ARCHITECTS MEMO
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HCHO

Looks pretty innocuous doesn't it! A couple of hydrogens, an oxygen and a carbon atom – but, this is the formula for formaldehyde, which causes a lot of angst these days!

Of course, nothing is ever simple and the same goes with formaldehyde.

Formaldehyde can be everywhere! That includes interstellar space where it is considered to be one of the essential building blocks of amnio acids - precursors of life itself. Anywhere that organic matter may be oxidised, burnt or fermented, formaldehyde will appear.

It is manufactured by the human body via an enzymatically catalysed reaction in order to effect essential metabolic functions before it is disposed of in an equally elegant manner. In fact, the human body metabolises formaldehyde relatively easily. At any time, one can expect to find about 30 milligrams of formaldehyde in each litre of blood and about twice that amount in the hippocampus. It is not acutely toxic by ingestion.

So what is all of the fuss about?

Well, formaldehyde exists as a gas, as an aqueous solution and in a couple of solid, polymeric states, paraformaldehyde and metaformaldehyde. Each of these three latter states can easily revert to the gas, typically with a little applied heat. Formaldehyde gas interacts aggressively with nasal tissues and eyes, creates a burning sensation in the throat and can also affect breathing.

Although the 'normal' threshold for first signs of irritation is 0.3ppm (parts per million), sensitive people can detect it as low as 0.05ppm. Many will just detect it at 1.0ppm. A lot of research has been put into establishing the ill effects of formaldehyde since the early seventies and it has been implicated in causing asthma, the relatively uncommon nasopharyngeal cancer and possibly myeloid leukemia. In 2011 it was declared a known human carcinogen.

While this ruling was somewhat controversial, there can be no doubting that formaldehyde is best to be avoided - but that is easier said than done! Formaldehyde is an immensely useful chemical which is used 'as is' in aqueous solution as a bactericide and fungicide and especially, as a tissue fixative in embalming fluid where it crosslinks with amino groups in protein and preserves it.

It is this ability to crosslink with other chemicals which accounts for about 90% of the nearly 9 million tonnes of formaldehyde produced annually. Its use as a building block is critical in the manufacture of urea - formaldehyde; melamine - formaldehyde and phenol - formaldehyde resins which are widely used as binders for reconstituted wood products and textiles. The most common products where one will meet formaldehyde is in particle board; medium density fibreboard; hardboard, furniture made from the above, some carpets, and clothing.

Measurements done on actual houses in America have shown levels of 0.076ppm in brand new houses droppin to 0.045ppm after 30 days. (Exact details of construction were not provided). The US EPA specifies no more than 0.016ppm for their own new builds.

Urea or melamine/urea-formaldehyde resins will always contain some unreacted formaldehyde - with the better resin manufacturers attaining the lowest residual levels. However, in the curing process which converts these liquid resins into the solid binders that glue the wood fibres and chips together, further formaldehyde is generated which must slowly diffuse out of the product and into the air.

Problems mainly exist with new builds, refurbishments or possibly, on replacing a carpet, but the discomfort felt over those initial weeks of high flux can be considerable, and the purpose of this memo is to suggest ways of minimising this.

Good ventilation is paramount. The longer the formaldehyde source can be left in a well ventilated area, before enclosing in a building, the better. Although this sounds simple, storage costs and logistics mitigate against this. Nonetheless, the more ventilation, the better.

The immediate sealing of raw, reconstituted wood products can be beneficial because, even though this will reduce the rate of diffusion out (meaning that the formaldehyde will

hang around inside the board longer); it will reduce the flux to more acceptable levels.

Although some paints are still made using formaldehyde resins, these will rarely be field applied and, pre-coated materials that use such paints will be fully cured by the time that they are installed into a building and not be a reservoir for formaldehyde. Other paints, however, can be positively beneficial.

The legions of avid readers of these memos will no doubt remember memo 117 called 'Absorbing Stuff'. In that I wrote about the ability of the Resene waterborne enamel range of products to absorb finite and quantifiable amounts of formaldehyde. The amount is not trivial and can be very useful in ameliorating that initial high flux of the gas. Incidentally, this is the technology that the Chinese market relies on to reduce formaldehyde levels in the home.

I am aware of some evidence that just white paint in itself may have some formaldehyde reducing effect and also that the photocatalytic solution earlier proposed, has been difficult to deliver so far. Another simple and very useful aid are indoor pot plants! A quick web search will advise the best formaldehyde absorbers in a pot, and they come with the added benefit that they are good for the soul as well!

The real danger of formaldehyde is directed to industrial users and embalmers and I don't consider ambient formaldehyde as an acute danger but, if we can reduce our exposure to it, then why not.