Condensation

It's all around us!

CITY OF LONDON

Condensation - what causes it and what can be done to reduce it?

Condensation can be a problem in any home - old or new, flat or house. Everyday things like cooking, washing, bathing and even breathing produce moisture in the air that, when it comes into contact with a cold surface, causes condensation.

Summarised below are few key areas which will give some simple tips to help you and your family combat condensation in your home. However, to really get to grips with the problem of condensation you really need to read the entire booklet. So please take a few minutes to go through this booklet because once you understand how and why condensation happens, you may never need suffer again.

Condensation – it's all round us. So what causes it?

And because it's so common in so many homes, you really should know a little bit about it.

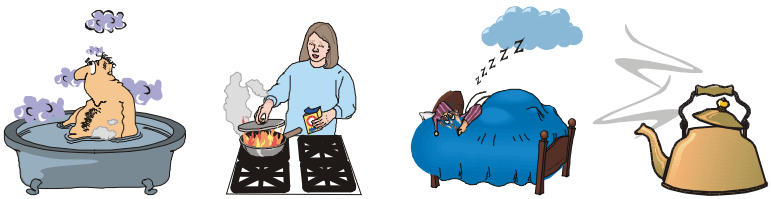
So let's take a look at what causes it, how it behaves, and just as importantly, how easily it masquerades as rising damp. Because it's this latter quality which gives it the ability to fool the unsuspecting resident and leaves them open to mis-diagnoses from unscrupulous or uninitiated damp proofing contractors.

The air, which surrounds us, either inside our homes or out in the garden, contains moisture in the form of a vapour that is normally invisible. Sometimes the air contains lots of moisture and can feel clammy or it can contain very little in which case it feels dry and may even become quite uncomfortable to breathe, resulting in dry throats and sinuses. In between the extremes there's quite a range where the air feels just about right. Naturally enough, when it's like this, we don't give it a second thought.

As individuals, there's not a lot we can do about the quality and moisture content of the outside air, but inside our homes we do have a say in how much moisture there is, how warm the air feels and how often we change that air for some which is a little fresher. That's because a lot of the moisture in our homes is actually generated by ourselves in the first place. For instance, if you put a pan of water on the hob to boil it will release moisture into the air, and this moisture is going to rise steadily upwards and disperse into the room. If the room isn't being ventilated very well, i.e. the air isn't being exchanged for fresher air, that moisture is going to stay in the room and add to its overall moisture content.

The same thing is happening every time you heat anything containing moisture, be it warming beans, toasting bread or boiling eggs. By heating these things, you're releasing moisture into the surrounding air. Not only does this happen when we're cooking but other activities; such as washing up, washing and drying clothes or having a bath all contribute to the problem.

You may be forgiven for thinking that if we stopped doing these things (even if we could) it would result in a clamp down on all of this moisture creation, but if you did; you'd be



All these activities create moisture!!!

wrong. That's because one of the main sources of moisture production (and we definitely can't do anything about this one), is that which is caused simply by breathing!

Some learned soul has worked out that if we were to spread out all the little tubes and airways in our lungs and put them onto a flat surface, they would cover the size of a football pitch! I'm not sure if this is actually correct but you get the idea. All of these little tubes and airways are (or should be) damp and as the air we breathe passes over them, it gets damp too. As we exhale this warm moist air into our houses, it also adds to the overall moisture content. Remember that when we talk about bedrooms a little later.

In all, the average family can produce up to 20 litres of water per day, just by their normal day to day activities. Try putting 20 litres into a bucket and seeing how much water you could be putting into your house – day, after day, after day!

= 20 Litres

Well, now we have an idea of how much and where all this moisture is coming from we need to know how it turns into condensation and allows that black mould to grow in the corners of the bedroom or mildew to appear on your clothes in the wardrobe. We also need to know why it might look like rising damp.

Understanding condensation is a bit like understanding juggling. There's more than one 'ball' involved and the circumstances have to be right to get it to work. The difference is, that with juggling you can see it all happening and it looks like fun. With condensation, you can rarely see it happening and it isn't fun at all!

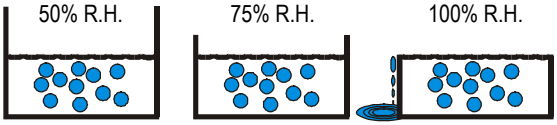
As we now know, all this moisture we're producing is finding its way into the air in our homes, and this air, at any one time, is at a certain temperature depending on which room it's in and where it is in that particular room. For instance it might be warmer in the living room than in the bedroom and, when it comes into contact with a cold wall or windowpane, it will be much colder than when it's above a hot radiator.

All this stuff about air temperature is common sense of course and we take it for granted but it has a dramatic effect on what happens to the state of the moisture in the air and why it suddenly turns to water when it comes into contact with the window pane or the

cold wall in the bedroom. This is because the air's ability to hold moisture is affected by its temperature and the warmer the air is, the more moisture it can hold. Naturally enough, the colder it is, the less it can hold.

Now, ***at any given temperature***, air can only hold a certain amount of moisture in the form of an invisible vapour. When there is more moisture in the air than it can hold as a vapour, it reaches what's known as ***saturation*** point and when that happens, the moisture vapour will turn back into water and condensation will occur! When this happens the air is said to have a ***Relative Humidity*** of 100 per cent. Air that is not saturated has a Relative Humidity of less than 100 percent with the air in most homes having levels of between fifty to seventy percent.

Now, we found out earlier that the air's ability to hold water is dependent upon its temperature. The warmer it is, the more moisture it can hold before it's saturated and the cooler it is, the less it can hold before saturation. So, if you imagine the air as a bucket containing water and we start to reduce the temperature of that air, then it's as though the bucket were getting smaller. Naturally enough, if you keep on reducing the size of the bucket (by reducing the air temperature) and keep the amount of moisture constant (by not getting rid of the moist air through ventilation), the bucket is going to get fuller and fuller and will eventually overflow. In other words, it reaches saturation and achieves a Relative Humidity of 100 percent!



Reducing the size of the bucket (air temperature) whilst keeping the contents the same means puddles!

As we said earlier, this is the point when condensation occurs. The temperature, when saturation point is reached, is called the ***'Dew Point'*** and it's another very important 'ball' in the juggling act!

So, at this point, lets have a look at what could be happening in our home. You're in the bath, which is full of hot steamy water, the kids are in the kitchen micro-waving a pizza and the tumble dryer is venting off nicely. Everyone and everything that is capable of producing moisture is doing its best to do so and consequently there's lots of it being produced and wafting gently into the atmosphere.

Also, the home feels quite warm as the central heating is on and, because we have lovely draught proof double-glazing, we're not losing that warm air into the atmosphere outside. We've also blocked up the fireplace with the latest gas fire too, so that's stopped that

route for any warm air which might have wanted to escape and, just to ice the cake, we've made sure that the boiler takes its air from via its balanced flue, so that's not removing our moisture laden air either! Oh, we're not completely air tight of course (we'd soon stop breathing if we were) but we've done everything a modern family can do to make our lives more comfortable and energy efficient and we've managed to get the number of times the air is changed in our home down to much less than one air change per hour. Because after all, the more times we change the air in our homes, the more it's going to cost us to warm up the new air, which replaces it!

No ventilation here!

If all this moisture laden air which is floating around the home isn't being changed very often because of our ultra efficient draught proofing and modern boilers etc, then what's going to happen to it when we've all gone to bed and things start to cool down?

Remember, the cooler the air, the less moisture it can hold before it becomes saturated and, as we wind down our activities and toddle off to bed, the central heating will turn itself off and the house will start to cool. In other words, the bucket is going to start to get smaller and smaller and smaller.

It will do this at a much faster rate than the air in our draught proofed house is changed and consequently there will still be a lot of moisture remaining in it long into the night - it will retain its high Relative Humidity.

In the bedrooms where we spend the night gently snoring, the moisture in the air is being continually added to, and it's all going into an ever-decreasing bucket!

And nowhere is the temperature going to decline faster than in the rooms which have outside walls. Especially the ones which face in a north or north easterly direction.

These northerly and easterly facing walls don't get much (if any) sunshine and consequently are never as warm as the south and south westerly facing walls. Their temperature easily declines to the dreaded dew point we mentioned earlier, and when

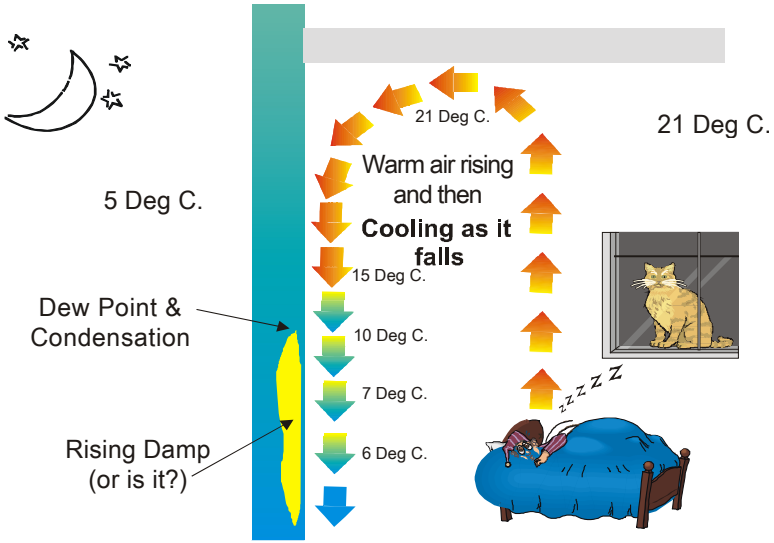
this happens condensation will occur! In fact, the lower reaches of some north and easterly facing walls can stay permanently at or below dew point in the winter months and condensation can be occurring all the time!

To re-cap then, when the dew point is reached, the moisture that is contained within the air can no longer exist as a harmless vapour and, a bit like Cinderella at midnight, it turns back into water.

It does this at the interface between any cold surface (below dew point) and the air, i.e. on the wall, on the window, on the mirror in the bathroom or on your best frock in the back of the cold, cold wardrobe!

When the air was warm, for example as it came out of your mouth when you were breathing, it rose. As it cools in the night air it starts to fall and some of it will meet the walls. These can be even cooler and will cool the air even more.

The ever-cooling air will fall even further and eventually will reach a height, which is at dew point. This often occurs at the lower reaches of the outside walls and this is how it gives the impression of rising damp!



In this example shown above; if the Relative Humidity is only 50% (and with two people breathing in a bedroom it could easily be higher), and the inside room temperature is 21 deg C., then the dewpoint temperature is 10 deg C. Many outside walls have lower temperatures than this during the winter!

Condensation or damp?

That's a quick brief on how it happens, now we have to decide what we're going to do about it, because if we do nothing then the home can become pretty uncomfortable and we're going to get:

Wet walls, Peeling wallpaper, mildew on our clothes and other fabrics, including furniture. A musty smell and, most dramatic of all, black mould (*Aspergillus Niger*).

This latter symptom is particularly interesting because it tells us that the cause of the problem is actually condensation and not some other form of damp, such as rising, or penetrating damp. This is because *Aspergillus Niger* needs pure water in which to grow and, unless you're distilling it yourself and throwing onto the walls, the only way to get pure water is by condensation.

Rising damp picks up salts from the ground as it moves into your walls and penetrating damp collects contamination from the building itself, thus rendering the water impure. Consequently, when you see black mould, think condensation. You won't go far wrong!

The elements, which control whether we have condensation problems or not are as follows:

Relative Humidity (and to a degree we control this by how we live)

Ventilation (because this is what removes the moist air from our homes)

Temperature of the air and fabric of the buildings (we partially control this)

How can I prevent/manage it?

Let's make a start by looking at what we can do to control the Relative Humidity by regulating the amount of moisture we put into the air in the first place. To be honest, there's probably not a massive amount you can do about this because we all need to eat, bathe and breathe, but you can do some things that can help the situation.

Firstly, there are some devices, such as paraffin and bottle gas heaters that are renowned for being moisture producers. They may be a convenient source of heating but if you can avoid using them then you'll certainly be helping your condensation problems.

As we saw earlier, cooking is also a major source of moisture production but it would be very difficult to terminate this activity completely! However, if it's possible, try to ensure that pans and kettles aren't left to simmer contentedly by themselves with no useful purpose. When it's done its job, turn it off! Drying clothes inside the home produces lots of moisture too!

Finally, if you are engaged in any moisture production activity, try to contain it within the area it emanates from until your ventilation system manages to replace the moist air with fresher stuff. If you're having a bath for instance and the extractor fan is struggling to cope, don't leave the bathroom door open, keep it closed and the air won't disseminate throughout the home! While you're in the bathroom, a handy tip to reduce the 'fog' is to run a few inches of cold water into the bath before you add the hot water. You'll be surprised how much this reduces the problem!

We can all examine the ways we can reduce moisture production in our own homes but we're never going to eliminate them entirely and, to help cure our condensation we're going to have to look at the other 'balls' in the juggling act. The next one being:

Ventilation

The less moisture there is in the air, the less there is to condense on our walls. That's common sense of course and easily understood. But getting rid of the moist air, although relatively easy, has its drawbacks. And the main one is cost. If we've spent a lot of money, via the gas or electricity meter, in warming up the air in our homes, probably the last thing we want to do is to open the windows and wave goodbye to it. So although ventilation is a vital part of condensation control, it has to be approached in a pragmatic manner. Opening every window in sight, even on a cold day isn't usually necessary to control the problem!

In our quest for comfort and civilisation a lot of us have altered the way in which our homes behave, especially the older ones. They were originally built with draughty windows and open fireplaces, but of course all this has been altered. We now have limpet fitting double glazed units and either gas fires, which effectively block the fire openings.

Also, when first built, older buildings had windows which were single glazed. This usually meant that condensation formed on them and was often a problem that had to be wiped away.

There's no argument that this was a pain but consider that all that water you had to wipe off the glass was water that wasn't being deposited somewhere else where it couldn't be seen!

Of course we're never going to exclude all the moisture we have around us - we don't want to; but we do want to reduce it enough to ensure that dew point is so low that it doesn't actually occur very often. Remember the bucket analogy; if the water (Relative Humidity) was reducing at the same time as the bucket capacity (temperature), then it would be more difficult for the two things to meet meet up and we wouldn't have an overflow!

For instance, an extractor fan in the kitchen, and one in the bathroom are going to effectively exert control over areas of huge moisture production. Putting one in a bedroom could be considered a bit over the top! However, opening the trickle vent in the bedroom window would not only be a lot quieter, it would also, in a very controlled way, re-introduce the draughts our grandparents enjoyed and reduce the Relative Humidity in a most satisfactory manner!

Sensible ventilation requires experimentation to find the most efficient way, and areas which naturally have still air in them, such as corners, behind large pieces of furniture or in enclosed spaces like wardrobes need particular attention. You're after enough air changes in the room(s) in question to rid you of your troublesome moisture without replacing it with troublesome fuel bills... and speaking of which:

Heating

We could address the problem by ensuring that the fabric of our building was always as warm as a summer's day and thus never ever fell below dew point. If all portions of your outside walls were always warm enough to be above it, no matter how many pans you were boiling you'd never have to buy the anti-mould stuff that they sometimes sell at B & Q! Well, you can give this method a try if you want, but by itself it probably isn't a winner.

Remember, it's usually the walls where most of the condensation occurs and going solely along the 'heating it all up will cure the problem' route is going to be expensive and difficult.

Some walls can be quite thick, very solid and on the perpetually cold side of a home. If they're cavity walls they can often be subjected to cooling draughts inside the cavity itself. Whichever type you've got, unless you have them insulated, then keeping them warm enough to address the problem by itself is going to cost money, probably lots of it. That's not to say that you should abandon the use of heat as a tool, just that by itself it's an expensive one.

It's far more effective to combine the heating method with moisture reduction and ventilation and to aim to keep the walls at a constant temperature, which, in conjunction with the other two elements, will curtail the condensation. If you can, avoid warming rooms for short periods of time because the walls will not absorb much heat in this fashion and consequently will soon become cold again. If you feel you can afford it, extend the period of your heating cycle rather than turn the temperature up for shorter periods.

Summary

To re-cap. If you have black mould, running water on walls or standing water on flat surfaces, your clothes change colour and texture in the wardrobe and the salt and sugar in your cupboards turn rapidly into solids, then you probably have a condensation problem! Look at all the 'balls' in the juggling act and do your best to adjust them so that you retain a cosy environment whilst ridding yourself of the problem. Don't assume you have a leaking wall or rising damp because ninety-nine times out of a hundred, you haven't. However, if you don't consider the alternatives and you can't appreciate the difficulties your building is operating under, you may well pay out a lot of money to end up at exactly the same place as you began! Condensation has to be considered and dealt with before any other forms of treatment are contemplated.

Finally, remember that condensation is more of problem in winter than in summer but its effects on your walls can last throughout the year and fool you into thinking you have rising damp. Consider the alternatives before you spend money on expensive 'cures' and try and get into the habit of reducing moisture production and ventilating your home more efficiently. If you're in doubt about the source of your dampness, call in an independent expert – it could save you a fortune.

Community and Children's Services