

KILTOX[®]
C o n t r a c t s

**The *Kair*[™] Guide to
Condensation & Mould Growth Control**



■ **Kiltox Damp Free Systems**

Kiltox Damp Free Systems have evolved over many years. We are continually updating our products, equipment and services as new technology and products become available.

Our systems eradicate all types of dampness in buildings including condensation, rising dampness and penetrating dampness.

The systems combine proven equipment, products and services to suit the requirements of the individual property. Our surveyors, contractors and technical advisors have a wealth of experience gained over many years, which ensures that the system they recommend will cure your problem.

The purpose of this brochure is to illustrate the unpleasant effects of condensation and black mould; explaining why they occur and also to introduce you to some of our products which will help to eradicate these problems.

The following areas are covered within this brochure:

- **What is Condensation?**
- **Conditions for Condensation**
- **The Causes of Condensation**
- **Mould Growth**
- **The Cost of Unchecked Condensation**
- **Heat Recovery**
- **Anti-Mould Products**
- **Silexine Fungi-Chek & Anticon Paints**
- **Kiltox Services**

■ Condensation & Mould Growth

Dampness in buildings is a serious problem. Water can enter buildings in a number of ways to cause superficial and structural damage; conditions in a damp property are often unpleasant, uncomfortable and unhealthy.

One of the most common causes of dampness in buildings is condensation which can often lead to the appearance of mould growth. It is the presence of water condensed on walls, ceilings and other cold surfaces which support mould growth.

Throughout the UK the living conditions of a large majority of the population have been adversely affected by condensation. Its occurrence together with the subsequent mould growth has been the largest single complaint received by local authorities during the past twenty years.

In industrial premises the effects of condensation and mould growth are also well known and have created their own particular problem especially in breweries and food processing factories.



■ The Problem

The problem of condensation, particularly in dwelling houses, is very much a problem of today and results from a series of relatively simple, totally invariable conditions, and is directly related to standards and methods of heating, ventilating and insulating buildings.

■ What is Condensation?

Air normally contains water vapour in varying quantities and its capacity to do so is related to temperature, warm air holding more water than cold air. Air is saturated when it cannot contain any more water vapour at the existing temperature; under these conditions it is said to have a relative humidity (RH) of 100%. If the temperature of the air falls until saturation point occurs the air is at a critical temperature at which it cannot hold any more water - this temperature is known as the dew point. Any further fall in temperature will result in water vapour being forced to condense out as liquid water. The amount of water vapour condensing out will be the equivalent to the amount of vapour excess of 100% RH of the air at its new temperature. Therefore, when warm air comes into contact with either colder air or a cold surface the warm air is cooled, i.e. depressing the temperature of the air to a level at which it can no longer contain all the water vapour and some of it is discarded as condensation or liquid water.

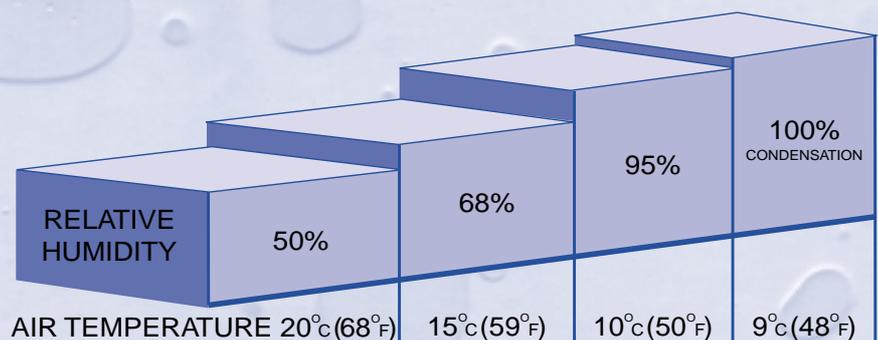
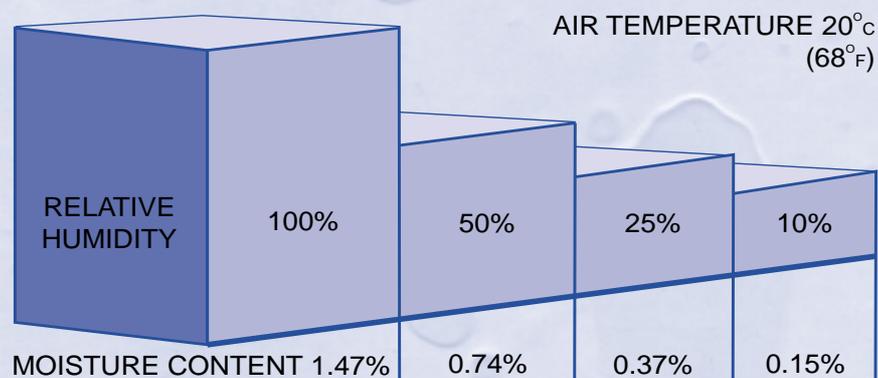


Table I

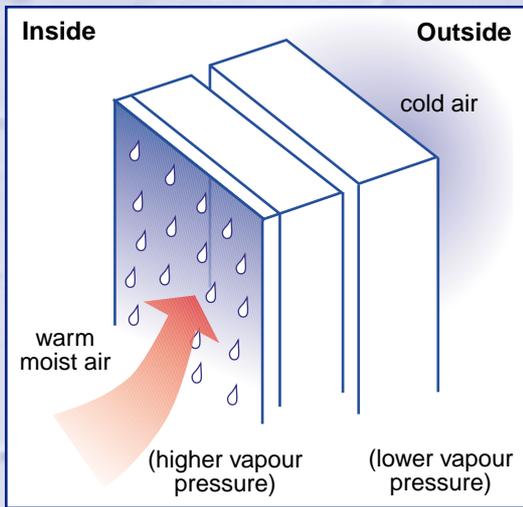


Fig. 1. Surface condensation

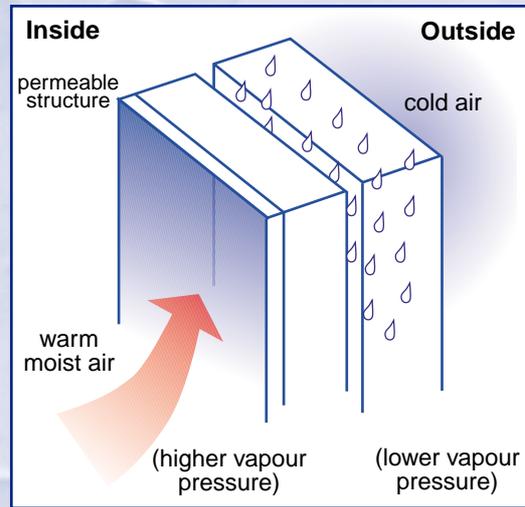


Fig. 2. Interstitial condensation in cavity walls

Condensation in a building usually occurs when warm air comes into contact with a cold surface, the air is cooled below its saturation point causing its excess water vapour to change into liquid water. The condensed water usually appears as water droplets or water film on non absorbent surfaces such as windows or tiles. This form of condensation is SURFACE CONDENSATION. It is obvious and always occurs on the surfaces which are at or below the dew point of the air immediately adjacent (*see fig. 1*).

Condensation can also occur within the fabric of the building due to the internal air permeating through the structure because of its greater pressure. Water vapour in the air exerts a pressure which contributes to the total pressure of the air. The more moisture present in the air the greater the contribution of water vapour to the total pressure of the air, referred to as vapour pressure. Air inside a heated building usually contains more moisture than does the external air.

This means it is at a higher pressure which tends to force the warm air through the structure taking the moisture with it. Most building materials, except metals, plastics and certain lined elements, are to some extent permeable and do not obstruct the movement of moist air through the structure. The warm moist air will eventually cool below its dew point within the fabric of the building resulting in condensation. This form of condensation is INTERSTITIAL CONDENSATION (*see fig 2*).

Interstitial Condensation is rather more complex than the surface phenomenon and presents a greater hazard because the resulting high moisture content can often go undetected for long periods until serious structural damage has developed such as timber decay. It will also render ineffective any insulation within the component where it occurs.

■ Conditions for Condensation

Condensation in dwelling houses is mainly a winter problem particularly where warm, moist air is generated in living areas and then penetrated to colder parts of the building.

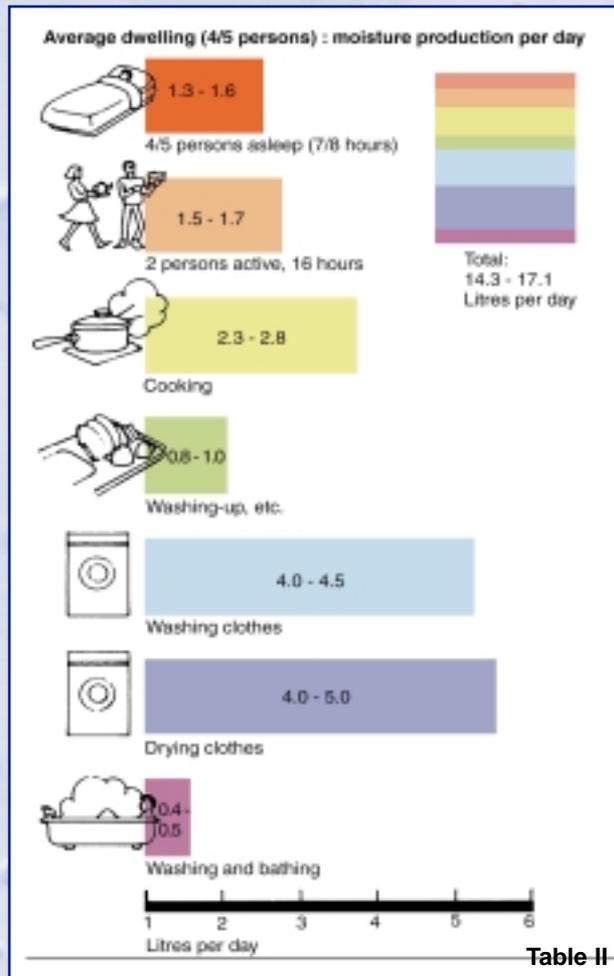
Water vapour is produced in relatively large quantities from a number of activities (see table II). It can also rise from damp ground under buildings, and in some cases penetrate timber floors and pass freely up the cavities of brick walls into roof space. The severity and effects of condensation will then depend on the type and nature of building construction and the extent of the vapour barriers created in each design.

In timber frame buildings and wallings the external cladding is liable to become wet by interstitial condensation as water vapour passes through the structure. This has caused failure of the applied painted coatings in a number of ways (loss of adhesion, blistering and chemical change) with consequent disfigurement. The use of impermeable sarking to prevent water vapour reaching the cladding has redirected the condensation process as moisture will condense on the sarking and drain into the framing timbers.

The traditional design of roofs has induced the occurrence of condensation, especially in the winter. In a flat or decked roof construction the waterproof roof membrane is also a vapour barrier, the water vapour is then prevented from permeating to the external environment. Condensation is then induced to occur within the roof deck or condense under the roof sheeting and drip from it.

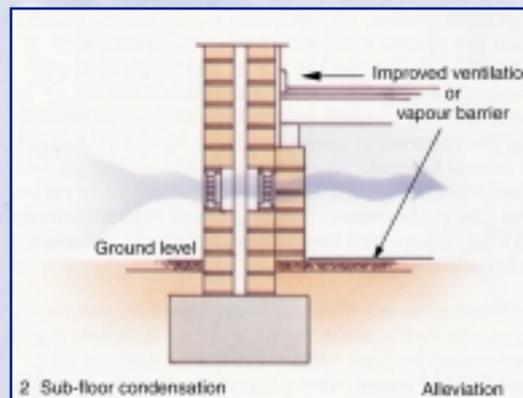
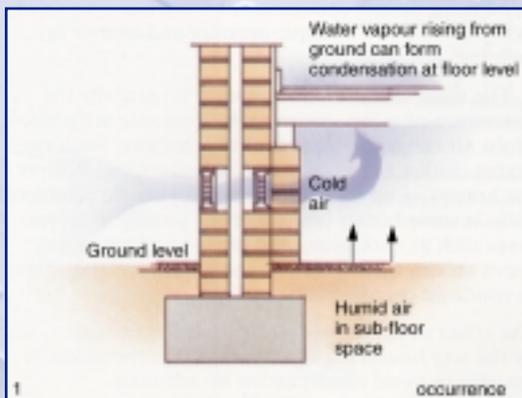
Condensation will also occur in low pitched roof constructions particularly when the ceiling follows the slope of the roof. The wetting of ceilings with condensation will also occur when the cold air through either convection process or percolating from the external atmosphere lowers the temperature of ceiling and condense water vapour from the underlying rooms. The effects are made apparent when little or no provision is made for ventilation of the roof space.

Typical examples of moisture caused by a number of domestic situations.



Condensation will often occur in brick cavity walls where moist air in the construction and external cold air circulate in a confined space. The temperature of the moist air is lowered, reaching the dew point and moisture is deposited on the coldest nearby surface, in some cases causing water to drip from the surfaces.

Condensation will also occur under suspended floors where the temperature of humid air in the floor space is lowered by cold air moving in through ventilators and water is then condensed on the underside of floor (see 1 and 2). This will often induce timber decay of the wooden floor.



■ The Causes of Condensation

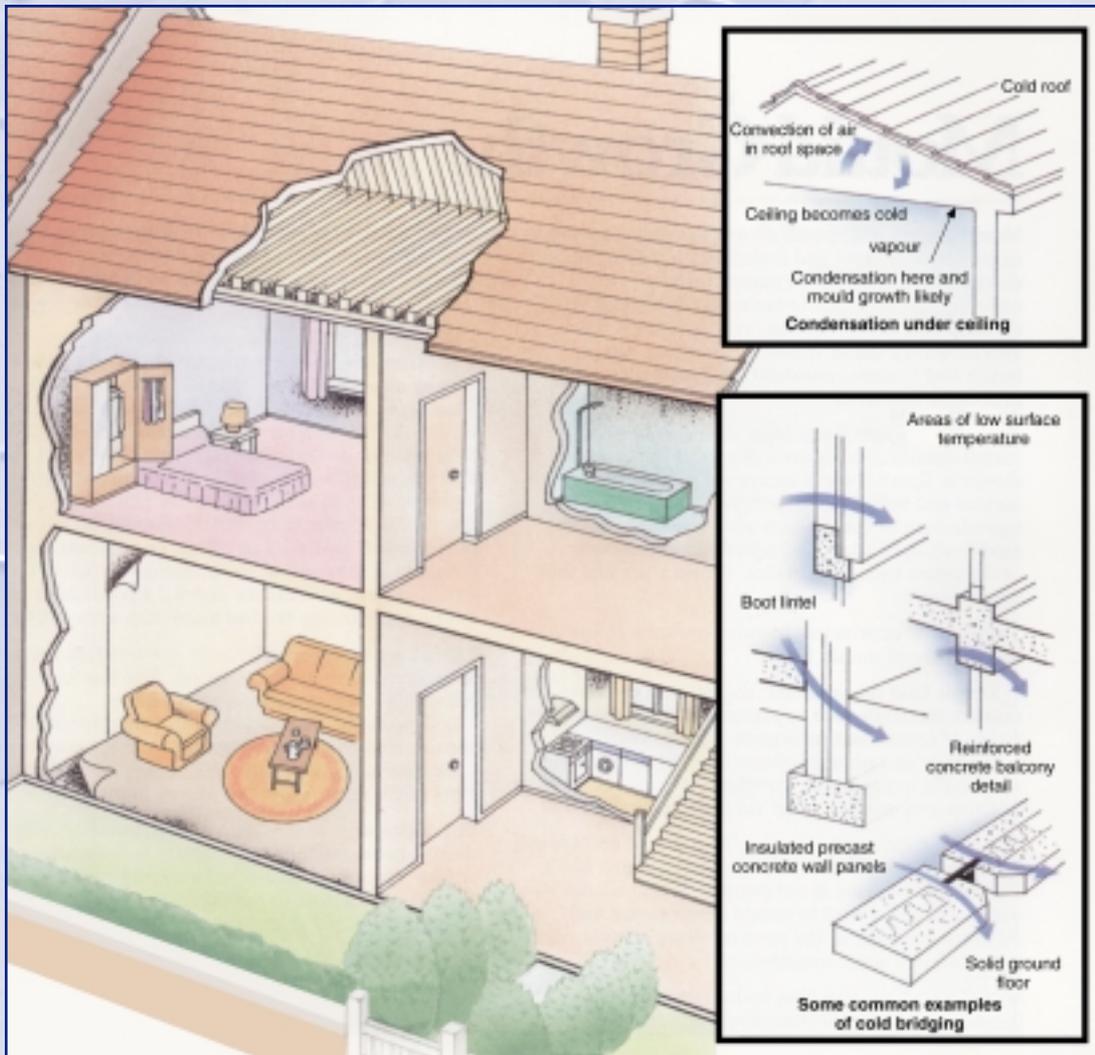
In dwelling houses condensation is related to modern living standards, economic pressure and change in building design.

1. The main cause of condensation is naturally the generation of moist, warm air by domestic activities. Moist air can come from cooking, bathing, washing, drying clothes as well as paraffin heaters and flueless gas heaters - up to 17 litres of water can be produced daily in some homes (*see table II*). Usually in certain areas such as bathrooms and kitchens where moist, warm air can then spread to cooler parts of the house to condense on cold surfaces.

The effect of moisture generation is further aggravated by the way houses are ventilated - it is theoretically possible to avoid condensation by adequate ventilation. Up to about the late 1960's there was natural ventilation in many homes because of the lack of double glazing, poorly fitting windows and doors, open fire places. Present attitudes have eliminated natural ventilation by the use of double glazing, draught excluders, fitted carpets (preventing air movement up through suspended wooden floorboards) and the removal of open fire places with the introduction of central heating. To put it simply the greater ventilation the greater heat capacity required to replace heat loss in this way - buildings have been effectively sealed and provided better conditions for condensation to occur.

Ventilation is only effective if consistent throughout the whole inside of the house. Further problems are encouraged by poor ventilation where stagnant air pockets are created. There is a real danger of condensation occurring where air is left undisturbed behind furniture and cupboards, often recognised by the appearance of mould growth.

Many houses remain unoccupied and unheated throughout the greater part of the day, allowing the fabric of the building to cool down. The moisture producing activities are then concentrated into a relatively short period. This sudden increase in warm air can produce condensation as the air comes into contact with the relatively cold structure which is still warming up.



2. Economic Pressure - dramatic increases in fuel prices force many occupiers to under use heating systems, not heat unused rooms and seal all draughts and reduce ventilation as described previously.

Background heating is often provided by flueless gas and paraffin heaters as a way of trying to heat and save costs. Excessive quantities of moisture are produced from such heaters. For every litre of paraffin burnt over one litre of moisture vapourises into air.

3. Changes in building design - many dwelling houses now have central heating systems where open fire places have been removed, reducing natural ventilation.

Windows without controllable ventilation became popular and permanent ventilators were not used in rooms without a flue.

Modern changes in roof design, including elimination or overhanging eaves and lowering the pitch, also reduced ventilation and increased the likelihood of condensation.

■ Mould Growth

Mould growth will appear on any damp surfaces such as plaster, wallpaper and timber and is associated with condensation problems in many buildings. It is unacceptable because of appearance (unsightly growths of various colours - greens, yellows, pinks, black, grey or white), odour (musty and damp), fears of health and hygiene considerations (particularly in food processing industries).

Moulds are simple fungi from several groupings in the fungal classification system. A typical life cycle is shown in figure 5 where spores are produced under asexual and sexual reproduction. It is sexual reproduction of fungi which allows genetic modification to adapt and tolerate changes in the environment such as humidity, temperature and food requirements.

There are three principal features common to the broad range of mould fungi:

1. Simple food requirements: able to exist on non-nutrient materials such as plaster and brick which have traces of contaminating organic matter.
2. Produce vast number of spores which allow rapid adaptation to particular environments.
3. Grow very quickly under suitable conditions.

The main requirement for the development and growth is a source of moisture although food, oxygen and a suitable temperature are also important. It is available water which is critical to mould development and different materials at the same moisture content often have different water availabilities.

Moulds can be regarded as hydrophilic fungi (tolerating high water availability) although individual species have their own optimum requirements for moisture. In most situations where surface condensation occurs and the relative humidity of the internal atmosphere exceeds 70% mould growth will be established.

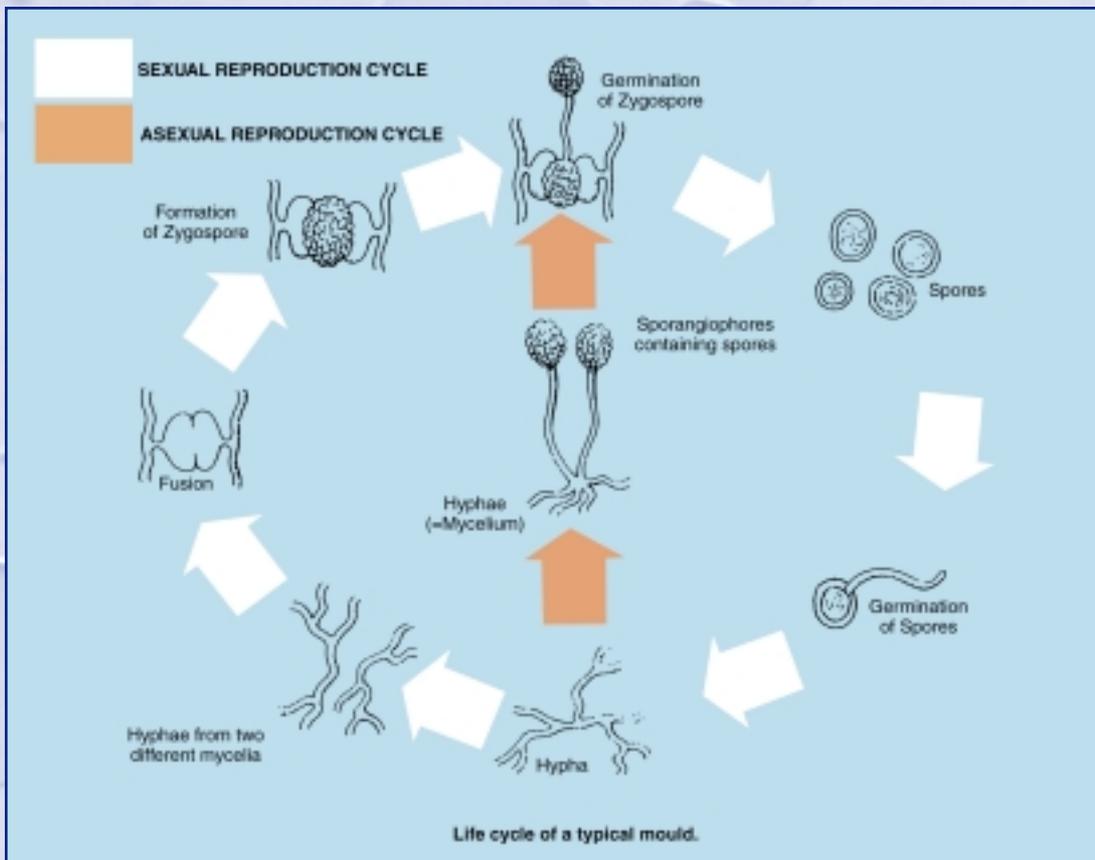


Figure 5

The susceptibility of material to mould growth will vary as mentioned previously. For instance it has been demonstrated that mould will develop on cheese and leather at 76% RH. It will not develop on wood below 85% RH nor on cotton or glass below 96% RH. The longer surfaces are under conditions of high moisture or local high humidity the greater the probability of mould growth developing. In a number of structures there may be a local or adjacent high humidity at the walls of the buildings sufficient for mould growth whereas the internal environment may not be experiencing relative humidities above 70%.

There have been approximately one hundred species of fungi detected in dwelling houses. The species commonly encountered were *Penicillium*, *Cladosporium*, *Rhizopus*, *Mucor*. Fungi specifically encountered on paint and plaster were for example *Cladosporium cladosporioides*, *Aspergillus niger*, *Penicillium purpurogenum*, *Mucor plumbeus*.

The appearance of mould growth in buildings often suggests poor standards of property maintenance and/or domestic activities encouraging condensation. Prolonged exposure to mould growth will cause disintegration and disruption of certain painted surfaces. Paper and certain fibre building fabrics may also be softened and deteriorate as some mould species are capable of digesting cellulose.

■ The Cost of Unchecked Condensation

A paper in the British Medical Journal, Vol. 298, June 1989, stressed the higher incidence of ill health in damp buildings with accompanying mould growth and it is now accepted that air pollution is a major reason for the huge increase in Asthma sufferers, of whom children are often the most vulnerable.

We are convinced that the use of Input Ventilation is by far the most economical method of eliminating condensation. In order to evaluate the position yourself, you only have to ask what the direct annual cost of condensation is. Even in a flat which does not suffer badly from condensation, it is likely that at least one room has to have the mould cleaned off and be repainted every year. Thus at a minimum the cost is something like £250 per year.

In many cases the direct cost is much more than this. If more than one room is involved, (sometimes the window frames need to be repainted, and repaired, or even replaced.), the occupants' clothes and other belongings may go mouldy and need to be replaced. In extreme cases the occupant may take the matter to the Court and compensation payments of several thousand pounds may result.

There is in addition a substantial 'hidden' cost which relates to administration. In the case of Local Authorities and Housing Associations for instance, a Surveyors time is consumed in repeatedly being subjected to the Tenants complaints. In some instances Surveyors productivity is impaired by this disruption and aggravation.

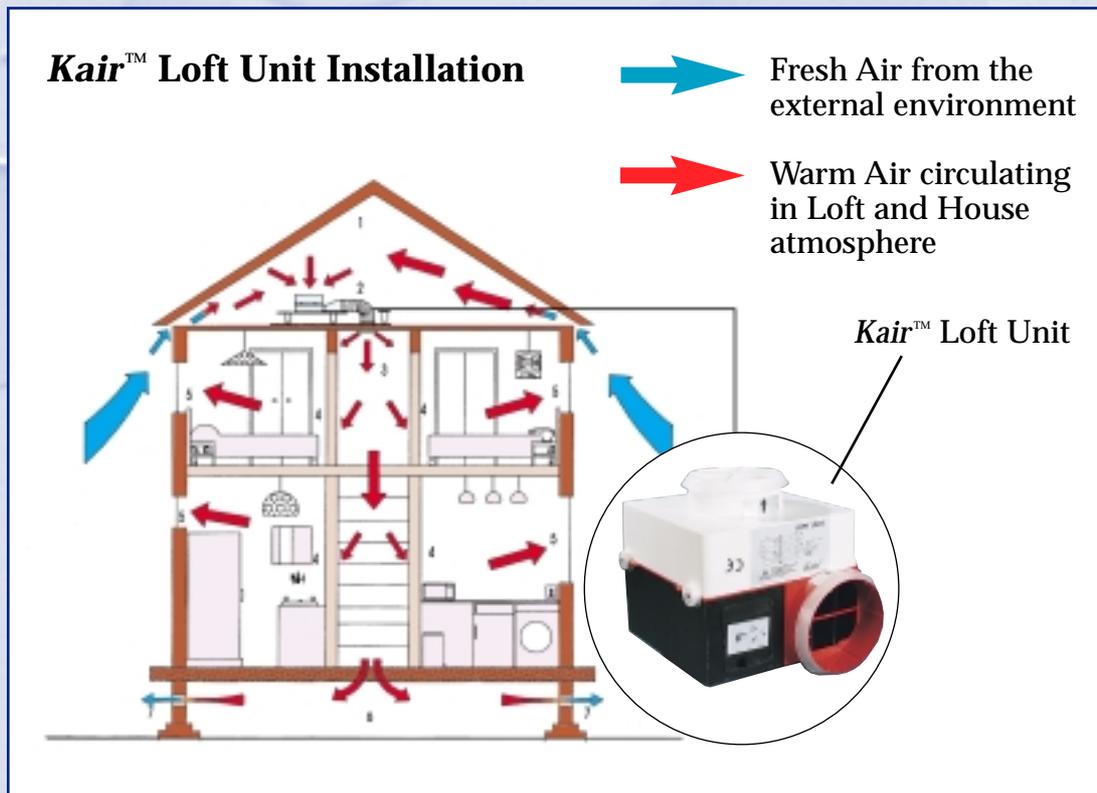
Kair Ventilation Division - The Positive Way to Control Condensation

Condensation is an increasingly serious problem in dwelling houses and offices. It affects over 50% of Buildings in the UK.

Accompanying condensation there is an increase in the presence of mould growth and many of the household pollutants.

Input Ventilation Systems are a cost effective way to eradicate Condensation and Black Mould problems.

We at **Kiltox** have supplied and installed Input Ventilation Anti-Condensation Units for a large number of Local Authorities and Housing Associations on a continual basis. We have practical expertise second to none and our high quality installation service means you can rely on the effectiveness of the equipment and its installation.



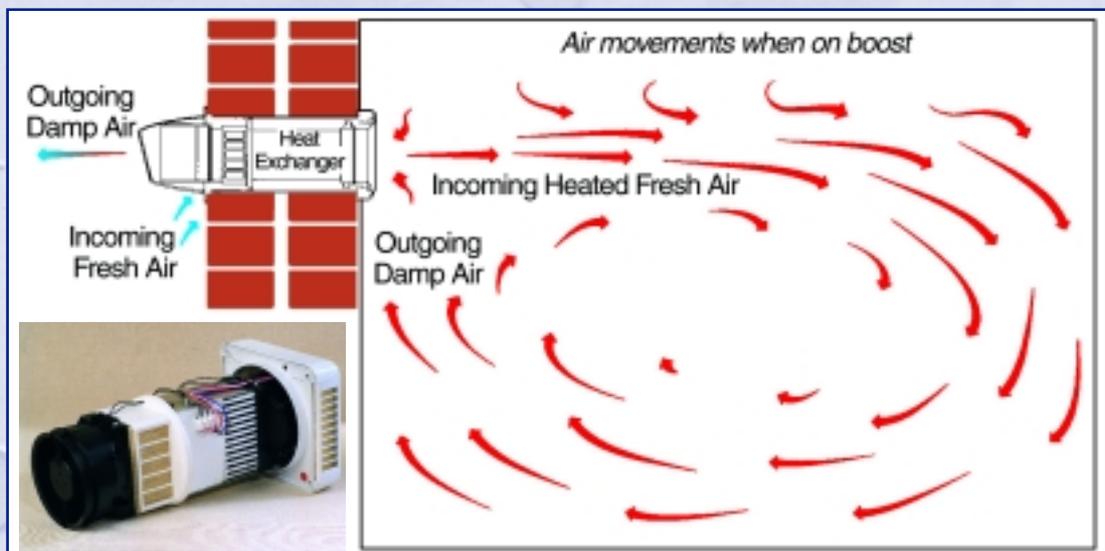
1. The loft space which contains warmer air mixing with air drawn in through eaves.
2. The warmer fresh air is then drawn into the Kair unit where it passes through a special air filter.
3. The filtered air is introduced into the property through the Kair diffuser grille, located centrally at ceiling level in the landing of the property, and is circulated around the property.
4. The fresh air then mixes with the warm air in the property, thus combating the condensation.
- 5-7. The stagnant air is then expelled through natural leakage points in the property. This also serves to help prevent cold draughts entering the property.

■ Heat Recovery

In addition to the outstanding benefits of input ventilator units as the complete cure for condensation, we can now offer you an additional and Environmentally friendly benefit, HEAT RECOVERY.

The world is becoming increasingly aware of the enormous cost of energy production and this plus the use of fossil fuels to generate power is a momentous environmental issue. Carbon, Sulphur Dioxide and other pollutants given off when burning fossil fuels puts a great burden on the atmosphere and over half the energy produced in this way is used simply to keep people and buildings warm. Despite spending millions of pounds on double glazing and insulation much of this expensively produced heat is wasted through extractor fans and other ventilation systems.

Ventilation is of course absolutely vital, for without it we run the risk of serious health hazards, discomfort and the awful consequences of condensation, mould growth and subsequent damage to the fabric of the building. The question is, can we achieve a balance between retaining valuable heat, whilst ensuring an adequate supply of clean fresh air. The answer is YES with HEAT RECOVERY, retaining a high proportion of the exhaust heat and using it to pre warm a fresh incoming supply of clean filtered air.





Energy conservation is the responsibility of all of us.

Conventional extractor fans potentially waste over a million kilowatts of energy every year, which is comparable to the total output of two large power stations. Replacing conventional extractor fans with heat recovery systems would save at least half of that energy loss.

Input ventilation anti condensation units are a successful and cost effective way to cure condensation. Input ventilation with Heat Recovery offers you even more benefit because it can save over 80% of heat which would otherwise be wasted by transferring it to the incoming fresh air supply.



■ Anti-Mould Products

Condensation and Black Mould are a serious hazard to health. The Environmental Protection Act 1990 puts the onus on all Landlords to ensure that their properties are designed and maintained to a standard that prevents conditions arising which can lead to any defect causing damage to the health or personal property of the tenant. Condensation and Black Mould fall very much into this category.

Under the Act, Landlords also have a **Duty of Care** to their tenants, to ensure that the premises are constructed and maintained free from defects which might cause personal injury or damage to the property of the occupant.

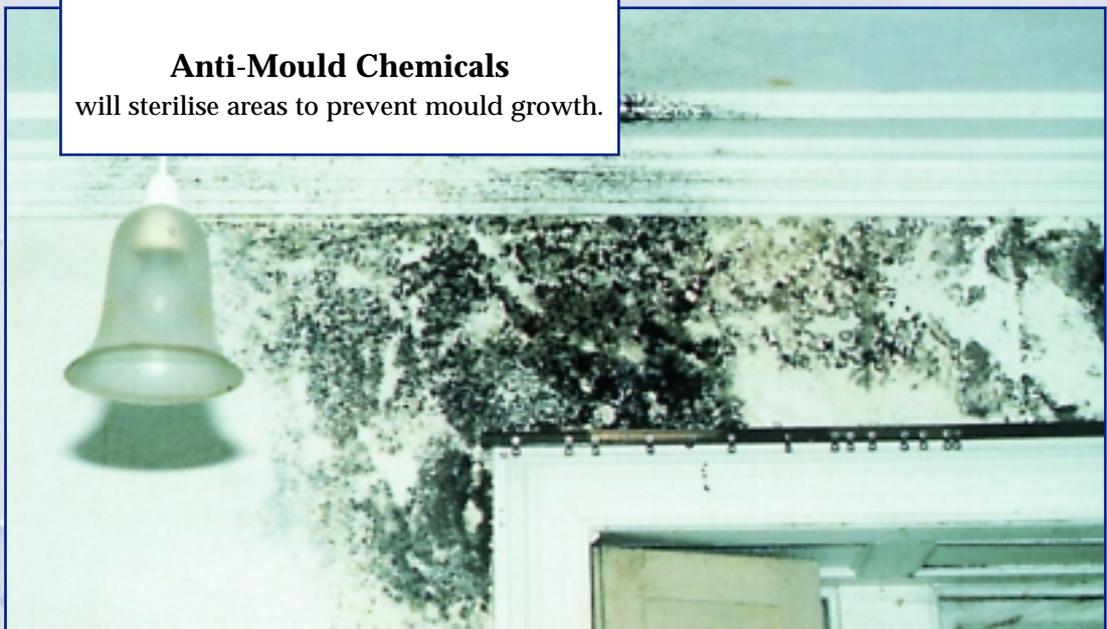
It is a proven Medical fact that Black Mould can cause respiratory problems and Condensation and Dampness can aggravate Asthma suffering as well as causing Mental distress. It is therefore vital that black mould is cleaned off and condensation problems eradicated as quickly as possible.

Anti-Mould Pack

will provide you with the means to clean off mould and ensure that it does not reoccur.

Anti-Mould Chemicals

will sterilise areas to prevent mould growth.



Conclusion:

Mould growth and condensation can be prevented by a combination of:

- Adequate ventilation
- Adequate heating
- Reduction of humidity
- Specialist coatings



Anti-Mould Paints

whilst providing a decorative finish will combat condensation and mould growth.

■ **Silexine Fungi-Chek & Anticon Paints**

The growth of Mould on Paints is an old problem, one which the Paint Industry has recognised and in the past thirty years has expended considerable effort towards its study and solution. Probably the most comprehensive official investigation of recent years was carried out in the U.S.A., by the Department of the Army Corps of Engineers, Engineer Research and Development Laboratories.

Using the same Test Methods, fungi Chek was tested and proved to be far superior to any other Fungicidal Material. Amongst other independent research carried out, it was found that Fungi Chek emulsion paint was found to be outstanding as a Fungicidal coating.

Note: In the American tests the specimens were incubated for ONLY 10 DAYS, whereas the Fungi Chek panels showed no sign of fungal growth even after 84 DAYS incubation and with the painted surfaces being in constant contact with an active Mould surface.

KILTOX[®] *Damp Survey Service*

The Kiltox Damp Survey Service will provide you with a type written report detailing all aspects of dampness and related problems in your property.

Our surveyors will locate the problem, recommend a service or specify equipment which will eradicate the problem, and provide an estimate for the recommended works. When you receive their report our surveyors will be available to discuss, clarify and in any way reassure you as to how our service will solve your problems.

DPC & Replastering Systems



Kiltox DPC and Replastering System is a process for the installation of a chemical damp proof course into existing walls and replastering thereafter. **It is a system assessed and approved by the British Board of Agrément.**

Walls treated with the Kiltox System dry out very quickly, enabling redecoration to take place at the earliest possible moment.

Kair Ventilation Systems

Kiltox Kair Ventilation systems are designed to provide an incoming supply of clean fresh filtered air. Stale moisture laden air will be expelled with many resulting benefits to health and comfort.

Our heat recovery systems provide all these benefits and in addition give an 80% recovery of exhaust heat. Our primary function is to completely eradicate condensation, dampness and mould. Our systems are especially beneficial to people with asthma or other respiratory problems.

Energy Conservation Service

The Burning of fossil fuels to generate power puts a great burden on the atmosphere and is a momentous environmental issue. Over half the energy produced in this way is used to keep people and buildings warm. Most of this expensively produced heat is wasted.

Heat Recovery Systems, Damp Proofing, Insulation all save energy.

Extractor Fans Air Grilles/Trickle Vents

Extractor fans are an established method of combating condensation. Providing the fan selected is to the correct specifications for it's proposed purpose it will help control condensation in the room in which it is fitted. Extractor fans, particularly heat recovery extractor fans, in conjunction with other products and services are an integral part of condensation control and improvement to the atmosphere.

Installation & Servicing

The installation of equipment or application of paints and chemicals must be carried out by competent qualified personnel. The siting of equipment or the correct quantities of materials can be of vital importance to the effectiveness of the condensation cure. Most organisations have approved contractor lists. The people best qualified to train your contractors are the people who manufacture the product or provide the material or service you wish to use. Use Kiltox approved contractors for all aspects of condensation control.

Don't forget service equipment. All equipment should be maintained and serviced on a regular basis.

Procurement Services

We aim to provide/source any service or product that is beneficial to our customers.

Damp Advisory Centre

For all aspects of dampness in buildings we can provide: Technical training seminars for surveyors and ancillary staff. Advice on technical products and services, lists of approved specialist contractors and FREE impartial advice.

Specialist Services & Products

- Dampcoursing Fluids
- Timber Treatment Fluids
- Fungicidal Fluids
- Dampcoursing Renders
- Waterproofing & Tanking Systems
- Condensation Control Systems
- Ventilation Systems
- Dehumidifiers
- Specialist Paints & Coatings
- Specialist Building Products
- Surveying & Design Services
- Training Seminars & Lectures
- Product Procurement

KILTOX[®]
C o n t r a c t s

6 Chiltonian, Manor Lane, Lee, SE12 0TX
www.kiltox.co.uk info@kiltox.co.uk

Tel: 08451 66 20 40 Fax: 08451 66 20 50