#6452

The ten houses which used the polyethylene air barrier system were built with four commonly used systems: standard frame walls; frame wall with exterior insulated sheathing; frame wall with interior strapping; double wall.

Stucco had little effect on the airtightness of the double wall houses but did produce significant reductions in airtightness for the two houses which used either standard frame walls or frame walls with interior strapping. This suggests that the latter two air barrier/wall system combinations had leakage sites which the stucco sealed at least partially, but the same leakage areas were not in noted in the double wall houses.

The Airtight Drywall Approach was used in 14 of the houses. Development of the ADA system has continued since the project houses were built, so improved gaskets and construction methods are used today.

Both air barrier systems are used to meet the R-2000 airtightness standard. The tightest envelopes were those constructed with the double wall technique and polyethylene air barrier systems.

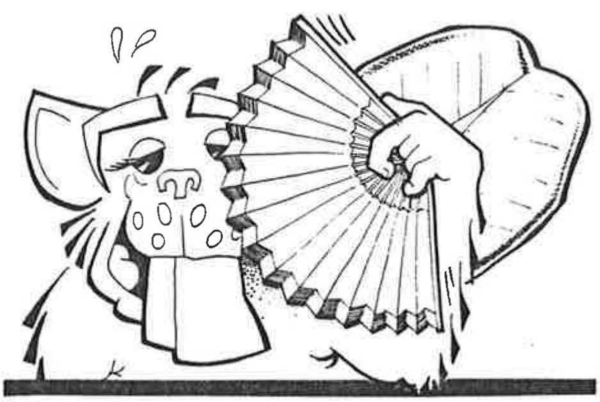
Two of the ten stucco-covered houses, using the polyethylene air barrier showed a small amount of airtightness degradation over the monitoring period. However, the changes in airtightness were small and not judged to be significant.

Six of the 14 houses built with an early version of the ADA air barrier system had a slight degradation of airtightness, but the magnitude of the changes was small and not judged to be significant.

Stucco produced significant reductions in airtightness for most of the polyethylene and ADA air barrier system houses.

<u>Measured Airtightness of Twenty-Four Detached Houses Over Periods of up to Three Years</u> *Prepared for: Efficiency and Alterative Energy Technology Branch (CANMET), Energy Mines & Resources Canada by: UNIES Ltd., Winnipeg MB*

Mechanical Ventilation: how do people really use it?



Mechanical ventilation systems must not only have the proper physical capabilities but, they must also be used regularly if they are to do work as intended. Up to now most studies of residential ventilation systems have focused on developing or evaluating the system capabilities: establishing standards for the ventilation system and its components - easy to regulate and inspect but that's about it. Little consideration has been given to how systems are actually used.

A mechanical ventilation system must meet two requirements to be an effective tool for improving indoor air quality. First, it must have the appropriate capabilities such as air flow capacity, distribution and to minimize adverse interactions with other systems, appliances or the house envelope. The second criteria is, simply, that it must be used regularly. The most expertly designed, carefully installed ventilation system is useless if it is not used by the homeowners.

A multi-year study (Part of the Flair Homes Energy Demo/Canadian Home Builders Association Flair Mark XIV Project in Winnipeg.) monitored the use of 12 conventional Heat Recovery Ventilators (HRVs), two exhaust-only HRVs and three central exhaust systems. The systems were installed in R-2000 and conventional houses, all built with airtight building envelopes. Monitoring periods were from 9 to 40 months.

All were detached bungalows with similar floor plans, full basements and net main floor areas of 646 sq.ft.to 915 sq.ft.

Purchasers of the houses were informed that their homes were to be monitored in the multi-year study. They received verbal and written descriptions on the ventilation systems, their purpose, operation and maintenance requirements. Further assistance was provided by a technical during monthly site visits and whenever repairs were carried out.

The three central exhaust systems were designed for use with single-speed blowers located in the basement and controlled by dehumidistat and/or manual switches on the main floor. The homeowners generally activated the systems using the manual switches or used the dehumidistat as a switch. Only once the ventilation system was found to be operating under the control of the dehmidistat.

Central Exhaust Ventilation Systems

Homeowner use of the three central exhaust systems averaged only 37 minutes per day, producing an average seasonal mechanical ventilation rate of 0.01 ac/hr. while the installed flow capacities ranged from 0.45 ac/hr to 0.72 ac/hr. This was less than 3% of the ventilation rate if the systems had been operated continuously at the minimum ventilation capacity specified.

The three houses with central exhaust also contained 4" make-up air ducts connected directly from the outdoors to the return air plenum (which induced a flow whenever the blower was operating). Measurements of make-up air duct flow rates showed a wide variation. In one house the rate was comparatively large, at 76 cfm, but in another it was only 3 l/s (6 cfm). The difference was created by the respective ducting arrangements; in the other first house the make-up air duct entered the plenum close to the furnace while it was almost at end of the plenum, at a considerable distance from the furnace where the static pressure was minimal.

Heat Recovery Ventilators

HRV systems are designed for continuous low speed operation, with high speed operation prompted by dehumidistat activation or by manual override switches in the bathrooms and kitchens. The units could only be turned off by unplugging them, an intentionally inconvenient method.

The 12 conventional HRVs were operated an average of 19.3 hours per day, giving an average seasonal mechanical ventilation rate of 0.33 ac/hr, although large variations were found between the houses and in different seasons. Most of the total air change rate was provided by mechanical ventilation, not natural infiltration. Houses with forced air heating lower mechanical ventilation rates than those with electric baseboard heating. Natural infiltration rates, although of roughly the same magnitude as those experienced by the three houses with central exhaust systems, were small compared to the mechanical ventilation rates.

The type of control systems may have also affected how homeowners used their systems. Two of the three central exhaust systems used automatic controls and single speed blower operation. Observations from the site visits suggest that the homeowners treated the dehumidistat as on/off switches. Psychologically, they may have regarded the central exhaust systems as an optional feature to be activated when there was a perceived need for ventilation, as opposed to a system designed to operate automatically. The large flow capacity of the central exhaust systems may have also increased perceptions of energy waste. By comparison, the HRVs may have been viewed as more complicated devices, whose operation, although not totally understood, required near-continuous use. The heat recovery capability of the HRVs may have also reduced perceptions of energy waste. Many comments were received from the homeowners that they did not understand the use or operation, of their HRVs, even after two or three years of occupancy and in spite of the written instructions and verbal explanations.

The homeowners were probably more typical of the general public than those in other research projects. Individuals who purchased the houses in the Flair project received incentives to do so in the form of free energy conservation options, so many of them could not be classified as conservation enthusiasts with a special interest in the house and its unique energy related features.

Documents such as the National Building Code and CSA F326, are written to house the general public, not just energy enthusiasts. The results of this study may be indicative of actual usage patterns for merchant-built houses constructed to these codes and standards.

The study concluded that additional thought must be given to homeowner education and to the operation and control of ventilation systems, the homeowner interface.

<u>*Utilization of Residential Mechanical Ventilation Systems*</u> *prepared for: Efficiency and Alterative Energy Technology Branch (CANMET), Energy Mines & Resources Canada by G. Proskiw, P. Eng. Unies Ltd. Winnipeg MB*

Ventilation fan noise

by Dave Quirt

Nothing discourages people from using fans in bathrooms or kitchens more than their noise. Several surveys, including one by CMHC, showed many people don't use the fans in their homes because of the annoying noise.

Interestingly, the least expensive fans are not the noisiest; nor do noisier fans provide better air flow, so it's unclear why builders choose particular fans. Nevertheless, fans are essential to prevent moisture problems and enhance air quality.

The National Building Code recognises the need for ventilation and requires that mechanical ventilation be installed in residences, and a new Canadian Standards Association (CSA) standard for laboratory testing of residential fans has been recently issued. Among other things, this standard covers sound emission ratings and is intended to help builders select quieter fans.

To evaluate the accuracy of the CSA standard (CAN/CSA-C260), the Institute for Research in Construction (IRC) carried out a two-part study to evaluate the laboratory test procedures and establish the relationship between the laboratory rating and actual field performance. Results indicated that the standard, is in fact, valid.

In the first phase of the study, 11 fans were tested in the IRC acoustics laboratory to rate sound power emission. For the tests the fans were mounted on a test stand with wood frame and plywood surfaces. This simulated the effect of vibration