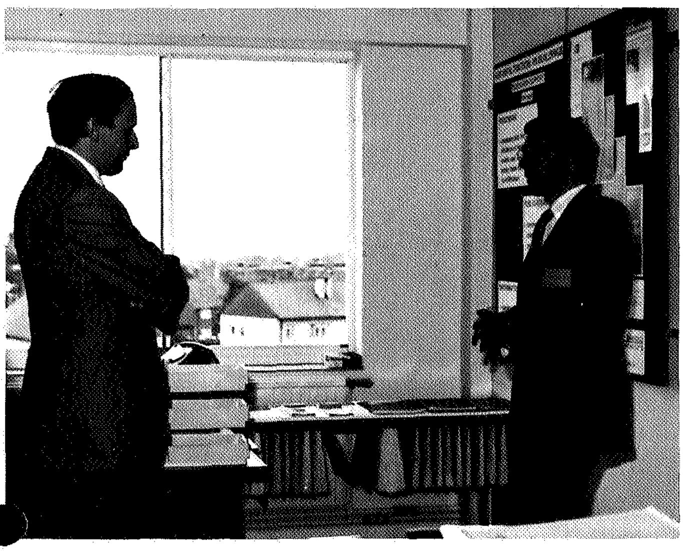
Air Infiltration Review

a quarterly newsletter from the IEA Air Infiltration Centre

Vol. 2 No. 4 August 1981

## Government Minister Visits AIC



On Thursday 25th June, John Stanley MP, the Minister for Housing and Construction in the UK Government, formally opened BSRIA's new three-storey laboratory and office building in which AIC is now accommodated.

After the opening ceremony, the Minister's tour of the new premises included a visit to the AIC's offices (see photograph) where the work of the Centre was discussed in detail.

On the following day, the BSRIA facilities were open to visitors from industry and this also provided an opportunity to display and discuss the services offered by AIC.

## AIC's Numerical Database

An important objective of the Air Infiltration Centre is to assist mathematical modellers in the development of their air infiltration models by providing high quality numerical datasets for model validation purposes. The intention is to provide data covering as wide a range of building types and climatic conditions as possible, so that the full range of applicability of individual models may be assessed.

A number of datasets relating to dwellings have now been prepared. These datasets range in complexity from basic 'single cell' measurements of air infiltration, with associated climatological data, to detailed measurements of pressure differences and flow paths. In all, there are over 300 measurements made in 14 dwellings from 5 countries.

The data is currently being used in a model comparison exercise, the objectives of which are to

- establish the ability of existing air infiltration models to cope with a typical cross-section of currently available data.
- identify any shortcomings in the datasets.
- determine the key parameters which must be measured in order to provide satisfactory datasets for the estimation of air infiltraiton.

Copies of these datasets are available to participants, for model validation purposes, from the Air Infiltration Centre.

# Air-to-Air Heat Recovery and the Airtightness of Dwellings in the Netherlands. The Increase of Through Ventilation.

W. F. de Gids and J. C. Phaff
Institute for Environmental Hygiene-TNO
Netherlands

*Much interest has recently been shown in the use of balanced ventilation systems incorporating air-to-air heat exchangers. In this article, Willem de Gids and Hans Phaff from the Institute for Environmental Hygiene-TNO, Netherlands describe how through ventilation can reduce the effectiveness of this type of system.*

To minimize the energy losses due to ventilation and infiltration, air-to-air heat recovery is generally recommended. In the case of heat recovery, the effect of through ventilation is often neglected or underestimated. Quantitative values about the effectiveness of air-to-air heat recovery in relation to airtightness are rarely given. In this short note, we would like to pay attention to this aspect.

From previous investigations, the estimate of airtightness based on measurements of 130 Dutch dwellings is $0.1 m^3/s$ at 1Pa pressure difference. This is equal to about 11 air changes at 50Pa. Our best estimate for the distribution of air leakages over the building envelope, based on existing data, is shown in Figure 1.

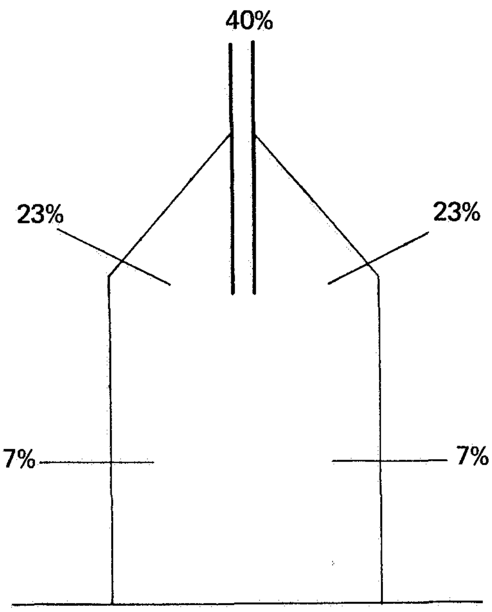



FIGURE 1

The ventilation simulation program of our Institute was used to determine the ventilation rate of this house for the following sets of conditions.

- Variations in wind velocity and external air temperature.
- Natural, mechanical exhaust and balanced ventilation systems.
- Retrofitting of roof/wall joints.

In terms of air flow, the balanced ventilation system is comparable with an air-to-air heat exchanger.

The results of some of these calculations are illustrated in Figure 2. For the balanced ventilation system, a desired volume flow rate of $63 dm^3/s$ is assumed. In this example, the excess flow rate due to through ventilation, expressed as a percentage of the desired flow rate, is

- without retrofitting 54%
- with retrofitting the wall/roof joints 32%

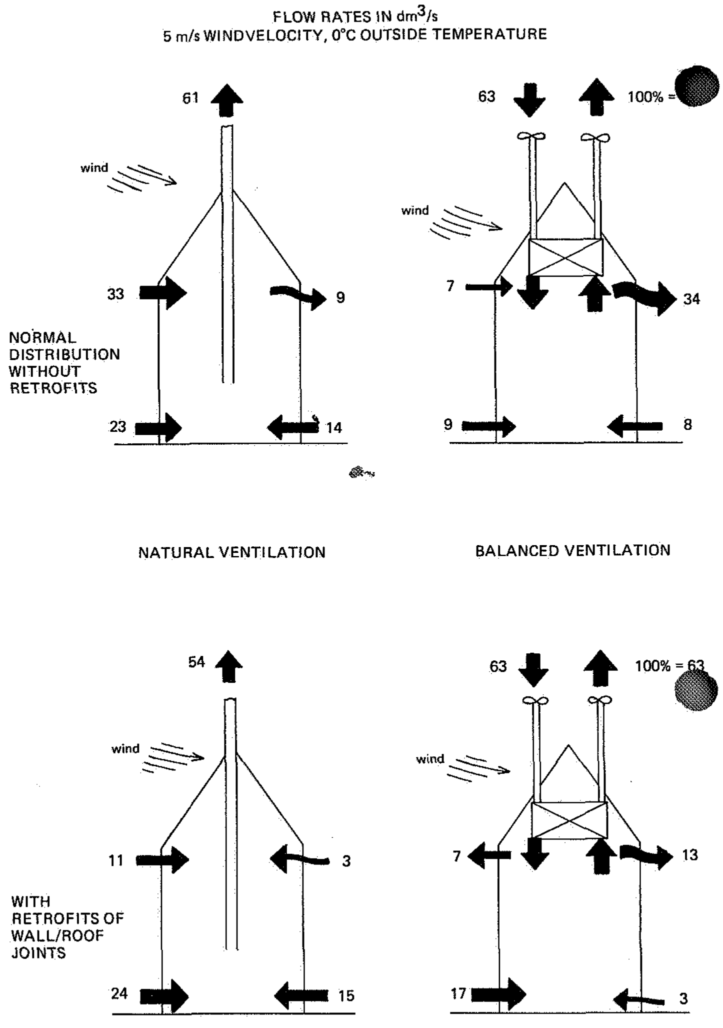



FIGURE 2

Thus, through ventilation will increase the total ventilation. This increased ventilation gives an extra energy loss of up to about 50%. This extra energy loss cannot be recovered by the heat exchanger because it is flowing out through the building fabric and not through the heat exchanger. Furthermore, the improvement due to retrofits on wall/roof joints is small. It is therefore recommended that, when predicting the overall efficiency of air-to-air heat exchangers, the excess due to through ventilation should be considered carefully.

# Errata

Air Leakage in Residences in Canada.
R. S. Dumont, National Research Council of Canada.

*Published in Air Infiltration Review, Vol. 2 No. 3 May 1981.*

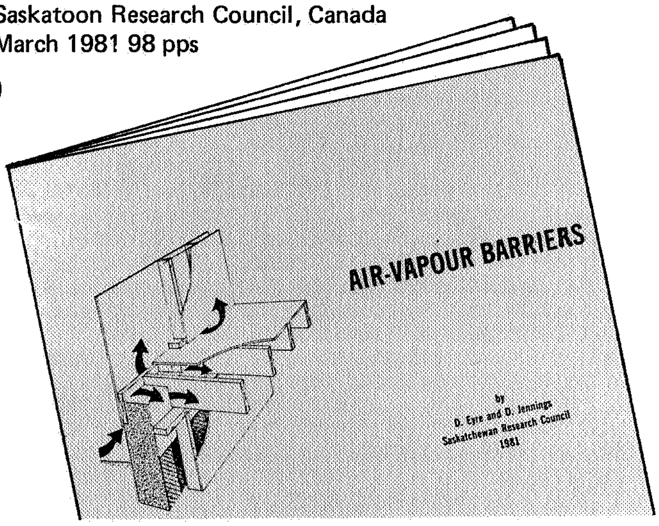
The second sentence in the penultimate paragraph should read:

> To provide sufficient ventilation air and humidity *control,* most of the airtight houses use controlled ventilation with an air-to-air heat exchanger.

We apologise for any misunderstanding this may have caused.

# New Book on Air-Vapour Barriers

Air-Vapour Barriers
D. Eyre, D. Jennings
Saskatoon Research Council, Canada
March 1981 98 pps




The traditional vapour barrier was designed to be a barrier to the diffusion of water vapour. The air-vapour barrier also prevents the natural infiltration of air, thus giving the householder more control over the ventilation of the dwelling. This book discusses in great detail the purpose, design and installation of air-vapour barriers, drawing on the experience of energy-efficient houses built in Saskatoon.

The first half of the book discusses the fundamentals of water vapour movement and control, air infiltration and exfiltration and the management of air in tight houses. The problems and advantages of low air change rates are outlined and some general comments are made on design problems in air-vapour barrier installation.

The second half contains detailed instructions on how to install an air-vapour barrier. Each area of difficulty is dealt with separately with clear diagrams showing the installation of the barrier at every point. These techniques are designed for the construction methods and climate in the Canadian prairies and so may not be more generally applicable. Nevertheless, this book is the most comprehensive description of air-vapour barrier techniques yet available.

Copies of this book may be obtained from:

Saskatoon Research Council
30 Campus Drive
Saskatoon
Saskatchewan S7N 0X1
Canada

# Forthcoming Conferences

1. Building Design for Minimum Air Infiltration.
   2nd AIC Conference.
   Royal Institute of Technology, Stockholm, Sweden.
   September 21–23 1981.

2. International Symposium on Indoor Air Pollution, Health and Energy Conservation.
   University of Massachusetts, Amherst, USA.
   October 13–16 1981.

3. 3rd International Conference on Energy Use Management.
   Berlin, West Germany.
   October 26–30 1981.

4. Symposium on Developments in Domestic Engineering Services.
   CIBS, London, UK.
   December 1, 1981.

5. Conference: Thermal Insulations, Materials and Systems for Energy Conservation in the 80's.
   Oak Ridge National Laboratory/American Society for Testing and Materials, Clearwater Beach, Florida, USA.
   December 8–10 1981.

6. ASHRAE Semiannual Meeting.
   Houston, USA.
   January 24–29 1982.

7. Energy Conservation and Efficiency.
   Institute of Mathematics and its Applications.
   1 Birdcage Walk, London, UK.
   March 1–3 1982.

8. 3rd International Symposium on Energy Conservation in the Built Environment.
   CIB Working Commission 67, Dublin, Republic of Ireland.
   March 30–April 1, 1982.

9. 3rd ASTM/CIB/RILEM Symposium on the Performance Concept in Building.
   Lisbon, Portugal.
   March 24–April 2, 1982.

## 1981 Survey of Current Research

The AIC is currently updating its worldwide survey of current research into air infiltration in buildings. Nearly 500 survey forms have so far been sent out to organisations in 24 countries. If you have not received a survey form but would like a summary of your research included in this year's report, please contact Martin Liddament at the Air Infiltration Centre.

# Recent Acquisitions

The following papers have recently been acquired by the Air Infiltration Centre's library.

1. Cole, J. T. et al.
Development and field verification of a model of excess infiltration and house air infiltration for single-family residences.
Institute of Gas Technology Report for 1979.

*Describes the completion of the development of an air infiltration model and the partial verification of the model by comparison with measured data.*

2. Dickson, D. J.
Air flow through and within masonry walls.
Electricity Council Research Centre Report M1420, April 1981.

*Describes measurements of air leakage of one of the walls of an ECRC test house.*

3. Dickson, D. J.
Methods of measuring ventilation rates and air leakage of houses.
Electricity Council Research Centre Report M1419, April 1981.

4. Eckhoff, D.
Repairing older windows.
(Utbedring av eldre vinduer.)
Norwegian Building Research Institute Report 33, 1980.

*Gives detailed suggestions for repair of windows and for the improvement of air tightness and sound insulation (in Norwegian).*

5. Etheridge, D. W. et al.
Natural and mechanical ventilation rates in a detatched house: Measurements.
Applied Energy Vol. 8 No. 1 March 1981, p1–18.

*Compares three types of ventilation system installed in a detached house.*

6. Gustavsson, L., Olsson, C–H, Svensson, G.
The contribution of window insulation (weather stripping) to energy conservation.
(Energibesparing genom fönsterisolering.)
Swedish Council for Building Research Report R178: 1980.

*Presents a review of the literature and a survey of the various types of window insulation systems (in Swedish).*

7. Irwin, H.P.A.H.
The design of spires for wind simulation.
Jnl. Wind Eng. & Ind. Aerodynam. Vol. 7 No. 3, May 1981, p361–366.

*Gives formulae for the height and base length of triangular spires that will produce required values of boundary layer thickness in a wind tunnel.*

8. Kasperski, M. G., Klosouski, J. M.
Sealants—their properties and performance.
Specification Associate Vol. 20 No. 5 p29–31 and No. 6 p34–36, 1978.

9. Nylund, P–O.
Air leakage—a neglected feature in energy saving.
Proceedings IEA Conference 'New Energy Conservation Technologies and their Commercialisation', Berlin 6–10 April 1981.

10. Railio, J.
Mechanical ventilation or natural draft?
(Painovoimainen vai koneellinen ilmanvaihto?)
LVI No. 1 p42–45, 1981.

*Compares three types of ventilation systems; natural draft, mechanical exhaust, and mechanical supply and exhaust (in Finnish).*

11. Silberstein, S.
Air leakage measurements of an unpartitioned mobile home.
National Bureau of Standards, NBSIR 80–2105, August 1980.

12. Tjernberg, K., Odmansson, E.
Thermography. The effects of external factors upon thermal images.
(Termografering. Mätningsbelingelsers inverkan pa värmebilder.)
Swedish Council for Building Research Report R86: 1980.

*Reports an investigation of the effect of temperature, pressure, sun and wind on thermal images associated with air leakage (in Swedish).*

Photocopies of the above papers are available from the AIC, free-of-charge, to organisations in participating countries.

# New Translations

The following papers have recently been translated into English.

Cali, M., Fracastoro, G. V.
Proposal for a method of calculating air infiltration in a multi-storey building.
(Proposta di metodo per il calcolo delle infiltrazioni d'aria in un edificio multipiano.)
La Termotecnica, Vol. XXXV No. 2, February 1981, p62–66.
= AIC Translation No. 13.

Nylund, P–O.
Why tight houses?
(Vafor täta hus?)
VVS Tidskrift, November 1979, Vol. 50 No. 11, p56–58.
= AIC Translation No. 15.

Feustel, H.
Research into the ventilation of dwellings–Theory before practice.
(Forschung im Beriech der Wohnungs lüftung–Theorie vor Praxis.)
Clima. Comm. Int., No. 11, 1980, p33, 34, 36.
= AIC Translation No. 14.

Gusev, A. A., Kylatchanov, A. P.
Studying air exchange in premises using radioactive tracers.
(Izuchenie vozdukhoobmena v pomeshcheniyakh metodon radio-aktivnykh indikatorov.)
Vodos. Sanit. Tekhn., June 1978, Vol. 67 No. 6, p13–18.
= AIC Translation No. 16.

Copies of the above translations are available free-of-charge to organisations in participating countries.

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**THE AIR INFILTRATION CENTRE** was inaugurated through the International Energy Agency and is funded by eight of the member countries:

Canada, Denmark, Italy, Netherlands, Sweden, Switzerland, United Kingdom and United States of America.

The primary role of the Air Infiltration Centre is the technical support of active research in air infiltration in buildings. Its main aim is to bring the prediction of air infiltration rates and the associated energy implications up to a level comparable with that developed for other energy transfer processes in buildings.

# Representatives and Nominated Organisations

| Participant | Steering Group Representative | Other Nominated Organisations | | |
|---|---|---|---|---|
| **Canada** | R. Dumont,<br>Division of Building Research,<br>National Research Council,<br>Saskatoon, Saskatchewan,<br>Canada S7N 0W9.<br>(Tel: 306.665.4200) | J. Shaw,<br>Division of Building Research,<br>National Research Council,<br>Ottawa, Canada,<br>K1A 0R6.<br>(Tel: 613.993.1421)<br>(Telex: 0533145) | | |
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ISSN: 0143-6643