Airtightness Construction Trends

.... mechanical ventilation is needed to avoid indoor air quality problems. Many new conventional houses have low natural air change rates..... and are tight enough to require mechanical ventilation, but most have none.

Canada is a world leader in cold climate housing. Emphasis on increasing airtightness has improved energy efficiency, reduced structural moisture damage, and improved comfort. These benefits can be achieved without causing indoor air quality problems, by paying attention to adequate ventilation, depressurization and spillage control, by improving ventilation equipment and installing depressurization tolerant combustion appliances.

National surveys of the airtightness and energy efficiency of new housing, including both conventional and R-2000 houses in all southern regions of Canada, have been done over the last 16 years. The latest tests looked at new conventional houses built in 1990 to 1996. Test results show a continued trend to more airtight houses with significant but decreasing regional differences. Houses built in the last five years are 35% tighter than those built in the previous five years.

R-2000 houses are still much tighter and more efficient than new conventional houses, but the gap is narrowing. The trend to tighter houses is strongest in British Columbia, where houses built from 1981 to 1985 were much looser than in all other regions. However,major improvements have now brought the average BC house close to the national average.

The profile of house samples was representative of the housing stock. On average, R-2000 houses are 22% larger than conventional houses. British Columbia has the largest houses by a significant margin, while the smallest houses are in Quebec and Atlantic Canada.

The significant increase in airtightness is probably due to a number of factors. Builders and house buyers are generally more aware of the issues of moisture damage, comfort, and energy efficiency, due to various programs for builder training and consumer awareness. The 1985, 1990 and 1995 editions of the National Building Code also have had some influence, although their airtightness provisions are not very significant.

The Model Nation Energy Code for Houses specifies that houses should have a normalized leakage area (NLA) of less than 2 cm^2/m^2. On average, new conventional houses in all regions are within this limit. Regions other than the Prairies and Ontario have significant numbers of houses which exceed the 2 cm2/m2 limit by significant amounts.

Greater airtightness creates a need for mechanical ventilation to avoid potential indoor air quality problems. Many of the new conventional houses have low natural air change rates, especially during Spring and Fall when windows are closed. They are tight enough to require mechanical ventilation, but most have no central mechanical ventilation systems. These houses must rely only on kitchen and bathroom fans which are seldom run continuously. Ventilation can be provided by quiet fans with automatic controls, or by heat recovery ventilators.

Greater airtightness also creates the potential for depressurization which can lead to spillage of combustion products from fuel burning equipment. This occurs when exhaust fans cause the air pressure inside the house to be lower than outside. About 35% of new conventional houses which require mechanical ventilation to prevent IAQ problems have none, and 64% have either no ventilation systems or systems that may be inadequate.

For houses with spillage-susceptible appliances, the maximum allowable house depressurization (by code) is 5 Pascals (Pa). Up to 40% of spillage-susceptible new conventional houses could have depressurization greater than 5 Pa.

The majority (64%) of all new houses have air change rates of less than 0.364 air changes (ACH) and no heat recovery ventilator (HRV). These figures range from 13% in Atlantic Canada to 83% in British Columbia. Forty-one percent of the houses have natural air change rates below 0.208 ACH and no HRVs; these figures range from 8% in the Atlantic provinces to 67% in B.C.

The conclusion to be drawn from these figures is that homes built to current practice for airtightness must have at least a central ventilation system adequately sized for the house, and suited for continuous operation.

Energy Efficiency Trends

In each region, R-2000 houses are still significantly more energy efficient than conventional houses in the same region.

New conventional houses consume an average of 93 giga-joules per year (GJ/y) for space heating, compared to 70 GJ/y for R-2000 houses.

Airtightness and Energy Efficiency of New Conventional and R-2000 Housing in Canada, 1997 Natural Resources Canada, Building Group Department of Natural Resources/CANMET

Whether one compares new conventional and R-2000 houses, or the most and least efficient new conventional houses, the least efficient houses have poorly insulated basements that account for a proportion of total heat loss. This indicates that more attention should by given to basement insulation in new conventional houses.

R-2000 houses, on the other hand, loose more heat through windows than conventional houses do, due to their larger size and window area. The efficiency of B.C. houses is low when climate is taken into account.

Under the EnerGuide for Houses energy efficiency ratings, new conventional houses average 73 out of 100, and R-2000 houses have an average rating of 79. ☼

InterBUILD '98, Calgary

How would you feel if you organized a party, and nobody showed up? The organizers of the interBUILD housing and construction show in Calgary must have felt that way. They put on an excellent trade show, and a fairly good technical conference alongside, even got the Alberta premier to open the show. Unfortunately not many visitors attended.

Trade shows have a long history of being the vehicle suppliers and purchasers use to find out about the latest developments in the industry. Industry trade shows (as opposed to consumer shows) usually have more "meat" in the content, and provide a less frenetic opportunity for exhibitors and visitors to learn about new developments and establish contacts. The biggest construction show in North America is the annual NAHB show in the USA, which is too big to visit comfortably. It was in that spirit that the interBUILD housing and construction show was put together.

I suspect that part of the poor turnout was not because everyone in Calgary is busy these days, but because the marketing implied that this was an international show for those interested in export markets, so there might be little for the local builder or trades person. Anyone not involved in export work, and this includes most of the construction industry (except product manufacturers), would have considered this not to be a show for them.

Unlike consumer goods, which can be produced in one location to serve the needs of the entire world, construction is rooted, by definition, in one place. It does not make any sense to transport houses around the globe. Perhaps some specific products, and design and management services are exportable, but not entire buildings. The bulk of construction will always be rooted locally. That is something that seems to be forgotten when so much emphasis today is placed on export trade. Too many also forget that you have to have a healthy domestic industry, for which exports are the icing on the cake, and not the cake itself.

The organizers are planning to make this an annual event, and have tentatively booked the third week of April 1999 for the next InterBUILD. We hope the exhibitors give them another chance, and that the organizers review their marketing strategy, as it could be time well spent for anyone in the construction industry. ☼

Information:
InterBUILD Expositions Inc.
Tel: 403-413-6222
Fax: 403-413-6224

Designer Grills

Forced warm air grills are a basic component of forced warn air heating systems. Standard floor grills aren't very attractive, and their aerodynamic design is nominal. To compensate for inadequate layouts and air distribution, some people have been installing deflectors to keep floors warmer and deflect air away from drapes and furniture.

A couple of Vancouver entrepreneurs have come up with a new high impact polyethylene 4 x 10 pop up vent that is available in a number of colours. A homeowner can lift the vent to get deflection of air flows, without the need to install a permanent deflector. More importantly, the grill, which can be used as regular floor register, has a very well made and easy to use damper. Air flow can be modulated very easily, and much more effectively than most metal grills. ☼

For information:
Break Thru Products Inc.
Tel: 604-552-2706
Fax: 604-534-8266