Retrofits reveal asbestos dangers

Many commercial buildings built prior to 1990 are now being retrofitted to deliver energy savings and improve indoor environments. While this presents great opportunities for our industry, a life-threatening danger exists for all HVAC&R contractors working in such buildings, as Sean McGowan warns.

Asbestos lining within a heater bank.

Textile flexible joint in the exhaust duct.

Although the use of asbestos in buildings declined rapidly by the end of the 1980s as the health effects of the material became known, the national ban on the importation and use of chrysotile asbestos did not commence until December 2003.

Prior to the turn of this millennium, it was not unusual to find asbestos containing materials (commonly referred to as ACM) used in over 3,000 applications within the Australian built environment.

Most of us would know of asbestos-cement building products such as fibro sheets, but what of the thousands of uses you don't know about, many of which formed part of mechanical services plant built prior to 1990?

For instance, asbestos sheeting (more widely known as millboard) was commonly used to insulate heater banks within ducted systems. Similarly, it was also used within the switchboards of mechanical plant. In fact, anywhere where asbestos-free millboard is found now, asbestos sheeting was likely its predecessor.

Furthermore, asbestos lagging and castable-type asbestos was wrapped in calico cloth for use as gaskets and to seal piping joints. Where boilers and steam pipes were in use, asbestos is almost certain to be found in these applications too.

According to the asbestos unit of Workplace Health and Safety Queensland, it is highly likely that asbestos will be found within buildings built before 1980; likely to be found in buildings built between 1980 and 1990; and of those buildings built between 1990 and 2003, elements of asbestos containing material may exist in plant and equipment.

In fact, it is even possible (I was told of at least one example) that new buildings that have had plant recycled from pre-1990 buildings can contain textile and millboard asbestos in the equipment.

Similarly, as older buildings undergo retrofitting, many elements of mechanical plant are being decommissioned and removed – exposing HVAC&R contractors and sub-contractors to the potential hidden dangers within.

For Scott Bryen, principal mechanical engineer with Schneider Electric, it is an issue which needs widespread industry recognition, particularly with younger tradesmen who haven't lived through the asbestos years.

"I raised this issue at an AIRAH breakfast as I hadn't heard of it being raised previously," he says.

"I would assume the younger generation hasn't been made aware of the potential issue as they haven't worked through the 1980s within the industry," Bryen says. "The older tradesmen from this period are becoming less hands-on and won't have the opportunity to pass on their knowledge to the people on the ground, so to speak."

While it is the legal responsibility for the owner of a building built before January 1, 1990 to ensure that, as far as practical, all asbestos containing materials in the building are identified, assessed and documented in a register for asbestos containing materials, the reality is that not all audits have been accurate.

Although they are likely to have identified obvious instances of asbestos containing material, its presence within items such as HVAC&R plant and building services equipment may have gone undiscovered.

According to Evan Blair M.ARIAH, employed by the Department of Public Works in Queensland, despite the greater awareness of the potential presence of asbestos in a wide variety of building materials, accidental disturbance is still occurring.

"There are many areas in buildings that are inaccessible. These areas may not have been inspected and there may be residual debris from previous ACM removal," he says.

"Wall cavities and ceiling spaces are commonly encountered locations for asbestos debris and residue – often from previous work. Also, the quality of previous ACM removal work may not be known."

Blair says the disturbance of asbestos-containing material not only has serious health implications, but also has the potential to cause major disruptions to a project in terms of time, costs and even the actual scope of works.

"Accidental or inappropriate disturbance, without the correct safety procedures in place, are the key concerns and are avoidable."

Drying cabinets containing heater banks with asbestos lining and textile wrapped electrical wiring.

Asbestos and HVAC&R

Asbestos is the term used to describe a group of six minerals whose characteristic feature is that they naturally occur as long, thin fibrous crystals.

Of the six, three were commonly used in Australia – chrysotile (white asbestos), amosite (brown asbestos) and crocidolite (blue asbestos).

Chrysotile accounts for over 50 per cent of all asbestos used in Australia, according to a Queensland Government Public Health Guidance Note. Other forms, namely anthophyllite, tremolite and actinolite, have rarely, if ever, been encountered here.

Although asbestos is known to have been used for over 4,500 years, it only became popular as a building material in the mid-19th century when its multiple benefits of sound absorption, tensile strength and its resistance to fire, heat, electrical and chemical damage became widely useful.

Where used for fire resistance, it was often mixed with cement to create what is commonly referred to as fibro-cement.

Asbestos-cement building products typically contained low percentages of asbestos (5-15 per cent), although older products contained much higher levels. In these products, the asbestos has been tightly bound and compressed during manufacturing.

While such materials carry a low risk of generating spontaneous airborne hazardous fibres, activities such as sawing and drilling are certain to release respirable fibres, which are extremely hazardous to health.

A particularly high-risk material is low-density asbestos fibre board, which is lightly compressed and looks similar to asbestos cement sheeting and plaster board. This product has a very high percentage of chrysotile asbestos (above 50 per cent) and was widely produced between 1958 and 1974.

It was commonly used for wall and ceiling panels, particularly in high humidity areas. Softer than asbestos cement sheeting, it will easily crumble and release airborne fibres with little disturbance.

An emerging risk during building retrofits is the removal of HVAC&R and mechanical services. According to the asbestos unit of Workplace Health and Safety Queensland, the incidence of asbestos in HVAC&R equipment is many, and includes:

- within ductwork insulating heater banks
- as AHU lining
- used for flexible connections and gaskets
- painted millboard-lined oil separators on refrigeration units
- as boiler insulation and refractories
- hot water insulation
- steam and hot water pipework lagging
- woven textile seals and sealing mastics
- electrical switchboard lining and fuse carriers
- acoustic barriers and baffles, and associated penetrations.

More broadly, it can also be found in walls, ceilings, soffits, gable linings, roofs, vinyl floor tiles, vinyl sheet flooring backing, fire doors, benchtops, pipework, telecommunications pits, drains, flues, sprayed coatings, fencing and as insulation fill.

While not specifically related to HVAC&R and mechanical services, it is likely that such services will pass through or be located within close contact to these building elements.

Asbestos may also be found as architectural decorative trim within older buildings.

The health effects

During manufacturing, asbestos fibres are mechanically split into progressively thinner fibres, eventually to microscopic size. It is known that fibres longer than about 5 µm (micrometers), with a diameter of 5 µm or less are easily respirable and are responsible for a host of adverse health effects. Fibres with a diameter less than about 1 µm are considered the most dangerous.

Three diseases have been shown to be clearly linked to asbestos exposure: asbestosis, lung cancer and mesothelioma.

Asbestosis is a non-malignant scarring of the lung tissue and usually follows many years of exposure, although in some cases short-term exposure to high levels of airborne fibres has been shown to be responsible.

Lung cancer has been shown to be associated with all forms of asbestos exposure, and presents decades later. The risk increases greatly among those who smoke.

Mesothelioma is a malignant tumour of the membranes that line our internal organs, and where it surrounds the lungs is referred to as pleural mesothelioma. Research has shown even short-term exposure to asbestos increases the risk dramatically.

Other adverse health effects from asbestos exposure include pleural plaque and pleural thickening in the lung membrane.

Managing the risk

According to Evan Blair, the safe management and control of ACM is the responsibility of all parties involved, including owners, facility managers, consultants, projects managers, contractors and sub-contractors.

"There are state and territory laws in place relating specifically to the management and control of asbestos, (and) these laws refer in part to national codes of practice," he explains.

The National Codes of Practice for the management and removal of asbestos are published by Safe Work Australia, and can be found at the agency's website www.safeworkaustralia.gov.au

These include the requirement for building owners to keep an accurate register of all asbestos containing materials on the premises.

Oil burner heater.

Typical old-style switchboard with ceramic fuses.

Mechanical switchboard with ceramic fuses.

All asbestos containing material registers must record:

- the date/s on which the identification or inspection was made
- the details of the competent person who carried out the identification/inspection
- the location of the asbestos-containing material
- confirmation as to whether it is friable or bonded
- confirmation as to its condition, such as damaged or intact
- the asbestos type, such as white, blue or brown
- details of any materials presumed to contain asbestos
- any inaccessible areas that are considered likely to contain asbestos

According to the asbestos unit of Workplace Health and Safety Queensland, the register must also contain hazard assessment information, recommend control measures and details of maintenance or service work on asbestos-containing material.

The register must be reviewed annually; or earlier if asbestos-containing material has been disturbed or removed.

Ceramic fuse holder with a textile spark/flame arrester.

Warning signs (as seen in some of the images in this article) must be placed appropriately to alert people to the presence of asbestos containing material. These should state that the register be consulted prior to the commencement of any work.

As the register must be readily available to anyone in the building, it is recommended that HVAC&R contractors and sub-contractors immediately review the register before beginning to carry out any work on buildings built prior to 1990.

"Asbestos registers and asbestos management plans should always be checked in the first instance, and the presumption rule as set out in the Asbestos Management Code applied where there is any doubt regarding the presence of ACM," says Blair.

"If a material is suspected to be an ACM, then it must be presumed to contain asbestos and be treated as such unless proven otherwise (through sampling and test analysis)."

"The identification, disturbance and/or removal of ACM should be taken into consideration in advance when scoping projects, well before work begins."

Disturbance of asbestos-containing material can be minimised through increased awareness of the hazards and the application of effective control measures, particularly in buildings constructed prior to 1990.

Some useful control mechanisms include:

- having ready access to building asbestos registers and management plans
- having prominent warning signage and labelling at facilities
- using a permit-to-work process in situations where ACM may potentially be disturbed
- undertaking risk assessments using competent persons
- using competent, experienced and appropriately licensed workers
- having personal protective equipment (PPE) available
- having in place incident-response procedures.

According to Blair, the level of potential risk from disturbed asbestos depends on a number of factors. These include the method of disturbance, friability of the material, level of PPE used, exposure time and quantity, and type of asbestos.

"The effectiveness of removal of ACM depends on the particular situation. For example, there would be a higher level of confidence that all ACM has been removed if a complete section of ductwork containing a heater bank was removed rather than trying to remove the insulation from around it."

Familiarise yourself

While older HVAC&R practitioners have lived through the years when asbestos was used and have a greater awareness of its historical uses in HVAC&R and mechanical services, younger members of the industry may have had less exposure to the risks.

Therefore Workplace Health and Safety Queensland strongly recommend that all HVAC&R practitioners familiarise themselves with the uses and likely occurrence of asbestos in areas of their work.

Their other recommendation is to 'mask up'.

The Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018(2005)] includes over 100 examples of asbestos-containing materials in Appendix A.

This is readily available for download from the Safe Work Australia website.

Further information about the risks of asbestos can also be found at Workplace Health and Safety Queensland's website; and from the workplace health and safety agency in your state. ■

Sources:
Asbestos unit, Workplace Health and Safety Queensland. Safe Work Australia.
www.safeworkaustralia.gov.au
www.whs.qld.gov.au