Hidden HVAC hazards: What's lurking inside?

Occupational hazard exposure to unsuspecting contractors is very common. The problem is, many who've been exposed to toxic or carcinogenic hazards usually have no idea what they've been exposed to.

Most mechanical services contractors, especially refrigeration contractors, know the risks of working with gases and refrigerants, but few are aware of the hidden hazardous contaminants that lurk within a building's HVAC system.

And it's not just the contractor's health that could be placed at risk, but any person who occupies the area serviced by the contaminated HVAC system.

For the most part, occupational exposure to contaminants occurs when contractors disturb the contamination in the HVAC system.

There are many ways in which contamination within a HVAC system may be disturbed, including installing access panels; cleaning coils; changing filters; inspecting, testing or servicing fire and smoke dampers; servicing heating elements; modifying or installing new ducts to existing ductwork and duct cleaning.

The three most common hazardous contaminants found within ventilation systems are asbestos, synthetic mineral fibres and toxic mould. Although there are many other HVAC contaminants, these three are the most common.

What is asbestos?

Asbestos is generally found in HVAC systems in buildings built pre 1980. It's most common use is as an insulation product surrounding inline electric heating elements and gaskets/sealant between duct joins. Asbestos can be found in HVAC systems in several forms.

Insulation surrounding inline electric heating elements in buildings built pre 1980 generally contain asbestos.

Asbestos sprayed insulation unintentionally sprayed into a supply air duct during construction.

Particles of sprayed asbestos insulation that has travelled down a supply air duct

Gaskets and sealants

Asbestos that is found in gaskets and sealants is known as "non friable" and is bonded within the product. The risk of exposure to airborne asbestos particles of this type is low.

Electric heating elements (inline duct heaters)

Contractors and service technicians should be cautious of insulation surrounding inline electric heating elements in supply air ducts of buildings built pre 1980 (and in some cases even slightly after). One should suspect that these elements contain asbestos. It should not be disturbed until verified.

Asbestos in these insulation sheets is well bonded and if left undisturbed, presents low risk of exposure, however, if this insulation is disturbed or deteriorating, small particles of asbestos can break free.

Asbestos should be removed by licensed contractors and replaced with an alternative product, regardless of its condition.

Friable asbestos

Friable asbestos that's found throughout HVAC systems, including in exhaust systems, generally finds its way into the system unintentionally.

Friable asbestos is defined as, "any material that contains asbestos that can be crumbled, pulverized or reduced to powder by hand pressure when dry."

The most common form of friable asbestos found in HVAC systems is from sprayed asbestos insulation which has been applied to steel and concrete in ceiling spaces

NOTE

Contractors should be aware of buildings that have had sprayed asbestos insulation removed from their ceiling voids. In many cases this insulation is replaced with alternative products. This does not mean the HVAC systems are free from traces of asbestos. Sometimes the removal of sprayed asbestos insulation can increase the amount of asbestos contamination within the HVAC system.

WARNING

DO NOT rely on a building's Hazardous Materials / Asbestos Register to rule out the presence of asbestos in a building's HVAC system. Most asbestos audits do not include inspecting and sampling of the HVAC system. This is sometimes due to restricted access.

Air duct cleaning contractors need to be especially aware of asbestos in HVAC systems. Many of these contractors use agitation methods to clean ducts, placing the safety of themselves and others at risk.

What is toxic mould?

Microbial contamination within air conditioning systems is quite common. Regions that experience higher levels of relative humidity will generally experience higher levels of mould growth in these systems. This may be due to faulty condensate pans and drains, inadequate humidity control or holes in coils. Most species of moulds only need a relative humidity of 70% to start growing, some species even less.

One of the largest contributing factors to amplified mould growth in air conditioning systems is due to fluctuations in temperature and humidity. These constantly trigger mould life cycles.

Many species of mould growth in air-conditioning systems are known to have a negative impact and even toxic affect on human health. Although mould growth needs to be significant to impact a person's health, asthma and allergy sufferers may be seriously affected by exposure to minor amounts of microbial growth. In hospitals or in places where people are very sick or have compromised immune systems, the presence of microbial contamination can cause serious infections and even death. Exposure to microbial contamination can also bring about allergic reactions. These generally subside when a person has left the contaminated area.

Prolonged exposure to certain types of mould can cause severe allergic reactions and long term neurological effects. Exposure to high levels of certain moulds may also cause respiratory infections.

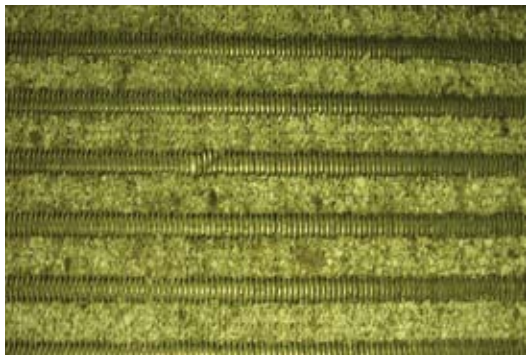
Mechanical service contractors should wear respiratory protection when working with HVAC systems contaminated with visible mould, however, to the untrained eye, visible mould growth can easily be mistaken for general dust and debris. Mould can be found growing on all types of surfaces including plastic, aluminium and stainless steel, painted surfaces, insulation and filters.

Undertaking activities that disturb mould, particularly washing mouldy coils, can cause an increase in airborne microbial contamination. This can pose risk to a person's health and cause problems for the HVAC system.

If mould is suspected within an air conditioning system, a sample should be taken and analysed to verify its presence, the severity of the growth and to identify the dominant species.

A suitably qualified ventilation hygiene contractor or indoor environment specialist should be able to provide such services. Some companies provide sample kits for contractors.

Mould growing on a fan shroud



Mould growing on heating coils

Mould growing on a volume control damper

Mould growth on internal insulation

for sound and fire retardation. Sometimes the sprayed asbestos insulation has been unintentionally sprayed into the ducts of the building's HVAC system during construction. This friable form of asbestos deteriorates over the years and small particles of asbestos can breakaway and contaminate the downstream components of the HVAC system.

Contractors working on HVAC systems in buildings pre 1980 should give consideration to the likelihood that traces of friable asbestos within the ducts may be present.

Asbestos particles can also contaminate a buildings HVAC system through the ceiling void's return air. This can occur when the sprayed asbestos insulation in the ceiling space begins to deteriorate and small particles break free and are drawn into the return air system. Almost all buildings that have sprayed asbestos insulation within a return air ceiling void will have some trace of asbestos throughout the air conditioning system, including the air handling units and supply air ducts.

As it is not possible to visually identify trace asbestos with the naked eye, ventilation systems in a pre 1980 constructed building that have asbestos sprayed insulation and use ceiling void return air, should be inspected and tested by a qualified person.

How is asbestos identified?

Laboratories can provide an analytical assessment of suspected asbestos. Qualified persons who take samples of asbestos will know where to have it tested.

Suspected asbestos should not be disturbed. Seek out a suitably qualified person to investigate.

What should you do with a contaminated HVAC system?

Contractors and technicians should notify the building owners if a HVAC system is suspected of or confirmed to be contaminated by any of these substances

According to the National Air Duct Cleaners Association (NADCA) USA's ACR 2006 Standard, a HVAC system which harbours any of the mentioned contaminants or has accumulated any other contamination should be cleaned.

Contractors that need to work on HVAC systems suspected of containing hazardous contaminants should ensure the work does not present a risk. Precautions to be taken include the use of adequate personal protection (dust masks and disposable coveralls), implementing engineering controls and modifying work practices to contain or prevent contamination. Works should not proceed if there is the potential for exposure to hazardous contaminants. Qualified persons should be the only ones to work on these systems

Section of insulation broken free in supply duct

What are Synthetic Mineral Fibres (SMF)?

Synthetic Mineral Fibres (SMF) or Man Made Mineral Fibres (MMMF) are generally fibrous materials made from glass, rock, alumina and silica. They are commonly used as alternatives to asbestos in insulation and fire rating products. Synthetic mineral fibres assist these products to maintain temperature and sound.

Fibreglass particles in supply duct from air handling unit insulation

Deteriorated insulation within fan coil unit

The most common use for SMF materials within HVAC systems is as a fiberglass insulator for ducts and air handling units. SMF, in the form of ceramic mineral fibres are also used in the insulation sheets surrounding inline electric heating elements.

The most common SMF contamination in air conditioning systems occurs when internal fiberglass insulation breaks down and deteriorates to the point where SMF particles break free and are delivered into the post filtered components of the system.

Almost all internal insulation will deteriorate with time and exposure to varying temperatures, humidity and air movement.

Exposed fibreglass insulation in cushion head

Air conditioning systems that are mounted on roof tops and exposed to the elements are affected from deteriorated internal insulation. The sometimes drastic difference between the conditioned air within the roof mounted unit and ducts; and the ambient outside air, breaks the internal insulation down.

People who are exposed to damaged or disturbed SMF are at risk of both short and long term illness, depending on the amount of exposure. Common health problems associated with exposure to SMF particles include eye, skin and upper respiratory tract irritations. Prolonged exposure to SMF has been associated with a slightly increased risk of lung cancer among workers in early SMF industries.

Contractors exposed to SMF should wear appropriate personal protective equipment such as disposable coveralls, eye protection, gloves and respiratory protection.

Do not undertake any work on a HVAC system that will disturb SMF without controlling the risk of spreading contamination and preventing exposure to building occupants.

References – NADCA ACR 2006 Assessment, Cleaning and Restoration of HVAC Systems (USA)

About the Author

Jeremy Stamkos is the Managing Director of Enviroair Pty Ltd and has over fifteen years experience in decontaminating commercial HVAC systems. Jeremy is also the current Region 11 (Oceania) coordinator for the USA based National Air Duct Cleaners Association.