages it can leak and many premises owners have covered older cacs roof sheeting with newer metal roof sheeting. This can be at a height above the original roof, or directly on top, making identification difficult.

Corrugated asbestos cement sheet has been extensively used in some rural areas of Hong Kong as lining to paths and fields. Loose sheets have been used to cover drainage culverts, wells and other holes in the ground. Identifying all such occurrences is difficult if concealed by vegetation. When preparing AIR for rural areas prior to redevelopment the RAC should require removal of vegetation to make inspection easier or arrange to return to site at a later date as this is carried out.

### C. Recommended good practice

Because of its common use as roof and canopy sheeting it can be difficult from ground level to identify all external sheeting used on a building – particularly tower blocks. Inspection from adjacent high vantage points is recommended. However, because it can be covered by newer materials or a sand/cement render, inspections should also be carried out below suspect materials as well. Temporary housing and squatter areas use a large number of materials in their construction and additional layers can be added for further weather protection. Inspection both inside and outside premises, and checking walls and roofs for a sandwich construction with inner ACM layers is advised.

### D. Associated ACMs

Where flues, or similar, pass through the sheet, check what material has been used to provide packing around the cement sheet – asbestos rope and plaster have both been used in these circumstances.



Cacs wall sheeting concealed behind metal sheet showing typical stippled pattern



Metal roof sheeting covering older cacs roof



Squatter hut made from a mix of cacs and metal wall and roof sheeting with cacs also used to line fields



Cacs pitched roof concealed by parapet wall from ground level inspection

**ABATEMENT**

**A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT**

For corrugated cement sheet removal in a fire zone refer to the fire site module for abatement details. Corrugated cement removal not within a fire site is exempt from the reporting requirements of the Air Pollution Control Ordinance. Unless a building owner specifically requests a method statement for contractual or work monitoring purposes, or an AAP is being prepared for an entire building with many ACM types, it is not necessary to prepare an asbestos abatement plan just for corrugated cement sheet. Other types of cement sheet – including flat profile sheeting, ceiling tiles, wall partitions etc., all require production of an AAP and submission to EPD. Removal work for all cement sheeting must be done by a registered asbestos removal contractor – either to a prepared AAP or in accordance with the EPD code of practice and guidance notes on removal of low risk ACMs. When prepared, AAPs shall include a comprehensive method statement for the removal of cement sheeting. The method statement shall include the following requirements:

- Specify the type of work zone, open segregation is the usual requirement. However, if sheeting cannot be removed without minimal breakage, then a full containment work zone should be specified. If there are doubts about friability of the sheeting a 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. For external occurrences a floor to 2m height above the ACM occurrence canvas sheet barrier is expected for segregated work zones. If the work zone is immediately adjacent to other occupied premises, specify a canvas sheet cover over the top of the work zone as well. Continuous strips of duct tape are expected to seal canvas sheet to prevent debris falling behind the sheeting. For internal occurrences, polythene sheeting should be used to seal all floor and wall surfaces within the work zone.
- Detail the requirement for a decontamination unit – 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. For large scale removal work, specify a 2 stage debris port for easier waste pack handling.
- Include a work zone plan to show the layout of the work zone and siting of decontamination unit. A section view drawing is also useful for external occurrences or to detail internal work zone erection details.
- Remove, or seal with polythene sheeting, all furniture in the work area. Check for concealed occurrences beneath non-ACM wall and ceiling sheeting whilst preparing the work zone.

- Detail pre-cleaning measures and protective equipment for workers.
- Specify who is to inspect the prepared work zone and certify it suitable for use. Written inspection records are expected.
- Detail method of removal. Hand tools are required. Specify method of unfixing cement sheet. All hook bolts from cacs should be disposed of as asbestos waste. If cement sheet has to be unscrewed, or nails removed, specify adequate or constant mist wetting and shadowing by vacuum cleaner to reduce fibre release. Dispose of all fixings as asbestos waste. Detail removal of any cement render. This should be done by hand tools with the minimum of breakage and disposed of as asbestos waste. Leaving cement render behind in the work zone is not acceptable.
- Once the cement sheeting has been removed specify the method of cleaning the supporting framework. Metal frames can easily be cleaned by wire brushing and wet wiping. Timber frames need more thorough cleaning – particularly of screw and nail holes.
- Specify thorough cleaning of work zone after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all surfaces.
- Specify who shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and debris.
- Personal air testing is required during work and reassurance air tests afterwards. The number of reassurance 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 section 7.2 of the EPD code of practice on removal of low risk ACMs.
- 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 (usually 1, but check if amphibole asbestos is present in the sheeting and specify Type 3 waste if present). Detail the location of the temporary asbestos waste store.

**B. WORK ACCEPTANCE**

- Typical removal errors include leaving cement sheet fixings on the floor – hook bolts etc., and not carrying out sufficient cleaning of supporting frames. Debris can be left in nail/screw holes in timber frames – which requires digging out or the frame disposed of as asbestos waste. Dust left behind on surfaces of metal framework is also common.
- Leaving behind non-ACM brick/concrete debris or cement render is not acceptable and the floors beneath removed cement sheet should be clear of all visible dust and debris.

## IDENTIFICATION

### A. Occurrence and types of asbestos

Flat profile asbestos cement sheeting is fairly common in Hong Kong, used as external and internal wall partition sheeting, as ceiling tiles/sheeting, door linings and in purpose-made products such as linings to fume cupboards, work benches and as chalkboards. Chrysotile is the most common asbestos analyzed in the sheeting, but traces of amphibole asbestos – typically amosite or crocidolite - can occur as well – particularly where the sheeting is being used to protect surfaces from chemicals. Corrugated asbestos cement sheeting (cacs) is much more common - being used as roof sheeting, canopies, and in rural areas as linings to fields and paths (refer to separate ACM Library sheet 1-1).

### B. Identification of cement sheeting

Asbestos cement sheet is very distinctive with a grey cement colour and fibre bundles visible on unpainted surfaces. Where used externally, the surface can be weathered/stained with moss/lichen growth, but painted surfaces can obscure the distinctive colour. The underside of the sheeting can have a stippled pattern that is indicative. Being cement, the material makes a distinctive sound when hit with a metallic tool.

Misidentification can occur with glass fibre reinforced cementitious sheeting or hard mica-reinforced insulation boarding if close inspection is not possible and the material has been stained by weathering or painted. Rarely, flat profile cement sheeting can be covered by a sand and cement render that can obscure the material. Identification of all flat profile cement sheet inside a building will be dependent on good surveying practice and a comprehensive bulk sampling and inspection strategy.

All walls, ceilings, eaves, gables, and doors inside premises must be checked – a few random checks can miss ACM occurrences. Hollow or cementitious sounding walls or ceiling sheeting/tiles must be further investigated. Doors to plant rooms, dangerous goods stores or older fire doors must be checked for outer or internal cement sheet linings. Electricity supply ducts can be lined or made of asbestos cement sheet. In premises that have laboratories, handle chemicals, rooms with heat producing equipment – such as kitchens, metal handling workshops - check fume cupboard wall linings and work tops, work benches for a cement sheet top, check walls around chemicals or heat producing equipment which may be lined with cement sheet. Older chalkboards are commonly asbestos cement – they are not limited to schools and can occur in any type of premises. They can often be multi-layered with non-ACM layers on top of ACM layers. Partitions between toilet cubicles can sometimes be asbestos cement sheet.

A ceiling in one room may be timber, whilst asbestos cement in another (especially in older colonial type premises). Externally, asbestos cement has been used as sight screens on tower blocks.

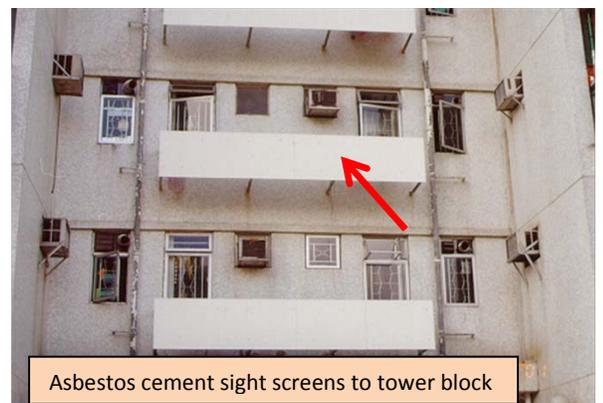
### C. Recommended good practice

Inspection both inside and outside premises, and checking walls and roofs for a sandwich construction with inner ACM layers is advised. A metallic tool for detecting the distinctive sound of cement sheet can help speed this process. Ceilings, walls and chalkboards can have more than one layer. Bulk sampling or inspection should be made through all layers to check for differing construction.

A common replacement product for asbestos cement sheet is mica-reinforced insulation boards or metal sheet sandwich products (brand names such as supalux, durasteel). Older varieties of these replacement products have been found to contain asbestos and they should be checked by bulk sampling.

### D. Associated ACMs

Vinyl floor tiles, asbestos cement flues or asbestos plaster/rope insulated flues (to fume cupboards or kitchen ranges), asbestos containing fuse boxes, asbestos rope/cloth in heat producing equipment such as ovens, brazing hearths etc., asbestos cloth fire blankets.



ACM IDENTIFICATION & ABATEMENT LIBRARY – Sheet No. 1-2 FLAT PROFILE CEMENT SHEET



**ABATEMENT****A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT**

For cement sheet removal in a fire zone refer to the fire site module for abatement details. Flat profile cement removal is not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AIR/AAP must be prepared and submitted to EPD prior to any abatement works. Removal work for all cement sheeting must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The AAP shall include a comprehensive method statement for the removal of cement sheeting. The method statement shall include the following requirements:

- Specify the type of work zone, open segregation is the usual requirement. However, if ceiling sheeting/tiles or wall partition sheet cannot be removed without breakage, then a full containment work zone should be specified. If there are doubts about friability of the sheeting a 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. For external occurrences a floor to 2m height above the ACM occurrence canvas sheet barrier is expected for segregated work zones. If the work zone is immediately adjacent to other occupied premises, specify a canvas sheet cover over the top of the work zone as well. Continuous strips of duct tape are expected to seal canvas sheet to prevent debris falling behind the sheeting. For internal occurrences, polythene sheeting should be used to seal all floor and wall surfaces within the work zone.
- Detail the requirement for a decontamination unit – 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. For large scale removal work, specify a 2 stage debris port for easier waste pack cleaning and handling.
- Include a work zone plan to show the layout of the work zone and siting of decontamination unit. A section view drawing is also useful for external occurrences or to detail internal work zone erection details.
- Remove, or seal with polythene sheeting, all furniture in the work area. Check for concealed occurrences beneath non-ACM wall and ceiling sheeting whilst preparing the work zone.
- Detail pre-cleaning measures and protective equipment for workers.
- The RAC shall inspect the prepared work zone and certify it suitable for use. Written inspection records are expected.
- Detail method of removal. Hand tools are required. Specify method of unfixing cement sheet. All fixing screws and nails should be disposed of as asbestos waste. If cement

sheet has to be unscrewed, or nails removed, specify adequate or constant mist wetting and shadowing by vacuum cleaner to reduce fibre release. Detail removal of any cement render. This should be done by hand tools with the minimum of breakage and disposed of as asbestos waste. Leaving cement render behind in the work zone is not acceptable.

- It may be easier, and with less fibre release, to wrap items such as work tops or doors lined with asbestos cement and dispose of whole rather than specifying removal of the cement sheet. Review the occurrence and ease of removal before specifying the abatement method
- Once the cement sheeting has been removed specify the method of cleaning the supporting framework. Metal frames can easily be cleaned by wire brushing and wet wiping. Timber frames need more thorough cleaning – particularly of screw and nail holes. If they cannot be cleaned they should be disposed of 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 RAC shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and debris.
- 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 section 7.2 of the EPD code of practice on removal of low risk ACMs.
- 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 (usually 1, but check if amphibole asbestos is present in the sheeting and specify Type 3 waste if present). Detail the location of the temporary asbestos waste store.

**B. WORK ACCEPTANCE**

- Typical removal errors include leaving cement sheet fixings on the floor – nails, screws etc., and not carrying out sufficient cleaning of supporting frames. Debris can be left in nail/screw holes in timber frames – which requires digging out or the frame disposed of as asbestos waste. Dust left behind on surfaces of metal framework is also common.
- Leaving behind non-ACM brick/concrete debris or cement render is not acceptable and the floors beneath removed cement sheet should be clear of all visible dust and debris.

**IDENTIFICATION**

**A. Occurrence and types of asbestos**

Large diameter (typically 150-450mm) underground water mains account for most of the use of asbestos cement pipes in Hong Kong. However, they are also found as smaller diameter above-ground occurrences such as rain water drain pipes and guttering to both residential and commercial/industrial buildings, and for specialist uses such as in water treatment plants (refer to separate ACM Library sheet 1-4). The underground water mains products typically contain chrysotile asbestos, often with traces of crocidolite and sometimes amosite.



Large diameter asbestos cement water mains

**B. Identification of cement pipes**

Cement pipes can be very distinctive with a grey cement colour. A stippled pattern can sometimes be evident on the surface. Being cement, the materials make a distinctive sound when hit with a metallic tool.

Misidentification can occur with metal pipes if close inspection is not possible and the surface has been stained by weathering. Large diameter underground water mains may also be normal concrete without any bonded asbestos. Cement pipe sections often have a metal joint and only inspection of this part of the pipe, or rust staining running down the pipe can be confusing and lead to misidentification as a metal pipe. Therefore inspection away from joints and bulk sampling is recommended for positive identification.



Asbestos cement water mains with metal flange joint exposed in trench

Underground water mains should form part of an asbestos investigation when the building above is to be demolished and any site formation works for a new construction undertaken. All road works or engineering works requiring disturbance to water mains should be similarly investigated. The Water Supplies Department (WSD) can provide drawings of the location of buried water mains in Hong Kong and these can be used to specify locations to excavate and expose and inspect water mains.



Asbestos cement pipe connected to newer metal water pipe

**C. Recommended good practice**

During an asbestos investigation, all pipes should be checked. A metal tool can be used for detecting the distinctive sound of cement. A magnet can differentiate between cement and iron pipes. When underground pipes are being excavated, ensure that excavation tools do not damage any asbestos cement pipes exposed – it is preferable for the RAC to be on site to supervise this operation to stop works before damage occurs.

It has been common practice by engineering contractors laying new mains or making new connections to leave redundant lengths of asbestos water mains in-situ. Therefore, a single inspection point is usually not sufficient to establish the presence of asbestos cement water mains, particularly if a suspect metal replacement pipe is identified. Good practice should always be followed during excavation not to damage other underground services, and WSD provide advice on these measures.



Typical small excavation to check underground water mains

**D. Associated ACMs**

ACMs associated with underground asbestos cement water mains are the connections to above-ground cement pipes.

## ABATEMENT

### A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Asbestos cement water pipes are not exempt from the reporting requirements of the Air Pollution Control Ordinance, unless maintained by Water Supplies Department (WSD), and an AAP must be prepared and submitted to EPD for approval. Removal work for all cement pipes must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall depend on whether the pipes can be removed without excessive breakage or not. The AAP method statement shall include the following requirements:

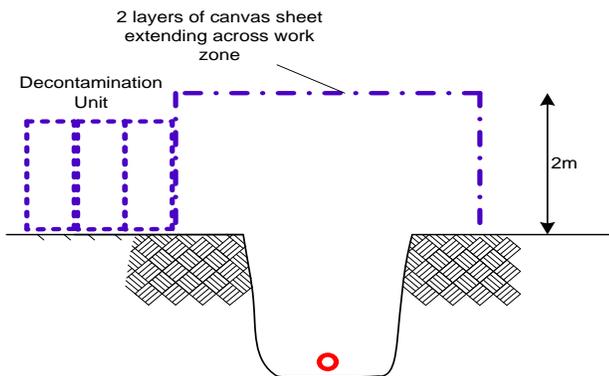
- Specify the type of work zone: open segregation is the usual requirement unless the cement pipes will be broken during removal. Specify full containment if cement pipes are encased in concrete thrust blocks or other encasing concrete requiring excessive breakage.
- Detail the erection of the work zone. A totally enclosing polythene sheet barrier around the walls and roof over the work zone is expected for work zones. Canvas sheet is permissible for walls and roof of external open segregated work zones. Continuous strips of duct tape are expected to seal polythene sheet to prevent debris falling behind the sheeting. For underground water mains the work zone should cover the excavated trench with polythene sheeting laid beneath the mains in the floor of the trench. Detail the requirement for a decontamination unit – 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.
- For full containment work zones a negative pressure unit (air mover) shall be sited to allow air flow across the work zone from the decontamination unit. If this is not possible a flexible tube (protected from contamination or sprayed red and disposed of as asbestos waste after completion of works) should be led from the air mover across the containment to allow proper air flow.
- For underground water mains, include in the AAP the excavation contractors risk assessment forms for excavation works, trench support, and measures to ensure other services are not disrupted. The WSD drawings for pipe location should be included in the AIR and AAP.
- For removal of underground water mains there are phases of work defined as non-asbestos – such as trench excavation and fitting of new connections to cut pipe sections. The AAP should separate out each phase of work and define them as asbestos work or non-asbestos work. Where new metal pipes are to be fitted to cut ends of asbestos cement pipes, the asbestos removal contractor should assist the engineering contractor to fit the new pipe. Any final cutting and shaping of the cut end of the cement pipe is defined as asbestos work to be done by the removal contractor.
- 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. The pipes should be drained before removal, and the water collected in metal drainage trays and filtered before disposal. This may require permit to work procedures. Hand tools are required. Smaller diameter cement pipes can normally be disconnected whole at pipe joints. Removal mid-joint will require cutting. A mechanical chain cutter is allowed for cutting. When the diameter becomes too large for this method or pipes have to be broken, specify that wet cloths be laid around the pipe and a hammer used to break the pipe. All debris created by breaking the pipe should be immediately collected and disposed of as asbestos waste.
- If an underground water mains is encased in concrete support, such as thrust block, this should be removed as much as possible with mechanical hammers before erection of work zone (but without damaging the encased pipe) and final concrete removal and lifting of the section enclosing the cement pipe must be done inside the full containment work zone. All concrete debris should be disposed of as asbestos waste.
- Cement water mains can be heavy and difficult to manhandle. A small powered hoist should be supplied for easier handling of large diameter pipes. The hoist should be pre-installed over the trench and included in the work zone. The practice of using mechanical diggers to lift and move cut pipe sections should be discouraged unless it is done after RAC inspection of the work zone and air testing -when it is permitted to dismantle the work zone sufficient to allow digger access.
- Specify thorough cleaning method after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all surfaces. The floor of excavated trenches should be covered with polythene sheeting to prevent contamination of soil.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and 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.

## ACM IDENTIFICATION & ABATEMENT LIBRARY – Sheet No. 1-3 UNDERGROUND WATER MAINS

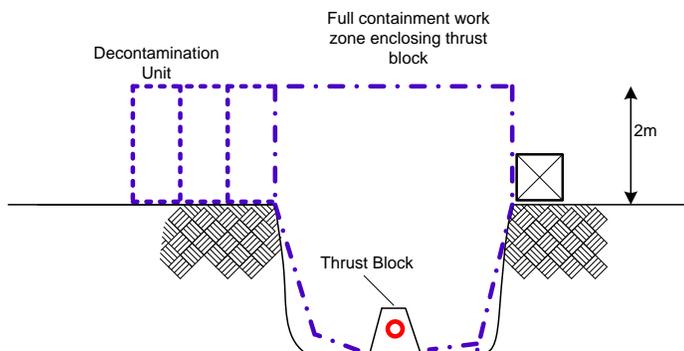
- Detail the dismantling of the work zone and the disposal of all polythene/canvas sheeting used as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type. Detail the location of the temporary asbestos waste store. Try and arrange for immediate collection by waste vehicle for underground water mains rather than having to erect a temporary store on the roadside.

### B. WORK ACCEPTANCE

- Check that metal flange joints have been wrapped and disposed of as asbestos waste. If larger diameter pipes have had to be broken using hand tools, a very comprehensive inspection of the trench is required to identify and remove all broken chips of cement.
- For underground water mains where connection of new pipe is required, check with the engineer that the cut end is acceptable for new connection and that no further shaping is required.



Section through segregated work zone



Section through full containment work zone



**IDENTIFICATION**

**A. Occurrence and types of asbestos**

Asbestos cement pipes are found in Hong Kong to both residential and commercial/industrial buildings – occurring as drain pipes, soil pipes, and less commonly as rain water gutters and specialist uses such as in water treatment plants. Large diameter (typically 150-450mm) underground water mains account for most of the use of asbestos cement pipes in Hong Kong and details of these can be found in a separate ACM Library sheet No. 1-3. The above ground products typically contain chrysotile asbestos, although amosite and crocidolite may also occur.



External asbestos cement water pipe in village

**B. Identification of cement pipes**

Cement pipes can be very distinctive with a grey cement colour and, if external, typically weathered and stained with moss/lichen growth, although painted surfaces can obscure the distinctive colour. A stippled pattern can sometimes be evident on the surface. Being cement, the materials make a distinctive sound when hit with a metallic tool.



Asbestos cement soil pipe connection to toilet

Misidentification can occur with plastic products if close inspection is not possible and the plastic has been stained by weathering. Cement pipe sections can have a metal joint and only inspection of this part of the pipe, or rust staining running down the pipe can be confusing and lead to misidentification as a metal pipe. Therefore inspection away from joints and bulk sampling is recommended for positive identification. Painted pipes can be difficult to differentiate between metal and cement pipes if a distinctive sound cannot be heard when hit.

Although most rainwater pipes and gutters have now been replaced with metal or plastic products, cement products can still be found to older premises that are listed as historic or premises left derelict or without recent maintenance works. ‘Tong Lau’ type old tenement buildings commonly had internal asbestos cement drain pipes installed at the front of the building, and the asbestos investigation should check for these pipes – either open or concealed within timber boxing either side of front windows/balconies.



Asbestos cement pipes used in water treatment filtration tank

**C. Recommended good practice**

During an asbestos investigation, all pipes and guttering should be checked. A metal tool can be used for detecting the distinctive sound of cement. A magnet can differentiate between cement and iron pipes.

Down pipes and gutters that cannot be reached for checking should be listed as suspect in the AIR if there any doubts about the material. Instances have been found of new plastic drainage pipes outside a building whilst having redundant asbestos cement pipes still in-situ – internally or to the side of replacement drainage. The presence of newer plastic drainage should not stop a thorough search for older ACM remnants in a building.



Asbestos cement drain pipes inside service duct

**D. Associated ACMs**

ACMs associated with asbestos cement pipes and guttering can be flat profile cement sheet used as fascia boards, asbestos roof tiles and bituminous roof felt. Connections to underground asbestos cement water mains.

**ABATEMENT****A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT**

Asbestos cement pipes and gutters 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 cement pipes must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The removal method shall depend on whether the pipes can be removed without excessive breakage or not. The AAP method statement shall include the following requirements:

- Specify the type of work zone: open segregation is the usual requirement unless the cement pipes will be broken during removal. Specify full containment if space constraints require breakage for removal or cement pipes pass through floor/wall slabs or are partially encased in concrete/brick walls etc.
- Detail the erection of the work zone. A totally enclosing polythene sheet barrier around the walls and roof over the work zone is expected for work zones. Canvas sheet is permissible for walls and roof of external open segregated work zones. Continuous strips of duct tape are expected to seal polythene sheet to prevent debris falling behind the sheeting. Detail the requirement for a decontamination unit – 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.
- For full containment work zones a negative pressure unit (air mover) shall be sited to allow air flow across the work zone from the decontamination unit. If this is not possible a flexible tube (protected from contamination or sprayed red and disposed of as asbestos waste after completion of works) should be led from the air mover across the containment to allow proper air flow.
- For external vertical pipes on buildings, work zones may have to be erected on scaffold work platforms. Obtain scaffold design drawings from the main contractor and include drawings showing how the work zone shall be erected on the scaffold. If the works are full containment, allow sufficient space between floors to allow air flow. Metal mesh grille can be used to allow air flow but still provide footing and prevent objects falling. There should be an internal staircase inside the work zone for worker access and an external staircase for inspection from the outside by the RAC and inspectors from EPD / Labour Department.
- 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. The pipes should be drained before removal. This may require permit to work procedures. Hand tools are required. Smaller diameter cement pipes can normally be disconnected whole at pipe joints by scraping away joint cement seals and rocking the pipe gently back and forwards. Removal mid-joint will require cutting. A mechanical chain cutter is allowed for cutting. When the diameter becomes too large for this method or pipes through floor slabs have to be broken, specify that wet cloths be laid around the pipe and a hammer used to break the pipe. All debris created by breaking the pipe should be immediately collected and disposed of as asbestos waste.
- All pipe support brackets for pipes and gutters should be removed from walls and disposed of as asbestos waste. If a pipe is encased in concrete, such as a floor slab, the concrete that has been in contact with the pipe should be removed using hand tools and disposed of as asbestos waste.
- Specify thorough cleaning method after removal, including wet wiping and wire brushing of adjacent concrete/brick surfaces. 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 shall be the absence of visible dust and 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.

**B. WORK ACCEPTANCE**

- Check that no support brackets remain. If they cannot be removed, they should have been wire brushed clean. For through floor slab removal, check that no debris still clings to the cut concrete surface. Require additional cleaning by wire brushing if in doubt.
- If asbestos cement soil pipes have been installed to a building, after removal of visible occurrences, check for any concealed sections through external walls to internal soil ducts or to toilet pans. Ask the contractor to break open walls as necessary. Any additional ACMs discovered in this manner during removal works should be reported to EPD in an AIR/AAP Addendum.

## IDENTIFICATION

### A. Occurrence and types of asbestos

Asbestos roof tiles were common on public housing estates in Hong Kong, but have mostly been identified and removed. However, they do also rarely occur in private residential and commercial/industrial premises, and all roof tiles should be inspected. The products typically contain chrysotile asbestos.

### B. Identification of roof tiles

The majority of asbestos roof tile identified in Hong Kong are distinctive because they have a manufacturers chop mark on the surface. Therefore, all roof tiles that have any markings on them should be regarded as suspect. However, a few occurrences have been found without markings, and in other cases the markings have been obscured with successive layers of waterproofing coatings.

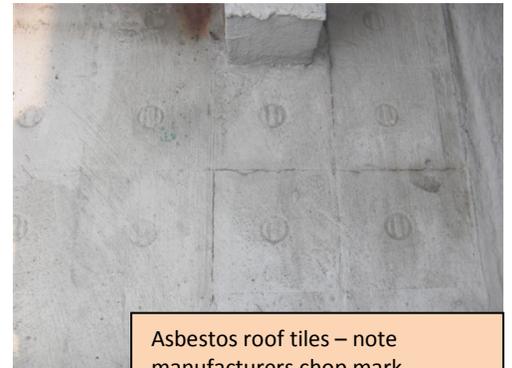
Asbestos roof tiles typically are finer textured than non-asbestos sand and cement types, and have a darker grey cement colour. Fibre bundles can sometimes be seen on the surface of weathered and unpainted tiles.

### C. Recommended good practice

Always check the texture of roof tiles and bulk sample any that are not clearly sand and cement tiles. Be aware that paint and other waterproof coatings laid on roofs can conceal tiles. Often, the vague outline of tiles beneath can be viewed if the roof surface is carefully studied. If any suspicion exists that tiles are present, then roof layers should be broken through to inspect. Asbestos roof tiles may occur not only on the main roof of a building but also on any lower or podium roofs, and all roof tiles on a building should be checked.

### D. Associated ACMs

ACMs associated with asbestos roof tiles are bituminous roof felt, asbestos cement drain vent pipes, guttering and vent pipes to rubbish chutes. All pipes that are laid across roof tiles should be checked for insulation. Pipe support brackets to small diameter pipes can be lined with asbestos cloth/gasket material.



Asbestos roof tiles – note manufacturers chop mark



Asbestos roof tiles on a residential block. Note that distinctive manufacturers chop mark cannot be seen at a distance

## ABATEMENT

### A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Asbestos roof tiles 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 – this includes work on Housing Department managed estates. Removal work for all roof tiles must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The AAP method statement shall include the following requirements:

- Specify the type of work zone: open segregation is the usual requirement unless the roof tiles will be broken during removal.
- Detail the erection of the work zone. A totally enclosing canvas sheet barrier around the roof tiles is expected for work zones. Canvas roof sheeting to cover the work zone may be advisable if nearby residents are concerned about the works. Consider waste transfer and disposal. Roof tiles are heavy and can cut polythene waste bags - metal drums can be used instead. A large quantity of waste may be generated. Decide on the waste transfer routes, polythene and timber sheeting can be specified to protect floors during transport of waste. A hoist may be preferred to lower the waste to the ground from tower blocks – detail this arrangement in the AAP if used and include emergency measures if waste is dropped from height. A safety officer should be employed in hoist inspection and certification.
- Detail the requirement for a decontamination unit – 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.
- The Housing Department have a specification for removal of roof tiles detailed in their work procedure (DEM1 & 2 for demolishing structures). This has been used satisfactorily for many years and should be referred to when preparing the AAP method statement.
- 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.
- Detail method of removal. Hand tools are required. The tiles should be wetted with amended water and kept wet during removal. For large roofs constant repeat applications will be necessary. Specify that water runoff is collected and filtered before disposal.
- A shovel or crowbar should be used to slide beneath the base of each tile and then carefully lift up. If any paint or waterproof membranes are present they may

require prior removal and disposal as asbestos waste – or cutting edges around the underlying tile to allow lifting. All debris created by lifting the roof tiles should be immediately collected and disposed of as asbestos waste. This includes any underlying sand and cement or bituminous adhesive that has been used to fix the tiles to the concrete roof of the building. Underlying sand and cement must be removed using hand tools and disposed of as asbestos cement. Bituminous adhesive can be removed using low VOC chemical removers if it cannot be satisfactorily scraped of the roof surface.

- Specify thorough cleaning method after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all surfaces.
- Personal air testing is required during work and reassurance 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.
- The asbestos consultant shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and debris.
- 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 and waste transfer routes. Witness use of waste hoists to ensure proper usage and transfer of waste at ground level to waste stores. Ensure that emergency measures are in place in case of spilled or dropped waste bags.

### B. WORK ACCEPTANCE

- The total absence of dust and debris in the work zone is a requirement. Check that no debris is present in drainage channels or drains. Check that all surfaces that the roof tiles were lying on have had all tile fixing materials removed.
- Check waste transfer routes to ensure no debris has spilled.

**IDENTIFICATION**

**A. Occurrence and types of asbestos**

Asbestos wall and balcony grille panels are common on older public housing estates in Hong Kong. They also rarely occur in other residential developments, schools and commercial /industrial premises. They have also been found in Government staff quarters. The products typically contain chrysotile asbestos.

**B. Identification of grille panels**

The presence of asbestos wall and balcony grille panels in public housing estates and schools is well recorded, and survey pre-planning on any public estate should include a records search for their presence. Wall grille panels are usually exposed and their distinctive circular or rectangular pattern is obvious during inspection. However, they can be concealed by adjacent structures built afterwards, or covered over by other sheeting. Balcony grille panels in public housing estates have been mostly encapsulated by a cement render, although some unexposed examples may be found. The cement render usually has a distinctive “A” chop mark on the external-facing surface to identify its presence – although it may be missing or concealed with subsequent paint layers.

Non-asbestos wall and balcony grille panels are very common in Hong Kong, being made from sand and cement or glazed ceramic, and of many different grille panels designs – square, round rectangular etc. Asbestos grille panels have mainly been found in a circular grille panel shape (although rectangular box shape designs can be found) and are typically finer textured than non-asbestos sand and cement types, and have a darker grey cement colour. Fibre bundles can sometimes be seen on the surface of weathered and unpainted or broken grille sections.

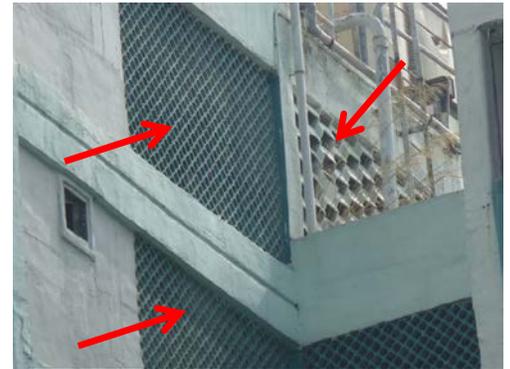
**C. Recommended good practice**

Identifying a balcony infill panel can be difficult on some buildings, particularly if subsequent building works have incorporated the balcony into the flat unit itself. A close inspection of the wall surface is necessary to see if it is a uniform concrete surface or whether an infill panel may have been used. Wall grille panels at ground and low level in a building may be obscured by other building works and internal checks should be made if another structure is concealing the line of panels from roof to ground on a building.

A common misconception is that these ACM occurrences are only confined to public housing estates and schools. This is not true, and they have been found in private premises, and all grille panels should be checked during an asbestos investigation, no matter what building type.

**D. Associated ACMs**

There are no other ACMs closely associated with asbestos balcony and wall grille panels, although any immediately adjacent drain pipes should be checked to see if they are asbestos cement.



Asbestos wall grille panels – both circular and box shape



Asbestos wall grille panels, circular shape



Encapsulated asbestos balcony grille panel. Note “A” chop mark in cement render



Unencapsulated asbestos balcony grille panels

## ABATEMENT

### A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

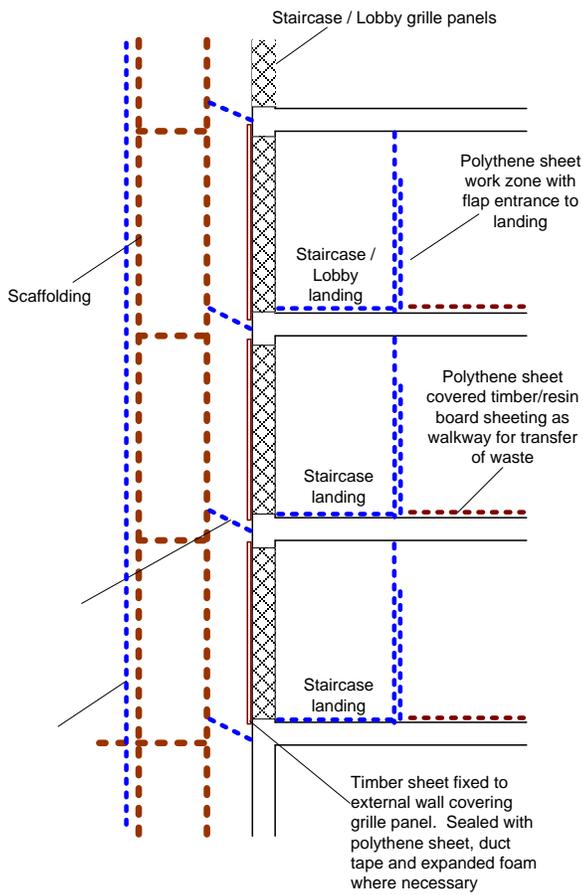
Asbestos wall and balcony grille panels are not exempt from the reporting requirements of the Air Pollution Control Ordinance, and an AAP must be prepared and submitted to EPD for approval – this includes work on Housing Department managed estates. Removal work for all grille panels must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The AAP method statement shall include the following requirements:

- Specify the type of work zone: open segregation is the usual requirement unless the grille panels will be broken during removal. Specify an initial trial removal for witness by EPD to ensure that segregated work zones are acceptable. Wall grille panel removal is usually straightforward. However, balcony grille panel removal is complicated by the fixing method whereby metal rods are fixed into surrounding concrete posts. This requires prior concrete removal to expose the fittings so they can be cut and the panel removed. The AAP can define this work as non-asbestos work and powered tools can be used to remove the concrete. However, this should be done inside the erected segregated work zone with the asbestos removal contractor in attendance in case of accidental disturbance. All powered tools must be removed from the work zone prior to start of asbestos removal. A photographic record should be taken of concrete removal.
- Detail the erection of the work zone. A totally enclosing polythene sheet barrier around the grille panels is expected for work zones. For wall grille panel removal from staircases, a single decontamination unit is acceptable at ground floor, then a single polythene flap entrance to each work site. Stairs should be protected from contamination by polythene sheeting. Similar setup is acceptable for balcony grille panel removal, with corridors protected by polythene sheeting. Timber sheet may also be necessary to protect floor seals during transport of waste. Detail the requirement for a decontamination unit – 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.
- The Housing Department have a specification for removal of both wall and grille panels detailed in their work procedure (DEM1 & 2 for demolishing structures). These have been used satisfactorily for many years and should be referred to when preparing the AAP method statement.
- The accepted method entails first fixing a timber panel over the external face of the grille, sealing, and carrying out all removal works from inside the building. This requires scaffold 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.
- Detail method of removal. Hand tools are required. Wall grille panels are comprised of smaller blocks and the cement seal between blocks can be chased out with a hand chisel and each block removed whole. Because of the sharp edges and weight of the blocks leading to puncturing of polythene waste bags, metal waste drums are typically specified for use. All debris created by dismantling the grille panels should be immediately collected and disposed of as asbestos waste. For balcony grille panels with encapsulating cement render, this should be left in-situ as much as possible, and cement debris must be disposed of as asbestos waste. The asbestos removal contractor must be very cautious during removal not to allow too much impact on the external covering timber panel since this may break the external seals and allow debris to drop down the building. The fixing pins will have been exposed by the concrete post removal. The side and top pins should be cut and the panel gently rocked back and forwards until the bottom pins break and the panel can be lifted out whole and wrapped for disposal.
- Specify thorough cleaning method 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 shall be the absence of visible dust and debris.
- Consider waste transfer and disposal. Grille panels are heavy and can cut polythene waste bags - metal drums can be used instead. A large quantity of waste may be generated. Decide on the waste transfer routes, polythene and timber sheeting can be specified to protect floors during transport of waste. A hoist may be preferred to lower the waste to the ground from tower blocks – detail this arrangement in the AAP if used and include emergency measures if waste is dropped from height. A safety officer should be employed in hoist inspection and certification.

### B. WORK ACCEPTANCE

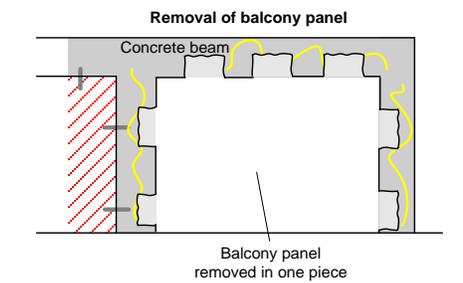
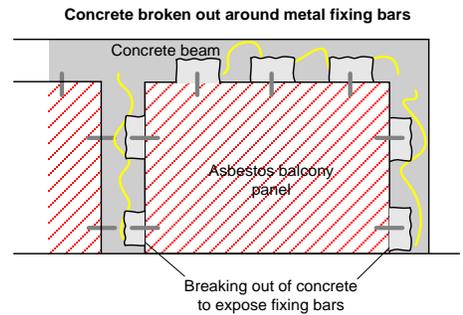
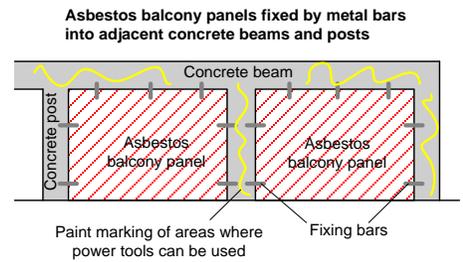
- For both wall and balcony panels the total absence of dust and debris in the work zone is a requirement. Often metal rails in front of wall grille panels have been cut away. Check that no debris is inside the cut metal remnants at floor level. For both wall and balcony grille panels check that the external timber panel is still securely fixed and sealed. If loose, check for debris outside the building.



Typical work zone for wall grille panel removal



After completion of wall grille panel removal – note external timber panel covered in polythene sheet still in-situ



Typical procedure for balcony grille panel removal



After completion of concrete removal and prior to start of balcony grille panel removal

## IDENTIFICATION

### A. Occurrence and types of asbestos

Refuse chutes which are wholly or partially comprised of ACMs were common in public housing estates in Hong Kong, but have mostly been identified and removed. However, they do also rarely occur in private residential and commercial/hotel/hospital/industrial premises, and all refuse chutes should be inspected. Linen chutes are rarely made of asbestos but, like refuse chutes, can have access hatches with asbestos rope and cloth seals. The chutes themselves can be made of asbestos containing concrete or be non-ACM, but with an asbestos cement vent pipe at the top of the chute. All products typically contain chrysotile asbestos.



Asbestos concrete refuse chute

### B. Identification of ACMs to refuse and linen chutes

Asbestos refuse chutes tend to be thinner than the non-asbestos concrete and have a darker grey cement colour. Fibre bundles can sometimes be seen on broken edges. All woven hatch seals to both refuse and linen chutes should be sampled. The seals can occur on the hatch itself, the frame on the chute, and the hatch itself may be lined or made of asbestos sheet. Being cement, ACM vent pipes make a distinctive sound when hit with a metallic tool. No evidence of rusting is an indicator for roof top vents.

Refuse and linen chutes can be disused in buildings and access hatches padlocked or welded closed. They must be unlocked or cut open and checked for ACM seals and linings. If this is not possible they must be recorded in the AIR as suspect inaccessible areas.

Inspection can be difficult if the chute is wholly enclosed within the building fabric and inspection may only be possible at roof level, at access hatches and from refuse rooms / laundry areas at the base of chutes.



Asbestos rope seal to refuse chute access hatch door

### C. Recommended good practice

All cementitious refuse chutes – and linen chutes if found – should be bulk sampled – visual identification is not sufficient. Since chute composition can vary down a stack, samples should be taken at the top, mid and lower parts of the chute. All access hatches must be inspected and broken open if sealed.

### D. Associated ACMs

ACMs associated with asbestos containing refuse and linen chutes are asbestos roof tiles or asbestos waterproof coatings at roof level.



Inspection of chute from access hatch

## ABATEMENT

### A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of ACMs from refuse and linen chutes 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 – this includes work on Housing Department managed estates. Removal work for all chutes and chute access hatches must be done by a registered asbestos removal contractor and supervised by a registered asbestos consultant. The AAP method statement shall include the following requirements:

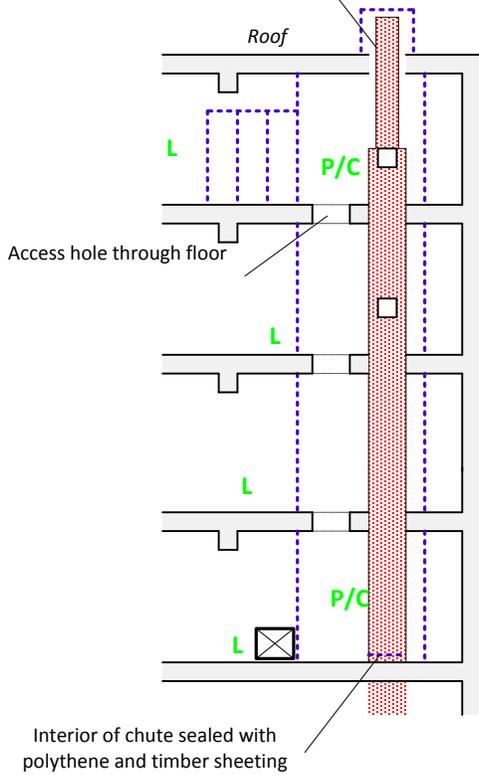
- Specify the type of work zone: Full containment is the usual requirement for an ACM chute since it will require breaking to remove. If the only ACM present is to door hatches then these may be able to be removed using open segregation. If the seal is on the door, the RAC must assess whether the hatch can be wrapped and disconnected without disturbing the door seal and whether or not there is any residue on the frame of the hatch fixed to the chute. If there is residue, or the chute hatch frame itself contains the ACM seal, then full containment should be specified for removal.
- 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.
- Assess whether it is possible to remove an entire chute at one time – adjacent holes through floor slabs could be made to enable access between floors and air flow – as long as this can be done without disturbance to the chute itself. Consider the amount of HEPA plant available to asbestos removal contractors. Removal from a vertical refuse chute in a tower block will usually have to be done in phases of 5 to 10 work zones per time if floors cannot be opened up to create one work zone. 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 chute ends is another – if a cement vent pipe just extends through a roof slab it can be preferable to seal the outside end with a box seal and carry out all removal work from the room beneath, removing concrete/bricks as required for access. Detail pre-cleaning measures and protective equipment for workers.
- Include drawings to show the layout of the work zone and siting of decontamination units and air movers. A section view drawing aided with photographs should be included for removal works carried out to many floors at one time.
- The RAC 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. Adequate wetting should be carried out and the material left to soak. Hand tools are required. Removable access hatches with asbestos rope seals can be wrapped with polythene sheeting and disposed of whole as asbestos waste. Specify how the ACMs are to be removed and the requirements for cleaning/disposal/retention of metal fixtures. Chute sections should be removed in whole pieces by loosening joints and gently rocking back and forwards. The sections should be wrapped whole for disposal as asbestos waste. All metal and concrete surfaces that have been in contact with ACMs should be adequately cleaned by wire brushing and wet wiping, making sure that floor slab concrete and rivet/bolt holes in metal frames are properly cleaned. The remnants can be very difficult to totally remove and thorough cleaning is important. If the surfaces cannot be cleaned to an acceptable standard they should be cut out and disposed as asbestos waste.
- 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 and concrete 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 metal frames 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 concrete floor slab surfaces have been cleaned or cut out for disposal as asbestos waste.

# ACM IDENTIFICATION & ABATEMENT LIBRARY – Sheet No. 1-7 REFUSE AND LINEN CHUTES

Concrete around refuse chute carefully removed and short top section of chute lowered into containment



Asbestos cement vent pipes can be boxed over and removed from the room beneath



Detail cleaning and disposal/retention of all metal fixtures and non-ACM concrete elements in contact with the asbestos chute

Provide section drawings for removal works on more than one floor to show sealing and access details

**IDENTIFICATION**

**A. Occurrence and types of asbestos**

The most common ACM associated with vinyl floor coverings in Hong Kong is the fixing adhesive which can contain traces (1-3%) of chrysotile. The vinyl floor coverings themselves can also contain chrysotile. The vinyl tile/sheets can also be used as skirting layers and up to dado rails to provide impact protection to walls in some building types. A rarer occurrence is asbestos paper backing to vinyl floor sheeting.

**B. Identification of vinyl floor coverings containing ACM**

In Hong Kong older ~ 9” size vinyl tile commonly used contain chrysotile, although rarely they can be non-ACM. The ~ 12” vinyl tile is usually non-ACM, although rarely they can contain chrysotile. Both types can have ACM or non-ACM adhesive. A usually reliable visual check is that black-coloured (bituminous) adhesives contain ACM whilst yellow-coloured adhesives are non-ACM. However, over time adhesives can be stained different colours making visual identification difficult. Due to all the permutations, bulk sampling is recommended for accurate identification.

A common problem identifying ACM vinyl floor coverings and adhesive is that buildings can typically undergo numerous renovations which can conceal older floor coverings with newer floor coverings such as vinyl coverings, timber flooring or rarely ceramic tile. Improper removal of ACM adhesive can also leave remnant patches beneath newer floor covering – either directly beneath the newer floor covering or beneath a newly laid cement floor screed. Fitted furniture sitting on top of ACM vinyl floor covering can be left in-situ during floor renewal so that strips of ACM vinyl covering can be left concealed underneath furniture. Raised platform floors can conceal vinyl floor coverings beneath.

Numerous changes of floor covering at different times during a buildings lifetime can lead to the presence of many different vinyl floor coverings of differing ages, size, colour and type of adhesive used. Combined with the other problems mentioned above, the comprehensive identification of ACM vinyl floor coverings/adhesive in a building can be a difficult task.

**C. Recommended good practice**

It is not sufficient to rely on bulk sampling to identify ACM vinyl floor coverings or their remnants. Visual inspections must be made to identify older vinyl floor coverings concealed beneath newer layers, fitted furniture and raised floors. Identification of remnant patches of ACM adhesive will require lifting of newer floor coverings and digging beneath floor screeds. The asbestos laboratory must do this during sampling, and the asbestos consultant can carry out further check during surveys. Examination of building renovation records and discussion with building users can help identify potential areas for checking.

Asbestos paper backing to vinyl floor sheeting is rare in Hong Kong. If encountered, check friability and ease of removal. Additional protective measures may be necessary for safe removal.

**D. Associated ACMs**

Waterproof roof coatings and coverings.



*Digging beneath floor screed to check for remnant adhesive*



*Cutting through fitted cupboard to check for concealed vinyl floor tiles*



*Typical yellow non-ACM adhesive – checks being made for remnant bituminous ACM adhesive*

**ABATEMENT****A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT**

Vinyl floor tiles are exempt from the reporting requirements of the Air Pollution Control Ordinance. Unless a building owner specifically requests a method statement for contractual or work monitoring purposes, or an AAP is being prepared for an entire building with many ACM types, it is not necessary to prepare an asbestos abatement plan just for vinyl floor coverings. Requirements for occurrences of friable asbestos paper backing should be discussed with EPD. Removal of vinyl floor coverings in a vacant building due for demolition can be carried out by the demolition contractor – providing that the tiles and adhesive are disposed of as asbestos waste. Removal work in an occupied building must be done by a registered asbestos removal contractor – either to a prepared AAP or in accordance with the EPD code of practice on removal of low risk ACMs. When prepared, AAPs shall include a comprehensive method statement for the removal of asbestos-containing adhesive and vinyl floor coverings. The method statement shall include the following requirements:

- Specify the type of work zone, open segregation is the usual requirement. However, friable paper backings could require the use of an air mover to better control air flow or even a full containment work zone. If there are doubts about friability a trial removal of a small area can be specified to assess the suitability of the work method.
- Detail the erection of the work zone. A floor to 1m height polythene sheet barrier around the walls of the work zone is expected for segregated work zones. Continuous strips of duct tape are expected to seal polythene sheet to prevent debris falling behind the sheeting.
- Detail the requirement for a decontamination unit – 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.
- If more than one room is being worked on, specify whether each room shall have its own decontamination unit entrance, or a shared unit is used. All floors, doorways (and walls up to 1m) between connecting rooms and decontamination unit should be sealed with polythene sheeting if vinyl floors are not present in those areas. Include a floor plan to show the layout of the work zone and siting of decontamination unit.
- Remove, or seal with polythene sheeting, all furniture in the work area. Check for concealed occurrences beneath fitted furniture.

- Detail pre-cleaning measures and protective equipment for workers.
- Specify who is to inspect the prepared work zone and certify it suitable for use. Written inspection records are expected.
- Detail method of removal. Hand tools are required. Tiles should be manually scraped off the floor and placed in waste packs – because of sharp edges, metal drums are commonly used.
- Any adhesive remaining on the floor that cannot be effectively scraped off using tools should be removed with a chemical mastic remover. This must be a low volatile organic compound. EPD have an approved list of chemicals for use. Problems can occur during removal if the condition of the cement floor screed is poor and cracked or pitted – leaving adhesive in the cracks or holes that cannot be removed by scraping or chemicals. The areas of cement screed affected should be specified to be dug up and disposed of as asbestos waste.
- Specify thorough cleaning method after removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all surfaces.
- Specify who shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and debris.
- Personal air testing is required during work and reassurance air tests afterwards. The number of reassurance 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 section 7.2 of the EPD code of practice on removal of low risk ACMs.
- 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 (usually 1). Detail the location of the temporary asbestos waste store.

**B. WORK ACCEPTANCE**

- Checks should be made that an approved chemical is being used and not a high VOC chemical. Low VOC fluids tend to have a “fruity” smell whereas high VOC fluids have a “petrol” smell.
- Inspection of floors can be difficult - adhesive can stain cement floor screeds and it can be hard to differentiate between patches of remnant adhesive and staining. Using a finger to test for stickiness of the floor can help check if adhesive remains. Corners of rooms and junction between floor and walls are difficult to clean and tend to be areas where adhesive remnants have not been removed properly and clearance inspections should concentrate on these areas. Check that cracks and pits in cement screed are clean or have been dug out.



*Typical staining of cement screed after removal*



*Old ACM vinyl floor tiles found after removal of fitted cupboard*



*Remnant black bituminous adhesive remaining after removal*



*Check pitted surface of cement screed for remnants of adhesive*



*Manual scraping for removal of tiles*

**IDENTIFICATION**

**A. Occurrence and types of asbestos**

Bituminous products commonly contain asbestos in Hong Kong. They are mostly used as waterproof coatings to buildings and fixtures and in adhesives. Chrysotile is the usual asbestos analyzed in these materials. The asbestos content is typically very low and can be below the 1% classification as an asbestos containing material.

**B. Identification of bituminous products**

Bituminous products are generally black in colour (although they can rarely be a lighter brown/yellow colour) and sticky to touch. Common materials used in Hong Kong are:

- Bituminous felt waterproof coverings to roofs and podiums
- Bituminous adhesive to vinyl floor coverings (these are detailed in more depth in the separate ACM library sheet 1-8 for vinyl floor coverings).
- Bituminous coatings to non-ACM pipe and cable insulation, eg. hessian soaked bitumen pipe insulation
- Bituminous coatings to ACM pipe and cable insulation, eg. asbestos cloth wrap to electric mains cable coated with bitumen
- Bituminous coatings to non-ACM and ACM packing inside building expansion joints

The above list will not be an exhaustive list of possible occurrences, and RAC should investigate any building elements or fixtures, or within plant and equipment, that is not mentioned above but which contains any black coloured coatings.

Laboratory analysis can be difficult using stereo and polarized light microscopy, and for accurate determination of content gravimetric reduction and point counting may have to be used. Rarely, the asbestos content can be very high – up to 30% has been identified in roof felt – but visually estimation is difficult and bulk sampling should always be undertaken.

**C. Recommended good practice**

Do not rely on visual identification. Bulk sampling should always be undertaken. Many of the bituminous products, such as roof felt, vinyl floor coverings and pipe insulation can consist of two or more layers as new products are laid down on top of older layers. Inspection for bituminous products and subsequent bulk sampling should always check through all layers. Bitumen coatings can be painted so the distinctive colour may not be apparent without checking beneath paint layers.

**D. Associated ACMs**

ACMs associated with bituminous coatings are ACM cable, pipe, flue, boiler insulation that may be impregnated with bitumen, vinyl floor coverings, asbestos cement drain pipes and guttering.



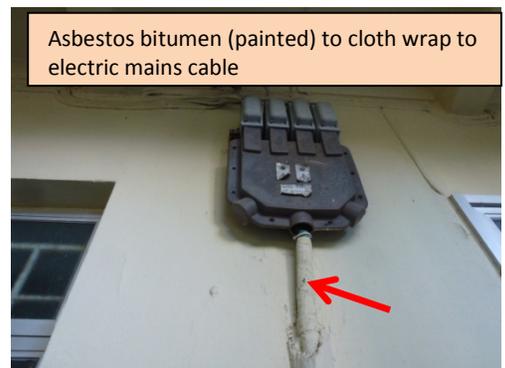
Asbestos bitumen used to impregnate non-ACM hessian wrap to oil pipes in fuel storage depot



Asbestos bitumen soaked timber fibre board inside building expansion joint



Asbestos bituminous roof coating to roof



Asbestos bitumen (painted) to cloth wrap to electric mains cable

**A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT**

Removal of asbestos vinyl floor tiles and/or their underlying bituminous asbestos adhesive and bitumen roofing felt are exempt from the reporting requirements of the Air Pollution Control Ordinance and the requirement to employ a registered asbestos removal contractor for their removal if part of building demolition works. This is detailed in the Government Gazette No. 25/1997, G.N. 3021 & 3022. For demolition, the removal can be done by a general engineering contractor, but it must be disposed of as asbestos waste. If a registered asbestos removal contractor shall be on site carrying out other abatement work it is recommended that they be employed to remove bituminous products as well. For non-demolition works, a registered asbestos removal contractor must be employed. All other identified bituminous products identified requires the production of AIR and AAP and submission to EPD. The AAP method statement shall include the following requirements:

- Specify the type of work zone, open segregation is the usual requirement. However, high ACM content products could require the use of an air mover to better control air flow or even a full containment work zone. If there are doubts about friability a trial removal of a small area should be specified to assess the suitability of the work method. Where bitumen has impregnated an underlying ACM such as asbestos cloth or rope, checks should be made to see if the ACM is totally impregnated throughout all layers. If some friable ACMs remain unsealed with bitumen, then full containment should be specified – refer to the ACM Library sheet 2-7 for asbestos cloth and paper products for AAP requirements.
- Detail the erection of the work zone. A floor to 1m height polythene or canvas sheet barrier around the walls of the work zone is expected for segregated work zones. Continuous strips of duct tape are expected to seal polythene sheet to prevent debris falling behind the sheeting. Full length protective sheeting and even overhead sheeting to form a fully enclosed work zone may be required for more friable products.
- For building expansion joints, scaffold work platforms will be required. These can be bamboo, but metal is preferred for more stability, particularly for full containment work zones. Provide plan and section view drawings of the proposed work zone including details to prevent dropping of ACMs – eg. temporary polythene catch fans beneath work point.
- Detail the requirement for a decontamination unit – 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 floor plan to show the layout of the work zone and siting of decontamination unit.

- Remove, or seal with polythene sheeting, all fixtures in the work area. Check for concealed occurrences beneath fixtures.
- Detail pre-cleaning measures and protective equipment for workers.
- Specify who is to inspect the prepared work zone and certify it suitable for use. Written inspection records are expected. For exempted items this can be a works foreman or registered asbestos supervisor. For non-exempt products this should be a RAC.
- Detail method of removal. Hand tools are required. Cables and pipes coated with asbestos bitumen can be specified to be wrapped and disposed of in whole lengths, other coatings such as roof felt should be manually scraped off the roof surface and placed in waste packs – because of sharp edges, metal drums can be used.
- Any adhesive remaining on floor/roof surface that cannot be effectively scraped off using tools should be removed with a chemical mastic remover. This must be a low volatile organic compound. EPD have an approved list of chemicals for use. Problems can occur during removal if the condition of the floor/roof beneath is poor and cracked or pitted – leaving bitumen in the cracks or holes that cannot be removed by scraping or chemicals. The areas of concrete affected should be specified to be dug up and disposed of as asbestos waste.
- Specify thorough cleaning method after removal. HEPA vacuum cleaning, wiping with solvent, wet wiping, and pva spraying are expected of all surfaces.
- Specify who shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and debris.
- Personal air testing is required during work and reassurance air tests afterwards. The number of reassurance 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 section 7.2 of the EPD code of practice on removal of low risk ACMs.
- 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 (usually 1). Detail the location of the temporary asbestos waste store.

**B. WORK ACCEPTANCE**

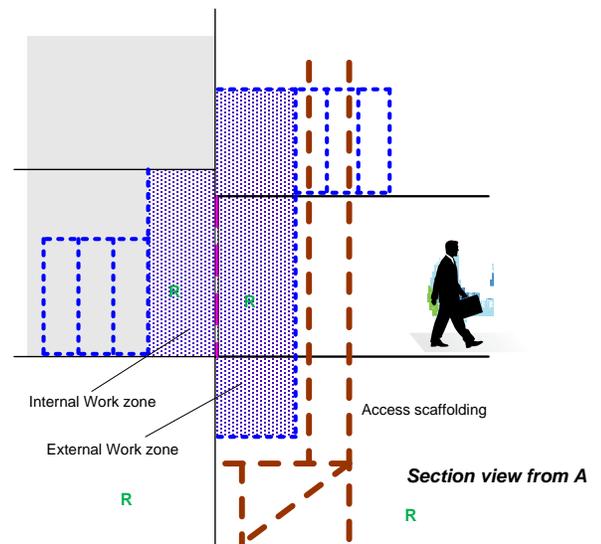
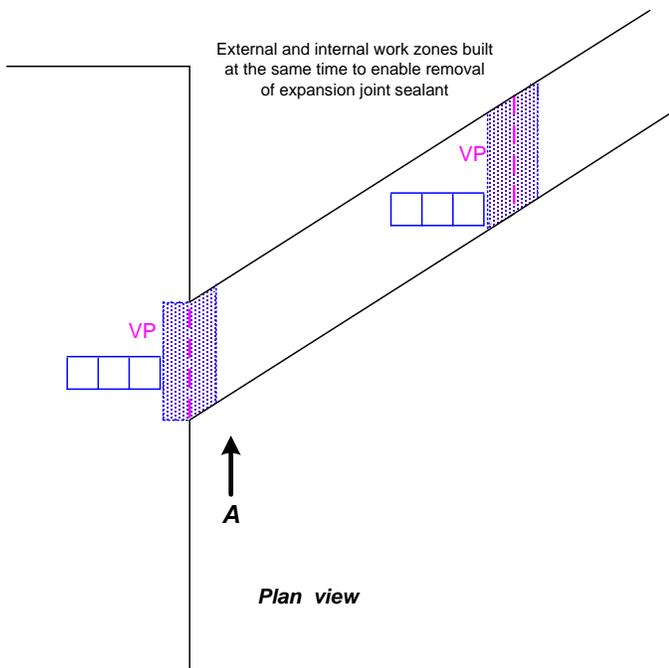
- Checks should be made that an approved chemical is being used and not a high VOC chemical. Low VOC fluids tend to have a “fruity” smell whereas high VOC fluids have a “petrol” smell.
- Inspection of cleaned floors/roofs can be difficult - adhesive can stain underlying cement surfaces and it can

be hard to differentiate between patches of remnant adhesive and staining. Using a finger to test for stickiness of the surface can help check if bitumen remains. Corners of rooms and junction between floor and walls, around roof vent pipes etc., are difficult to clean and tend to be areas where bituminous remnants have not been removed properly and clearance inspections should concentrate on these areas. Check that cracks and pits in cement surfaces are clean or have been dug out.

- After pipe and cable removal check that support brackets have been removed and any adjacent wall and floor surfaces that have been in contact with bitumen have been thoroughly cleaned.



After removal of asbestos bituminous roof coating – note how cement surface has been dug up to remove all remnants



For removal of products such as expansion joint ACMs, both plan and section drawings should be provided

## IDENTIFICATION

### A. Occurrence and types of asbestos

Hard, non-woven, compressed asbestos fibre gaskets are very common in Hong Kong, being used as friction linings to brake motors and as flange joint gasket seals to pipes and plant. Hot water or steam pipes and gas supply pipes commonly have this material in their flange joints. Many larger premises and engineering contractors have stocks of loose sheets of this type of material as replacement gaskets are required. Hence these materials can be found in very recent constructed premises. Chrysotile is the most common asbestos analyzed in these materials.

### B. Identification of gaskets

Identification can be difficult for in-situ materials, because brake motors can be in constant use and plant flange gaskets can be difficult to see or access dependent on the tightness of flange joints. Where lifts are installed in tall buildings, the lift engineering company should be consulted as to whether the gaskets in use are asbestos or have been replaced with a non-ACM substitute. If in doubt, they should be assumed to be an ACM until proved otherwise. Plant flange joints should only be dismantled to expose the gaskets if this does not affect operation. In larger premises, checking workshops for the material used – or discussing with engineering contractor employed – can help identify if asbestos gaskets have been installed. If doubts remain over their presence, then arrangements should be made to return to site at a time when the plant can be dismantled to check.

Non-asbestos replacement products can appear very similar, and bulk sample analysis is the only positive way to determine which are present. However, it is possible that over the years that plant has been operational, a mix of asbestos and non-asbestos gaskets have been installed, so that bulk sampling just one or two gaskets may be misleading. Fortunately, many newer plant gaskets in use in Hong Kong are rubber gaskets which appear visually distinctive from the thinner asbestos containing type. Gaskets can be concealed by outer mastic coatings, and checks should be made beneath any such material present.

### C. Recommended good practice

Make a distinction during the asbestos investigation between plant that has non-asbestos rubber gaskets and those that have the thinner – usually lighter coloured – suspect asbestos gaskets. If bulk sampling proves that a mix of ACM and non-ACM gaskets are present, it is best to assume all gaskets are ACM when specifying abatement procedures. Assessing the age of installed plant can help determine if concealed gaskets are ACM or not. However, it has been found that original non-ACM gaskets have been replaced with ACM gaskets stored in a premises workshop, or a contractors stock of older sheet material – hence a check on workshop supplies and external engineering contractors being recommended. Any age of premises can have these gaskets present.

### D. Associated ACMs

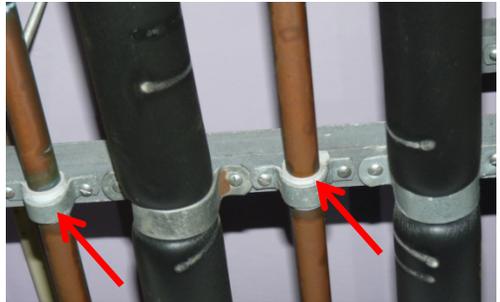
ACMs associated with hard non-woven gaskets are the insulating materials to the associated plant themselves – such as pipe, flue, boiler insulation etc. Since these gaskets are commonly installed to plant operated by electricity, fuse boxes controlling the plant can have ACMs.



Asbestos sheet gasket material in work shop with pipe flange gaskets cut out



Asbestos sheet gasket material in pipe flange joint



Asbestos sheet gasket material used as lining to pipe support brackets



Asbestos friction gasket to lift motor brake

## A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT

Removal of hard non-woven gaskets is exempt from the reporting requirements of the Air Pollution Control Ordinance and the requirement to employ a registered asbestos removal contractor. This is detailed in the Government Gazette No. 25/1997, G.N. 3021 & 3022. The removal can be done by a general engineering contractor, but they must be disposed of as asbestos waste. If a registered asbestos removal contractor shall be on site carrying out other abatement work it is recommended that they be employed to remove hard gaskets as well. Unless a building owner specifically requests a method statement for contractual/work monitoring purposes, part of an AMP, or an AAP is being prepared for an entire building with many ACM types, it is not necessary to prepare an asbestos abatement plan just for hard gaskets. If an AAP is requested, the method statement shall include the following requirements:

### Preparation of work area and personal protective measures

- Workmen engaged in removing pipe gaskets should be provided with appropriate respiratory protective equipment (RPE). In this instance half-face masks with replaceable filter cartridges should be used. The type of RPE used shall be chosen from a selection approved by the Commissioner for Labour as listed in the Government Gazette.
- Protective clothing of the disposal type should be provided and rubber boots.
- The work area around the location of gaskets to be removed should have restricted access, with the use of barrier tape and notices to prevent access from unprotected workmen. Close and lock doors where possible. The number of workmen in the work area should be minimised.
- Ensure adequate lighting to aid removal and work zone cleaning.

### Equipment

- Polythene sheeting to protect areas with duct tape for fixing.
- Hand scrapers.
- Hand sprayer containing water and wetting agent.
- A bucket of water and rags should be supplied.
- Asbestos waste bags should be supplied.
- If more than a few gaskets are to be removed a HEPA vacuum cleaner should also be supplied.

### Procedure for removal

- Ensure the pipework/plant has been made safe and drained.
- Protect nearby surfaces and equipment by covering with polythene sheeting.

- Unbolt or unscrew the flange or dismantle the equipment.
- Once the gasket has been exposed damp the material and keep soaked throughout.
- Ease the gasket away from the metal flange using a hand scraper and immediately place into a waste bag.
- Keeping the metal surface damp clean all residue away with the scraper and wet rags using 'shadow vacuuming' with the HEPA vacuum cleaner if available.

### Cleaning and Disposal

- Clean all equipment and the work area with wet rags and the vacuum cleaner if available.
- Put used rags, polythene sheeting and any other waste in the asbestos waste bags for disposal as asbestos waste.
- Carry out personal decontamination measures by wiping down RPE and protective clothing with wet rags - using a "patting" motion. Dispose of RPE filter cartridges as asbestos waste. Clothing should be carefully peeled off, kept inside out, and disposed of as asbestos waste. Use bucket of water to wash boots and body parts.
- Inspect the work area visually to ensure it is clean and dust free.
- All bagged and sealed asbestos waste should be disposed of as chemical (asbestos) waste.
- For ease of bagging waste, the waste bags commonly used for type 2 asbestos waste shall be used. A supply from the nominated asbestos waste collector shall be obtained and stored on site for use. Polythene bags of at least 0.15mm polythene sheeting complying with BS4932:1973 shall be used. The inner bag shall be coloured white and completely sealed with adhesive tape. The outer bag shall be transparent and completely sealed with adhesive tape. The inner bag shall display a "Danger Asbestos Waste" sign printed both in English and Chinese as specified by the Code of Practice and contain the contact details of the waste producer. Each bag of waste produced shall be goose-neck tied and sealed with duct tape.
- All asbestos waste in sealed bags is to be temporarily stored in a specially designated buffer area or secure store within the premises. Storage areas shall be clearly labelled and identified as containing asbestos waste and securely locked. Waste bags shall not be stored more than 3 bags high.

An alternative method – particularly for pipe flange joints is to use a metal cutter to cut the pipe either side of the flange joint and dispose of the cut section as asbestos waste. This is less disturbance to the gaskets but creates a lot more waste.

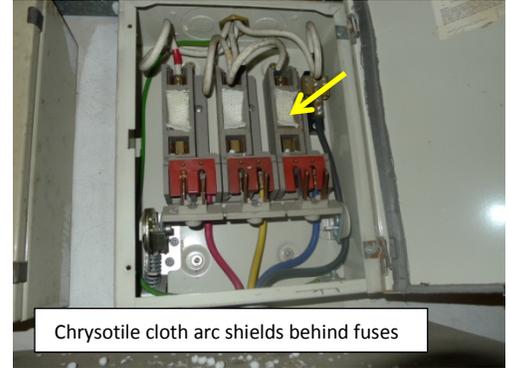
## B. WORK ACCEPTANCE

Check that no visible debris clings to the metal surfaces of the plant and no debris has fallen to the floor.

**IDENTIFICATION**

**A. Occurrence and types of asbestos**

Common occurring materials are asbestos cement sheet dividers between rows of fuses inside fuse boxes and asbestos cloth arc shields behind the fuses themselves. Rarer occurrences include asbestos paper linings to the inside of metal fuse boxes and asbestos rope door seals (the majority of rope seals found are woven glass fibre). Fuse boxes can also be lined externally with asbestos cement or insulation board. Wiring inside a fuse box can also be coated with asbestos cloth.



Chrysotile cloth arc shields behind fuses

**B. Identification of fuse boxes containing ACM**

Fuse boxes are usually listed in an AIR as “presumed to contain asbestos” because of the difficulty of inspecting live electrical equipment.

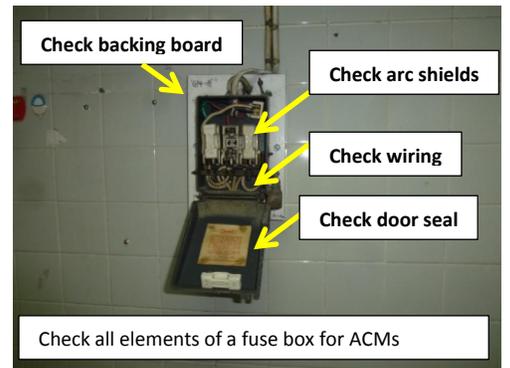
This presumption of containing asbestos can be a problem for building owners – with asbestos consultants erring on the side of caution and many non-ACM boxes being falsely identified as containing asbestos - leading to increased abatement costs. Therefore, asbestos consultants should make all efforts to inspect the inside of fuse boxes by making arrangement with building owners for switching off fuse boxes– perhaps returning to site at a later convenient time, eg., during electrical safety inspection works. Disconnected old and redundant boxes should be inspected during survey. For buildings about to be demolished all fuse boxes should be isolated and opened up for inspection.



Many smaller size fuse boxes also contain asbestos cloth arc shields.

**C. Recommended good practice**

The number of older model fuse boxes containing asbestos cloth arc shields in Hong Kong is relatively small. When opportunities occur to open and inspect a particular model box, take a photo record of the box and note the brand name, shape/colour of manufacturer label, shape of fuse box etc. Fuse box photo albums of both ACM and non-ACM model boxes can quickly be compiled to aid in future on-site identification. Communication with manufacturers or Internet research for model numbers/types with ACM can help produce an on-site survey reference guide.



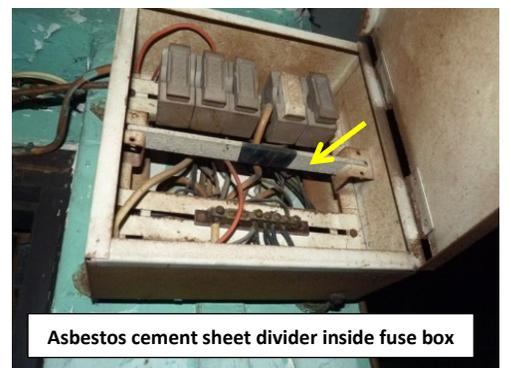
Check all elements of a fuse box for ACMs

This approach does not work so well for cement sheet divider identification since these type of fuse boxes tend not to be so clearly branded and asbestos cement sheets can have been added or taken away by electrical workers, which reduces the reliability of using brand name identification. Electrical workers can leave replaced cement dividers lying in the bottom of fuse boxes or on the floor of switch rooms etc. Check the immediate area around, inside, and on top of the fuse boxes for discarded sheets or broken pieces.

Check that the fuse boxes are fitted directly to a concrete/brick wall or timber sheet – not to asbestos-containing insulation backing board.

**D. Associated ACMs**

There are numerous other ACM occurrences that are associated with fuse boxes and their location. Check for packing around cables/trunking and inside trunking; lining to switch room walls and doors; gaskets/joints to ventilation systems. Refer to separate ACM Identification sheets for these materials.



Asbestos cement sheet divider inside fuse box

**ABATEMENT**

**A. ITEMS TO BE INCLUDED IN ABATEMENT METHOD STATEMENT**

The asbestos abatement plan shall include a comprehensive method statement for the removal of asbestos-containing fuse boxes. To reduce ACM disturbance to the minimum, the removal method statement shall require the wrapping and disposal of the whole fuse box as asbestos waste with the ACMs left in-situ undisturbed inside the box. If this requirement cannot be met, the method statement shall firstly detail the reasons why not and include additional abatement procedures to be followed to reduce disturbance and prevent fibre release outside the work zone. The method statement shall include the following requirements:

- Specify the type of work zone, - open segregation or full containment (open segregation is usual for fuse box removal unless disturbance of the ACMs inside the fuse box has to take place).
- Remind the contractor that electric appliances must be made safe / electrically isolated prior to commencement of removal.
- Detail the erection of the work zone. A floor to ceiling canvas sheet enclosed work zone is expected for typical segregated work zones.
- Detail the requirement for a decontamination unit – a 3-stage unit is the usual requirement. Ensure water supply to the unit will not interfere with any adjacent live electric systems.
- Detail pre-cleaning measures and protective equipment for workers.
- Two layers of polythene sheeting should be laid on the floor beneath the fuse box and fixed to the wall up to just beneath the box. Continuous strips of duct tape are expected to seal polythene sheet to prevent debris falling behind the sheeting.
- Specify who is to inspect the prepared work zone and certify it suitable for use. Written inspection records are expected.
- Detail wrapping of box in polythene sheet and sealing with duct tape. Check how they are fixed to the wall – will the fixing points prevent prior wrapping then removal? Propose alternative method if required.
- The fuse box should be immediately placed in asbestos waste bag for disposal.
- Specify thorough cleaning method after fuse box removal. HEPA vacuum cleaning, wet wiping and pva spraying are expected of all surfaces.
- Specify who shall inspect the completed removal works. Written inspection records are required. Acceptance criteria shall be the absence of visible dust and debris.
- Detail the air testing to be carried out during and after completion. Personal air testing is expected during work and reassurance air tests afterwards.
- Detail the dismantling of the work zone and the disposal of all segregated sheeting as asbestos waste.
- Detail the estimated amount of asbestos waste to be generated and its type (1, 2 or 3). Detail the location of the temporary asbestos waste store.

