BUILDING ENVELOPE NEV

#6651

An information service for building owners and managers, architects and engineers concerned with comfort, structural integrity, energy savings and building preservation.

Vol 7. January 1993

Publisher: Doug Lawson *Editor: Richard Willingham*

AWAY FROM THE MADDENING SMELLS

When a building is experiencing air quality problems such as noise, dust, smells, etc, it is often overlooked that this could be another victim of that common building affliction "the holey envelope".

Building Sciences Ltd was commissioned to audit such a problem building where for many years there has been odour problems in the upper floor offices of a large multi-purpose premises located in the Midlands. The lower floors of the building incorporate a covered retail market selling fish, meat, poultry and a large selection of dry goods. There are also cafe areas together with their kitchens located on these lower floors.

The problem was tracked down to a lack of continuity in the building envelope air barrier, but the deficiency was not in the envelope separating the offices from the building exterior. In this instance it was also necessary to effectively separate the offices from the "unconditioned" market environment and therefore the plane of the air barrier also had to include the ceiling slab of the market area, the walls of the large lightwells and also all of the walls of the building risers such as stairwells, liftshafts and service ducts.

Stack effect exfiltration occurring around roof top extract ducts above the lightwells.

The main culprits for this odour transfer were found to be the large lightwells and the services ducts, which run up through the height of the building. At their lower levels these were picking up the odour laden market air and then by stack effect transferring this to the upper floor offices. The stack effect of this five storey building was found to be significant with the roof top glazing assemblies above the lightwells, strongly exfiltrating warm air. Similar stack effect was occurring at all of the building risers, thus providing the force to drive the odour laden air through the riser walls and into the offices.

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WINDOWS CAN NOW BE EFFECTIVELY FIELD TESTED

A recent commission for Building Sciences Limited involved an Envelope Design Review on an office development project.

The walls of the building are to be glazed with wooden sash windows. Due to the extent of this glazing and the fact that some of these sliding sashes are large, up to 2.8 metres high, there was serious concern regarding the air tightness of these assemblies as if these were to leak excessively this could result in staff discomfort problems and would also impact the building air exchange rate and thus the space conditioning load.

The use of sliding sashes is, however, a requirement of English Heritage, otherwise alternative and potentially less leaky windows such as tilt and turn, or fixed/partially fixed could have been considered.

Doug Lawson of Building Sciences reports that in his experience sash windows are usually leaky and large sashes can be very leaky and even when these are made initially tight there can be a tendency for wooden members to move/warp and therefore gaps can open up.

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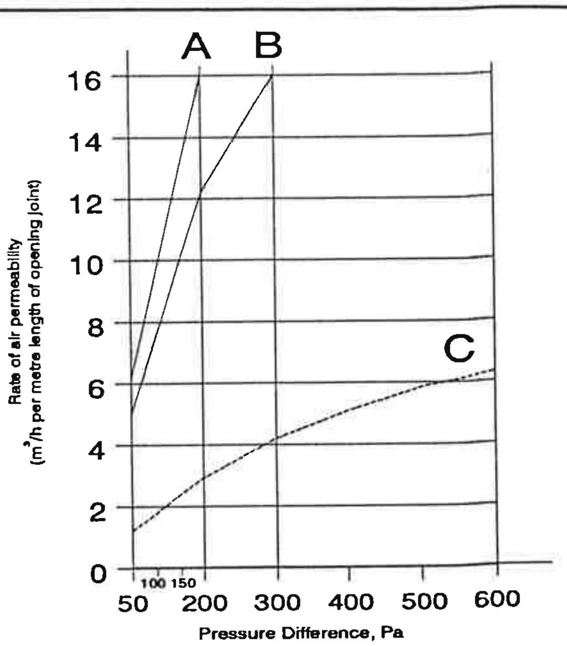
WINDOWS CAN NOW BE EFFECTIVELY FIELD TESTED (from page 2)



BS6375 Air Permeability Limits for Three Grades of Window Tightness.

The principle of the field test is to provide a temporary air tight chamber to the window interior. This is accomplished by taping a polyethylene sheet around the window perimeter together with fitting into the sheet an adaptor to receive the differential pressure measuring tube and the blower air supply hose.

Testing will be undertaken using a portable air leakage test unit which will include air flow and differential pressure measuring devices and blower unit, plus all associated components.

The increasing focus on building envelope performance, will dictate the need for further development of such field testing methods, for key envelope components.

CHANGES TO THE BUILDING REGULATIONS

Changes to the non domestic Building Regulations are being considered which would include an air tightness requirement for future building envelopes.

The next issue of Building Envelope News will address this tightness issue by reviewing Canadian experience in the eight years since the requirement for air barriers has been included in their Building Code.

GUIDE TO GOOD PRACTICE FOR CURTAIN WALLING

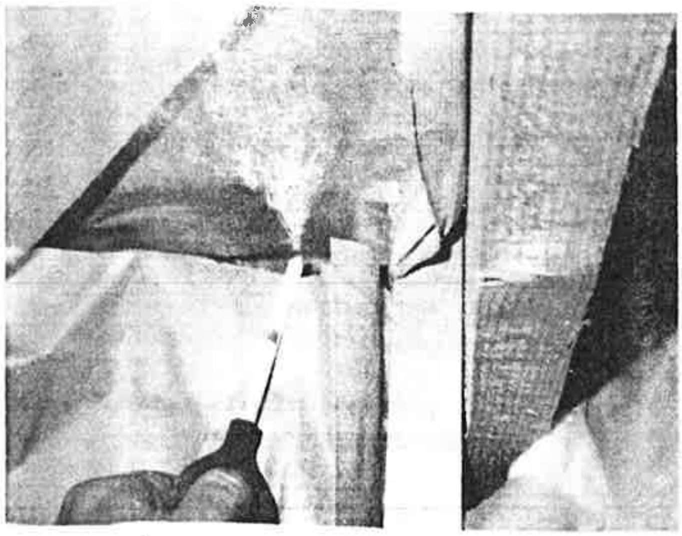
The Centre for Window and Cladding Technology's Standard and Guide to Good Practice for Curtain Walling will be formally launched on Thursday, 4th February 1993. This Standard which has drawn on the knowledge and skills of many CWCT members, will improve the specification of curtain walling by setting common standards for performance and a classification system for proprietary systems. The Guide to Good Practice breaks new ground in dealing with fabrication, installation and maintenance.

ALL THAT STANDS BETWEEN US AND THE ELEMENTS (from page 3)

Here is another instance, albeit a pretty extreme one of a significantly deficient air barrier system. In the opinion of Doug Lawson of Building Sciences an effective air barrier system must be capable of meeting the following specification:

1. Be composed of materials that are air impermeable or virtually so.
2. Be capable of being made continuous around the envelope.
3. Have sufficient mechanical strength to enable it to withstand the pressures created by wind, stack effect and air handling systems.
4. Be readily installed.
5. Be durable or accessible for maintenance.

While the paper/foil membrane described could meet the requirements of items 1) and 5) such a system could not fulfil the other three key specification requirements.



Air infiltration occurring at gap in paper/foil membrane at wall/roof junction.

NORTH AMERICAN FORUM

Initial reaction to an article on Indoor Air Quality might be what has this to do with the Building Envelope. Well quite a lot according to Tony Woods as a fundamental issue in the achievement of predictable and desirable indoor air quality is the integrity of the building envelope.

The author of the following article is Tony Woods who is President of Canam Building Envelope Technologists Inc, of Toronto and Past President of Ontario Building Envelope Council.

INDOOR AIR QUALITY
What can be done to improve it?

Now that people realise that pollution indoors is just as bad as, often worse than, it is outdoors, the focus of consumer and regulatory concern has quickly moved to the quality of the indoor environment. New codes and standards are coming into force which affect all members of, and suppliers to, the construction industry. The key to improving indoor air quality (IAQ) is to understand how the structure itself, and the materials from which it is made, interact with HVAC systems to create better or worse indoor environments.

In the search for ways to improve IAQ, the relationship between buildings and their HVAC systems is complicated even more by the economic need to keep energy usage efficient. Most mechanical engineers now believe that energy conservation and acceptable IAQ are quite compatible; it just takes some clever thinking to avoid wasting expensively conditioned air when you're trying to bring masses of fresh air into the building.

What is desirable air quality?

The ingredients for desirable air quality are as follows:

- Absence of pollutants and other harmful substances;
- Absence of annoying and irritating substances and conditions;
- Humidity levels beneficial to health and comfort;
- Temperature levels beneficial to health and comfort.

American Society of Heating, Refrigeration and Air conditioning Engineers (ASHRAE) states that acceptable IAQ should be maintained at levels expected to protect occupants from adverse health effects and discomfort. The new Standard 62 for ventilation in commercial buildings is being introduced to recognize the balance between the need to provide health and comfort, and energy conservation. It calls for 15cfm per person of fresh air supply.

Contaminants which cause health effects to the eyes, skin, respiratory tract or the gastrointestinal tract should not be present in the indoor environment. Toxic pollutants affect everyone (from irritation through to cancer), but some contaminants cause allergic reactions only in hypersensitive people (from headaches to asthma). For more information on this subject there is an excellent Canadian publication *Exposure Guidelines for Residential IAQ.*

Humidity and temperature levels work together to provide comfort for building occupants. Generally there are four parameters which are related: air temperature, air velocity, radiant temperature and relative humidity. Improper relative humidity can reduce IAQ to levels extremely damaging to health. (See illustration below).

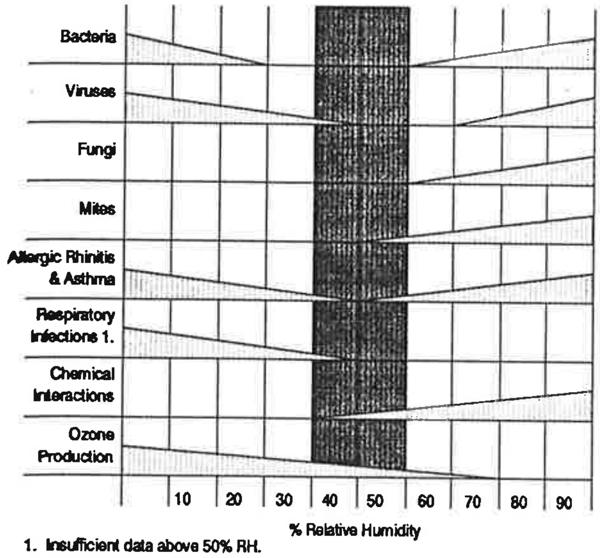


Chart showing potential growth in air contaminants and health problems where relative humidity varies outside of the 40% to 60% range.

One Canadian study commissioned by ASHRAE concluded that the optimum relative humidity range for people's health is 40% to 60%. When RH levels were above or below this range, bacteria, viruses and fungi became more evident. Studies have also shown that if indoor temperatures and humidity are properly controlled, IAQ problems are greatly reduced. There is a decrease in absenteeism, and productivity is higher.