

Numerical Database for the AIVC

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Background

As part of its new operating programme, the Air Infiltration and Ventilation Centre is establishing a numerical database to be used both in support of design studies and for the verification of numerical models. (Fig. 1) In addition to being available as a computer database, it is intended to present selected source data and simple algorithms in loose leaf form as a new volume in the AIVC's series of Application Guides.

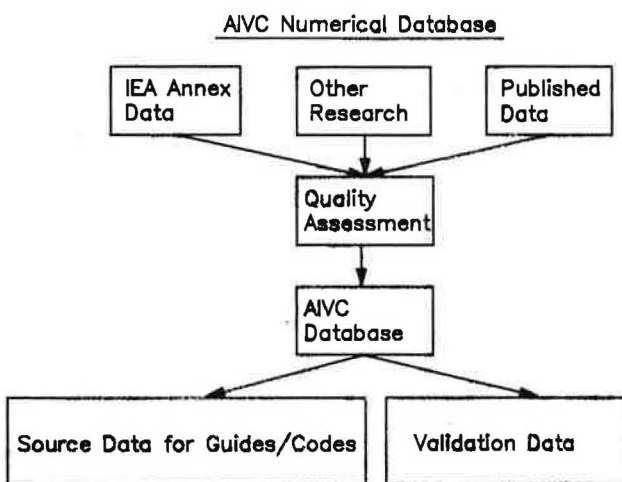


Fig. 1 Database Structure

Design data will include:

- component leakage values
- whole building leakage values for representative building types
- wind pressure coefficients and wind pressure algorithms
- basic climatic data
- key standards relating to ventilation and indoor air quality requirements
- impacts of occupant interaction on air change rates and energy use
- cost effectiveness data
- ventilation effectiveness and air flow patterns data

Validation data will include:

- air change rate measurements
- interzonal air flow
- air movement patterns

- ventilation heat loss
- pollutant transport

In each case validation data will be drawn from selected studies in which careful measurement control has been introduced and in which the key parameters needed for data input to models have also been recorded (e.g. driving forces, leakage distribution, fan, duct and diffuser characteristics, pollutant sources, etc).

Data Sources

Although the selection of data is intended to be very rigorous, it is planned to represent in the database all building types and conditions for which suitable measurements are available. By combining data from many sources throughout the world it will be possible for designers and numerical modellers to consider a far wider range of operating conditions than would be possible using the results of a single set of measurements. In many instances data from several sources covering similar areas of measurement will provide further cross checks on quality.

A key source of data will be the related air flow annexes of the International Energy Agency's Implementing Agreement on Energy Conservation in Building and Community Systems. Thus this approach will further ensure the maximum dissemination of knowledge resulting from IEA activities. Associated Annexes include:

- Annex 8: Inhabitant Behaviour with Regard to Ventilation
- Annex 9: Minimum Ventilation Rates
- Annex 14: Condensation
- Annex 18: Demand Controlled Ventilation Systems
- Annex 20: Air Flow Patterns within Buildings

The COMIS project taking place at the Lawrence Berkeley Laboratories in the United States (See AIR, June, 1989) is undertaking comprehensive multizone air flow measurements as part of the development of a building air infiltration and ventilation simulation code. It is hoped that these data will also provide further input to the database. Other data sources include a new compilation by ASHRAE on air leakage characteristics of component openings and data located during the AIVC's present world wide survey of current research.

Management system

In selecting a database management system, consideration had to be given to several requirements. For example, it is essential to ensure widespread availability of the database. Equally, it is important that the system should offer maximum flexibility in relation to establishing

and linking data fields. Another fundamental requirement is that it must be possible to introduce new parameters at a later date should it prove desirable to increase the scope of the database. The initial database will be PC based using DBASE IV software. Provision has also been made to introduce ORACLE software on workstation based systems if necessary. Access to the database will be by arrangement with nominated organisations within each country.

This development programme will span the full three year current operating period of the Centre with data entry commencing early in 1990 (See Fig. 2).

Other Activities

In addition to its numerical database, further technical activities are planned by the AIVC. These include a review of air flow simulation techniques and a study of combined thermal and ventilation heat loss models. The objective of the air flow review is to outline recent developments in building air flow analysis and to focus on some of the difficulties associated with air flow simulation. Rather than dealing with the considerable developments taking place in respect to refinements to computational methods the intention is to show how these algorithms can be applied to building orientated problems. Bibliographic references will be restricted to specific examples and case studies. Similar objectives are planned for the combined heat loss/ventilation modelling review. A number of numerical models are now available which are able to handle the simultaneous solution of conduction, convection and ventilation heat transfer in both single zone and multizone structures. The intention of the Centre is to investigate this area of activity since there is a need to develop the theory of infiltration and ventilation in context with the entire building energy field. As with the AIVC's air flow analysis

this study has significant interactions with other IEA annexes. The intention is to prepare a technical note on combined models and to investigate potential data for a validation exercise. The study will also reappraise the significance of ventilation as a heat loss mechanism in relation to conductive heat losses for different building types.

Technical Dissemination

As part of its dissemination and technical transfer role, further conferences and specialist workshops are planned for the new operating period beginning with a workshop at the AIVC on the Centre's numerical database in March of next year. Also planned for the very near future is a new PC version of AIRBASE the Centre's bibliographic database which offers full search capabilities yet will be available at only a fraction of its current cost. Pre-release versions have already been distributed and are operating successfully. For the first time regularly updated versions of AIRBASE will be available in every country and to individual organisations. Combined with improved fax and communication facilities, it should therefore be possible to expand substantially the library services of the AIVC. To coincide with this expansion an increase in the subject coverage of AIRBASE is also planned to include air flow related and air quality topics covered by other IEA annexes and to include improved coverage from non participating countries. Summaries of key documents from France and Japan will be translated into English. In future the AIVC library will also carry IEA reports from other activities within the Energy Conservation in Buildings and Community Systems Implementing Agreement, thus, to some extent, coverage will be broadened to beyond the scope of air infiltration and ventilation.

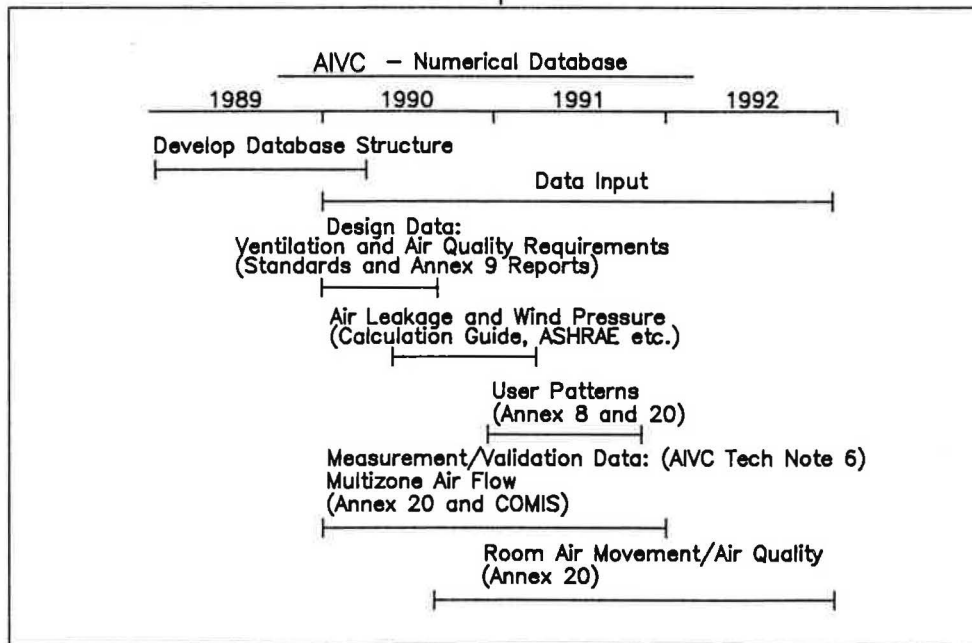


Fig. 2 Development Programme