

# **APPENDICES**

## Appendix I

### Professional Institutions and Major Energy Research

#### *Professional institutions*

A list of the professional institutions working on building energy performance analysis and the related HVAC field are given below (in alphabetical order):

1. *American Council for an Energy-Efficient Economy* (ACEEE)  
1001 Connecticut Avenue N.W., Suite 801  
Washington, D.C. 20036  
USA

ACEEE is a nonprofit organisation dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection. Technical and policy assessments are conducted and international conferences (the well-known ACEEE Summer Study) are organised by ACEEE.

2. *American Society of Heating, Refrigerating and Air-Conditioning Engineers* (ASHRAE)  
1791 Tullie Circle, N.E.  
Atlanta, GA 30329  
USA

ASHRAE has played an important role in developing voluntary energy standards and promoting research studies and discussions on HVAC related issues.

3. *Building Environmental Performance Analysis Club* (BEPAC)  
Building Research Establishment  
Garston, Watford WD2 7JR  
United Kingdom

BEPAC is actually a 'building modellers club'. The aim of BEPAC is to improve the quality of building performance by encouraging the use and development of environmental prediction methods for buildings (Irving, 1989 & 1988).

4. *Centre for Building Performance Research* (CBPR)  
Victoria University of Wellington  
P.O. Box 600, Wellington  
New Zealand

CBPR is a research group in New Zealand which carries out academic and contract research projects in the field of building energy performance.

5. *The Chartered Institution of Building Services Engineers* (CIBSE)  
Delta House, 222 Balham High Road  
London SW12 9BS  
United Kingdom

The CIBSE Building Energy Code is a popular reference in UK and Europe for building energy standards (CIBS, 1981 & 1982; CIBSE, 1977 & 1979). The CIBS example weather year

method is often used for selecting typical years for building energy studies (Hitchin, *et al.*, 1983).

6. *Energy Efficiency Office* (EEO)  
 Department of Environment  
 1 Palace Street  
 Victoria, London SW1E 5HE  
 United Kingdom

EEO conducts studies on building energy efficiency and publish good practice guide for various building types in UK.

7. *Energy Information Administration* (EIA)  
 U.S. Department of Energy  
 Forrestal Building, EI-231  
 Washington, D.C. 20585  
 USA

Established in 1977, EIA is the principal information source of energy data in the United States (EIA, 1994b). EIA maintains a comprehensive energy data and information program, develops analytical tool and provides energy analyses to meet the U.S. energy policies and development in USA.

8. *Energy Simulation Research Unit* (ESRU)  
 Faculty of Engineering  
 University of Strathclyde  
 James Weir Building  
 75 Montrose Street, Glasgow G1 1XJ  
 Scotland

ESRU is the core research group for the ESP-r simulation program and the UK Energy Kernel System (EKS-UK) project (Charlesworth, *et al.*, 1991). It has conducted a lot of research studies on the development of enhanced simulation environment and design tools (Hensen, *et al.*, 1993).

9. *International Building Performance Simulation Association* (IBPSA)  
 IBPSA Secretariat  
 Candaplan Group Inc.  
 393 Rymal Road, West  
 Hamilton, Ontario L9B 1V2  
 Canada

The mission of IBPSA is to advance and promote the science of building performance simulation in order to improve design, construction, operation and maintenance of new and existing buildings worldwide (IBPSA, 1993).

10. *Lawrence Berkeley Laboratory* (LBL)  
 University of California  
 Berkeley, CA 94720  
 USA

Energy & Environment Division of LBL has initiated the Building Technologies Program (LBL, 1993) which includes the following sub-groups: Windows and Daylighting Group, Lighting Systems Group and Simulation Research Group. Advanced energy research studies and software development (such as DOE-2) are conducted by LBL.

11. *National Renewable Energy Laboratory* (NREL)  
 1617 Cole Boulevard  
 Golden Colorado, CO 80401-3393  
 USA

NREL, formerly the Solar Energy Research Institute (SERI), has focused considerable efforts on the validation of building energy simulation programs during the past decade (Judkoff, 1988; Judkoff, Wortman and Burch, 1982; Wortman, O'Doherty and Judkoff, 1981). It has also developed solar radiation database and weather data for building energy analysis (Marion, 1994).

12. *Oak Ridge National Laboratory* (ORNL)  
 P.O. Box 2008  
 Oak Ridge, TN 37831  
 USA

ORNL conducted building energy research not only on energy performance, but also on energy policies and strategies (Weaver, Goins and Love, 1989).

13. *Pacific Northwest Laboratory* (PNL)  
 P.O. Box 999  
 Richland, Washington 99352  
 USA

The Building Energy Standards Program (BESP) of PNL is the body sponsored by the U.S. Department of Energy (USDOE) to support development of building energy performance standards in the United States.

### *Major energy research*

Important energy research are conducted in Europe and USA. A list of the most significant projects are given as follows:

1. Research projects in Europe

- 1.1 *Centre for the Analysis and Dissemination of Demonstrated Energy Technologies* (CADDET)  
 CADDET is an information centre set up by IEA in 1988 to broaden and improve exchange of information on demonstrated energy-efficient technologies (Litt, 1993).

- 1.2 *Computer Models for the Building Industry in Europe* (COMBINE)  
 COMBINE is a European funded research project looking at the development of the 'intelligent integrated building design systems' (IIBDS) for evaluating the performance of planned buildings throughout the design stage (Kennington and Monaghan, 1993; Augenbroe, 1993; Rode, 1993).

- 1.3 *Energy Kernel System (UK)* (EKS-UK)  
 EKS is an advanced machine environment intended to foster the collaborative development of the next generation of performance assessment programs (Clarke and Mac Randal, 1993; Charlesworth, *et al.*, 1991; Clarke, 1988). It employs an object-oriented architecture to manipulate methods and so create models according to templates supplied by a user.

- 1.4 *IEA programme: Energy Conservation in Building & Community Systems*  
 The International Energy Agency (IEA), set up in 1974, is an autonomous body within the Organization for Economic Cooperation and Development (OECD) looking at energy conservation and energy technologies. Several projects related to the prediction and

measurement of building energy performance have been undertaken under this programme (International Energy Agency, 1990).

1.5 *Passive Systems for Heating of Buildings and Passive Cooling of Buildings*(PASSYS)  
(PASCOOL)

PASSYS and PASCOOL focus on passive heating and cooling methods for the construction of energy efficient buildings (Jensen, 1993a; Strachan, 1993; Jensen and Van de Perre, 1991; Santamouris, *et al.*, 1993). Evaluation and validation of simulation tools for building energy analysis is a part of the work of PASSYS's subgroup on model validation.

2. Research projects in United States:

2.1 *Advanced Energy Design and Operation Technologies project* (AEDOT)

AEDOT is sponsored by USDOE and conducted by Pacific Northwest Laboratory (PNL). The aim of the project is to develop advanced computer-based technologies that will help designers make energy efficiency a primary criterion by combining expertise from a variety of domain perspectives during the design process (Brambley and Bailey, 1991; Brambley, *et al.*, 1992).

2.2 *Simulation Problem Analysis Kernel or* (SPANK)  
*Simulation Problem Analysis and Research Kernel* (SPARK)

SPANK (later renamed as SPARK) is an object-oriented simulation environment for general simulation purposes (Sowell, Buhl and Nataf, 1989; Buhl, *et al.*, 1991).