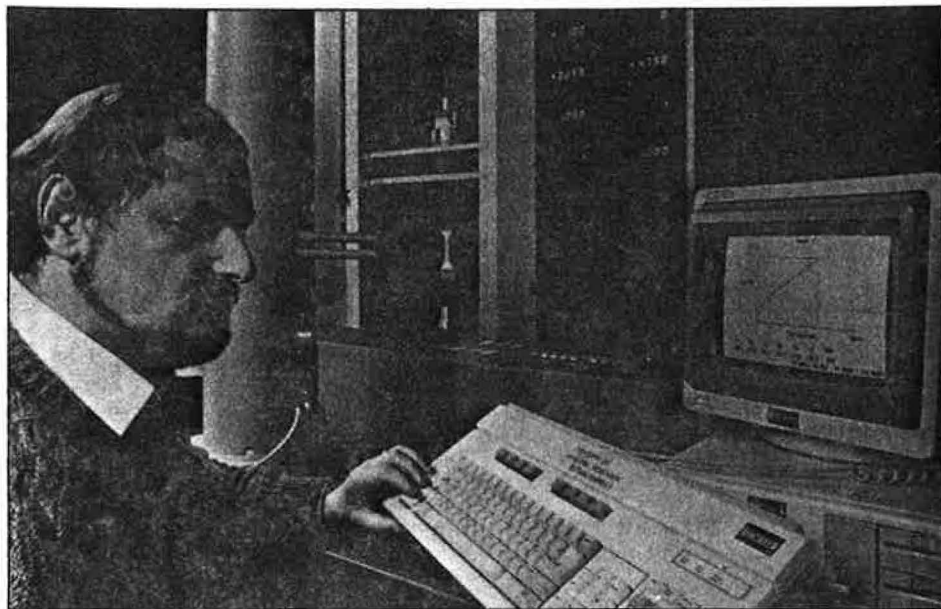


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Improving the performance of flat roof coverings



Measuring the tensile strength of samples of single ply roofing membrane, using an extensometer

Modern building methods demand improved performance from flat roof covering materials, and over the last two decades many new products have been introduced. BRE has a continuing programme of research to monitor the performance of these products as they appear, often working with companies in testing and development. The overall aim is to establish a basis for performance-based specifications for all types of membrane.

Mastic asphalt has been a successful weatherproof flat roof covering for years, but in recent winters there have been some cases of cracking in roofs where asphalt has been laid over thermal insulation. Failure is thought to be due to the faster rate of heat loss and greater range of temperatures in

the asphalt layer. BRE has carried out laboratory tests of the effect of this thermal shock on samples of roof similar to those that failed, and is devising a test method for comparing different grades of asphalt to give an indication of in-service performance. The new polymer-modified asphalts

perform considerably better at low temperatures; the indications are that they should prove satisfactory in service at temperatures down to -20°C . Tests and development work on these new products are being jointly funded by Permanite Asphalt Ltd.

In the work on **bituminous membranes** BRE is developing methods for predicting service life, using laboratory techniques for simulating the effects of weathering and ageing in conjunction with measurements of resistance to flexural fatigue of built-up membrane sections. Conventional glass-fibre-based felts can be artificially aged by heating at 80°C and by using combinations of heat, water and uv radiation. However, the newer polyester-based felts are hardly affected by these procedures and should be proportionately longer-lived in service. The current programme also includes the new polymer-modified felts used for both traditional laying and 'torching on'.

Single ply polymeric roofing membranes have been used in the UK for some time now, primarily for very large roof areas. Tensile strength and fatigue tests at room temperature on naturally and laboratory-aged samples are showing very good performance, and the programme is continuing, with tests at -20°C planned. Attention will also be focused on the requirements for bonded joints: preliminary results, mainly for pvc materials with and without reinforcement, indicate that the jointing process can reduce fatigue resistance.

Data from all this work is being conveyed to BSI through BRE membership of committees, and through them to formulation of CEN standards.

New BRE service provides housing stock data

Detailed information about the nature and condition of UK housing can be obtained from a database held at BRE and now made available as the Housing Stock Data Service. It can be interrogated to provide answers to such questions as how many houses do not have cavity walls, how many need repointing, what proportion of post-war dwellings are flats and what is their average floor area, how many terraced houses in the north are owned by elderly couples.

The database has been assembled from the latest English House Condition Survey (EHCS), carried out in 1986 and reported in November last year. The EHCS is con-

ducted every five years to provide a very detailed description of the housing stock.

BRE has been deeply involved in the EHCS since 1976 and has been largely responsible for developing the methods used to collect the information. The 1986 Survey was the most sophisticated and comprehensive so far: it comprised a physical inspection by professionally qualified staff of 30,000 dwellings, interviews with about 6000 occupants, and an enquiry of local authorities about housing in their areas. BRE was involved in the design of the survey, briefing and control of the team of 300 surveyors, data validation and processing, and preparing the report.

Database information includes:

- age, type, dimensions and tenure
- method of construction and material
- heating, drainage, garageing, insulation
- state of repair
- size of plot, type of locality.

As a standard service with fixed charges, data is presented as frequency distributions, 'multi-way' cross-tabulations, histograms and other variants, with guidance on their interpretation and reliability. Tasks requiring additional analysis, interpretation or reporting can also be undertaken.

For more information about the service and charges, contact the BRE Housing Stock Data Service (tel: 0923 664664).

COMING EVENTS

Timber R & D Open Day

Openings for Timber Research is the theme of this event, being held on 17 and 18 May to mark the transfer of the work on wood and wood products from the Princes Risborough Laboratory to the main BRE site at Garston. It will feature the Timber Division's special capabilities available to industry and its recent advances in timber research, and visitors will also be able to see the newly completed research facilities.

Four main subject areas will be featured, with displays to interest specifiers, builders, product manufacturers, and timber growers and suppliers.

Properties and use

- evaluation of the material properties and performance of timber and new wood based panel products to ensure fitness for use
- guidance on choice for specifiers and builders
- research helping foresters to improve the value of UK softwood
- long-term research aimed at ensuring more effective timber utilisation, particularly in structural applications

Structural performance and economic use

- BRE's contribution to the development of common European standards and their significance for suppliers and manufacturers
- evaluation of full-size components and the effects of long-term load on performance

Assessing durability

- evaluation of preservatives and treatments used to prevent deterioration by wood-destroying fungi and insects, and their performance in service
- advice on paint formulation and selection, and information on how coating properties can affect the performance of exterior wood

Maintenance and remedial treatment

- guidance on treatment strategies for dry rot, joinery decay and death watch beetle attack
- research aimed at extending maintenance cycles for surface coatings and reducing costs.

For more details of the open event and an application form, please write to the Conference Seminar Office at BRE (tel: 0923 664848).



Tests to assess the effects of duration of load on the performance of structural timber

Seminar: Window performance for 1992

Windows affect many aspects of design, including lighting, view, noise, safety, heating and cooling, and space planning. The window and its performance therefore provide an excellent backdrop for examining the implications of the European single market, and the Construction Products Directive in particular. 23 May, Garston.

Workshop: Vision in lighting design

In recent years there has been a very substantial increase in knowledge of the visual mechanism, and with it the potential for answering long-standing problems of vision in lighting design. The purpose of this workshop is to act as an exploratory forum between the lighting and vision science communities to discuss the application of vision science. Subjects include discomfort glare, emergency lighting, visual fatigue, flicker, and environmental cues to subjective visual assessment. 24 May, Garston.

Advisory seminars in Scotland

Technical risks of improved insulation Examines design options for improved insulation of all elements of the external envelope and recommends good practice construction to avoid possible defects such as interstitial condensation, rain penetration of insulated walls, cold bridges at floor junctions, and fire risk of combustible

insulants. Also indicates points to watch when surveying well-insulated buildings. 11 April, Edinburgh.

Dampness Day Brings together BRE experts on rising damp, rain penetration, condensation and other causes of dampness, and deals with problems in roofs, walls and floors. 12 April, Edinburgh.

Both these seminars will be held at the King's Manor Hotel; special overnight terms are available by booking through BRE Seminar office.

Lecture for lawyers: Dampness in buildings

This one-day course aims to provide lawyers with a basic knowledge of the many causes and effects of building dampness and the origins of those causes in design, construction and use. It covers moisture presence, movement and measurement in buildings, design decisions and responsibilities, and pertinent questions in problem situations. 14 March, Garston.

For information about any of the above events, contact the BRE Seminar Office at Garston (tel: 0923 664848/664765).

Condensing boilers in housing

A series of seminars is being organised by BRECSU for the Department of Energy to encourage the widespread use of condensing boilers in housing. Condensing boilers represent a new generation of heating appliances for new and existing homes. Measured seasonal efficiencies are about 86%, giving savings of 15-20% against conventional boilers and payback of the additional cost within 1 to 5 years. Independent monitoring established the seasonal savings achieved. The seminars will provide the results of an EEO/BRECSU series of condensing boiler demonstrations in occupied houses, together with practical details of their installation.

Eight seminars are to be held:

Cardiff 3 March	Edinburgh 8 May
London (N) 12 May	Leeds 16 May
London (S) 6 March	Newcastle 19 May
	Nottingham 1 March
	Southampton 18 April

The seminar fee, which includes a comprehensive information pack, lunch and refreshments, is £84 including VAT. Cheques should be made payable to Mid Career College and sent to Seminars Secretary, Mid Career College, PO Box 20, Cambridge CB1 5DG (tel: 0223 880016), to whom all enquiries should be addressed.

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BREDEM

the Building Research Establishment Domestic Energy Model.
A model developed to estimate energy costs and potential savings in housing.

The model that has been adopted by the Energy Efficiency Office of the Department of Energy and the Department of the Environment (DOE) as their standard procedure for domestic energy calculations and that is consistent with the calculation methodology given in the new British Standard Code of Practice. (BS 8211: 1988) for energy efficient refurbishment of housing.

BACKGROUND

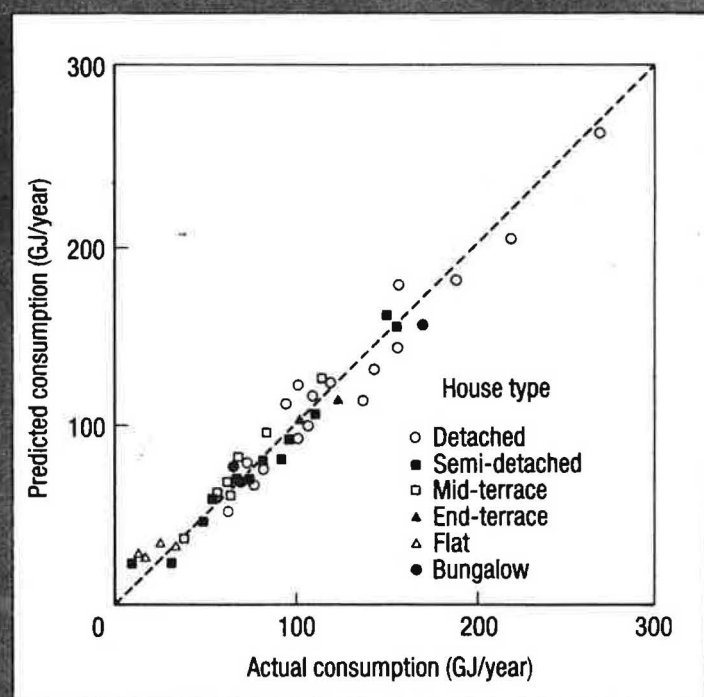
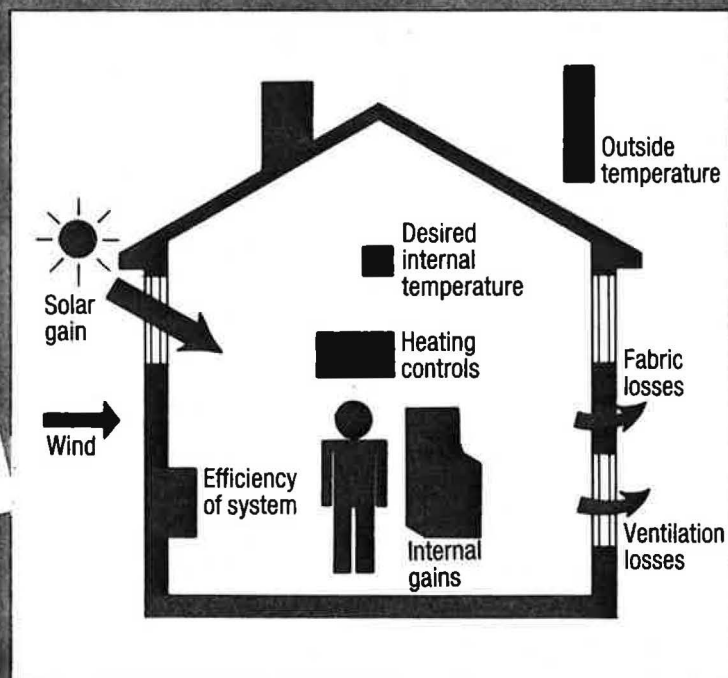
The average UK household spends about £500 per year on heating, lighting and power for domestic appliances but there is a huge variation between individual household expenditures. Field trials, in which the energy use in occupied dwellings is measured, show that the physical characteristics of the dwelling and the lifestyles of the occupants are about equally important in determining energy consumption. It is clear, therefore, that realistic estimates of domestic energy consumption can only be made if both these factors are considered together. The Building Research Establishment Domestic Energy Model (BREDEM) does just that.

BREDEM

BREDEM is designed to be easy to use and to give reliable results, being based on practical experience gained through measurements made in many occupied dwellings.

The approach is to identify the various uses of energy in dwellings and to estimate the annual requirement for each use. Space heating requirements are calculated taking account of the physical details of the dwelling and its heating system, internal and external temperatures and the living patterns of its occupants.

Other energy uses are estimated from average consumptions derived from surveys and appropriate to the composition and activities of the household. The performance of BREDEM has been extensively tested by comparing its predictions with measured consumption data from a large number of dwellings.



Comparison of predicted and real main fuel consumptions showing different house types

SUPPORTING LITERATURE

BREDEM - The BRE Domestic Energy Model - background, philosophy and description. BRE Report BR66, 1985, Price £9; summarised in IP 16/85.

BS 8211: 1988. *Code of Practice for energy efficient refurbishment of housing, and Designer's Manual.* Price £21.85 to BSI members and £34.65 to non members.

Energy Assessment for dwellings using BREDEM Worksheets. BRE Information Paper IP13/88, Price £1.

HOW TO ESTIMATE AND ASSESS ENERGY REQUIREMENTS AND MEASURES USING BREDEM

Use one of the commercially available software packages endorsed by the BRE.

A series of computer programs apply the BREDEM model.

Each program has been developed for a specific application. The choice of program depends on the analysis required and on the accuracy and detail of information available.

ENERGY ASSESSOR

allows rapid energy audits of existing dwellings to be undertaken by surveyors, estate agents, heating contractors and other energy assessors. The analysis can be performed on site with the aid of a lap-top computer.

ENERGY AUDITOR

allows a thorough energy audit to be carried out on an existing dwelling.

ENERGY CALCULATOR

provides a rapid and reliable means of assessing the energy running costs of existing or projected dwellings, once data specific to an individual house has been assembled. It is based on the principles of the British Standard (BS 8211: 1988) on energy efficient housing refurbishment and is available in three low cost forms (worksheet, hand calculator, IBM compatible disc).

ENERGY DESIGNER

allows those designing a new dwelling to evaluate different types of construction, insulation levels and heating systems. (This program is used by Milton Keynes Development Corporation to calculate their Energy Cost Index. It was used to assess new house designs.)

ENERGY TARGETER

allows those with large housing stocks to assess insulation options and heating systems.

For further information on computer programs contact:

Prof. P Chapman

Energy Advisory Services Ltd., The Old Manor House, Hanslope, Bucks MK19 7LS, Tel (0908) 510596

J Duggart

The ECD Partnership, 11-15 Emerald Street, London WC1N 3QL, Tel (01) 405 3121

Prof. P Burberry

The University of Manchester Institute of Science and Technology, Dept. of Building Engineering, PO Box 88 Manchester M60 1QD, Tel (061) 236 3311

ENERGY AUDITOR

SUMMARY OF WALL INSULATION RESULTS

	Installation Cost (£)	Savings (£/yr)	Payback time (yrs)	Recommend? (Y/N)
Wall type 1 zone 1	103	38.9	2.7	Y
Wall type 1 zone 2	270	46.0	5.9	Y
Whole house	373	74.8	5.0	Y
Wall type 2 zone 2	1034	57.8	17.9	N
Whole house	1034	57.8	17.9	N
Wall type 3 zone 1	628	24.0	26.1	N
Whole house	628	24.0	26.1	N

Enter your recommendations for each row
Press RETURN to continue -

WALL INSULATION RESULTS

RECENT BRE PUBLICATIONS

Reports and books

The thermal efficiency of large oil-fired boilers: investigations of factors affecting the thermal efficiencies of seven commercial/industrial oil-fired boilers at the nominal rated output and under part loadings

W A Don, D C Walker and R Rayment
BRE Report 1989. 87pp. Price £30.00. Ref No BR140.

This report gives the results of a test programme carried out on seven boilers, with rated outputs from 111 kW to 5689 kW, to find out the effects of various factors on the thermal efficiency when the boilers are operated at part load. The information indicates the savings that may be achieved over a broad spectrum of boiler types and can be considered generally by boiler operators and others concerned with boiler performance as a potential means of enhancing the annual efficiency of boiler plant.

Cruden Rural steel-framed houses
BRE Report 1989 16pp. Price £5.00. Ref No BR139.

Continuing the series of BRE reports on steel-framed houses, this records the form of construction of Cruden Rural houses, identifies locations within the structure where deterioration has occurred, and highlights areas where surveyors should pay particular attention. This type of house was built only in Scotland.

BRE Digests

Concise reviews of building technology. Available singly or on subscription as part of the BRE Update package.

338 Insulation against external noise
This Digest explains how the external envelope of a building affects the level of noise that is transmitted from outside to inside. This depends on a number of factors: the mass of the envelope, its continuity and the extra insulation afforded by double-leaf construction. There are also certain planning measures that will minimise exposure to outside noise.

339 Condensing boilers
Condensing boilers can be used in most buildings, new and existing, large and small, with valuable savings in energy. This Digest gives advice on selection,

system design, installation, commissioning and maintenance, and economic appraisal.

340 Choosing wood adhesives
Amongst the two groups of commonly used wood adhesives are products of widely varying properties. This Digest gives guidance on their selection and specification for use with solid wood.

Information Papers

Latest BRE research information and how to apply it. Available singly or on subscription as part of the BRE Update package.

IP20/88 Timber scaffold boards — reducing the incidence of site injury
J M Dinwoodie and A R Fewell

Each year building-site workers are killed or seriously injured as a result of scaffold boards failing. This paper explains the main causes of scaffold board failure and emphasises the attention and care that must be taken in purchase, handling and maintenance of boards.

IP21/88 Thermal bowing in fire and how it affects building design
G M E Cooke and P B E Morgan

During a fire, heat can affect one side of a wall or floor causing thermal bowing as a result of the differential thermal expansion. Data from experimental and theoretical work can be used in building design to reduce the detrimental effect of thermal bowing in, for example, tall walls.

IP22/88 Energy efficiency in the housing stock
G Henderson and L D Shorrocks

BREHOMES, the model of energy use in the UK housing stock developed by BRE, combines data from various surveys with a physical model of domestic energy consumption to produce a coherent picture of overall energy use. The results show that the average dwelling is now more energy-efficient than in 1970.

IP1/89 Domestic warm-air heating systems using low-grade heat sources
R Rayment and G E Whittle

The practicability of using warm-air distribution systems with low temperature heat sources such as solar, heat pump, or geothermal, has been demonstrated in an experimental test room. The optimal air-supply rates and source temperatures for comfortable conditions were determined from tests in a wide range of conditions.

How to find out more...

* About any new item in this newsletter, contact the Central Marketing Unit, Garston, Watford WD2 7JR (tel: 0923 664400)

To order any title...

* Listed on this page write to Publications Sales at the above address (tel: 0923 664444), quoting title reference or series number

IP2/89 Thermal performance of lightweight inverted warm deck flat roofs
J C Beech and G K Saunders

BRE research indicates that when the inverted warm deck roof is used in conjunction with a lightweight deck, thermal performance during rainfall may fall far enough in certain locations to give a risk of condensation. Further work has validated a simple modification to the design which reduces this risk.

Defect Action Sheets

Defects in housing and how to avoid them in design and on site. Available singly or on subscription as part of the BRE Update package.

DAS 124 Pitched roofs: Renovation of older type timber roofs — re-tiling and re-slating (Design)

DAS 125 Pitched roofs: Re-tiling or re-slating of older type timber roofs (Site)

Published by HMSO

British softwoods: Properties and uses
T Harding
Forestry Commission Bulletin 77
HMSO 1988. 41pp. Price £5.50.
Available from BRE Publications Sales
Ref No SO43.

Prepared by BRE for the Forestry Commission, this book brings together the latest information on the major British commercial softwood species, and provides an introduction to conifer wood properties for architects, designers, specifiers, foresters and students. It describes the properties of the woods, their current uses and prospects, requirements for use, and the suitability of sawn timber, small roundwood and poles in different applications.

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A regular newsletter highlighting on-going research, forthcoming seminars and courses, new books, films and software packages.

* The exact number of UPDATE titles depends on the output of research findings.

Printed in the UK for HMSO by Gower Press Ltd

Technical Consultancy takes off

In the three months since the launch of the BRE Technical Consultancy in October last year, more than 200 companies and organisations have approached BRE to discuss R & D and investigations on specific projects.

The Fire Technology service has attracted a considerable level of demand, much of it for assessments of fire resistance of components — shutters, doors, cladding and wall materials — and for advice on upgrading components in existing buildings. There is continuing interest in dust explosibility assessment and methods of

smoke control in shopping complexes, and there have been enquiries about possible build-up of methane under a building, methods of achieving fire protection of steel, and failure pressure of double glazing.

Enquiries to the Construction Products service have covered a wide range of materials, including plastics (particularly for accelerated weathering tests in the Xenotest 1200), paints and coatings, pesticides, cement, concrete, and rendering.

There has been particular interest in BRE's unique equipment — known as BRERWOLF — for investigating wind lift forces on roofs and cladding, available

through the Wind Engineering service. An extensive series of tests is under way for manufacturers of single ply roofing systems, through their association (SPRA).

Requests for Building Advice were as varied as ever — typical enquiries were about granolithic flooring, durability of slates, and acoustic ventilation.

For more information about Technical Consultancy, contact the Central Market- ing Unit at Garston (tel: 0923 664800).

Development of construction fixings

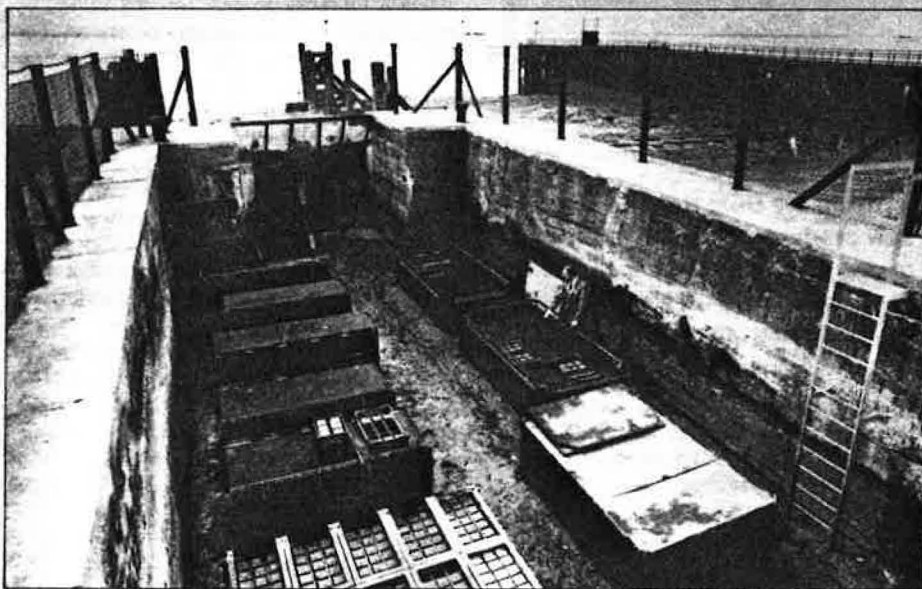
The BRE Scottish Laboratory has built up considerable expertise on the performance and durability of external insulation fixings, with laboratory and long-term loading tests, investigations of fire behaviour, and surveys of performance in practice. This has now led to involvement in testing and development work for companies producing specialist fixings. The first company to use the service was P A Fixings, which required assessment of external insulation fixings in different types of no-fines concrete. Other companies have recently approached the Laboratory for discussions about various types of fixings, including designs for stabilising panels of large panel system buildings.

Using power station by-products in concrete

Work has recently started, under contract with the CEGB, aimed at evaluating the potential for sea disposal of by-product gypsum derived from the coal-fired power stations now being fitted with desulphurisation plant to reduce acid emissions of sulphur dioxide. The contract calls for the design of cement-stabilised blocks incorporating flue gas de-sulphurisation (FGD) gypsum and pulverised fuel ash (pfa). A major objective of this form of disposal would be to use the blocks to create artificial reefs for the promotion of

fisheries. The work is being carried out in conjunction with ecological studies at the Central Electricity Research Laboratories.

BRE's main task is to establish the optimum mix conditions for blocks to achieve the necessary strength and durability in sea water. Mix trials will be carried out on small cylinders and then on larger blocks produced in a BREPAK blockmaker to assess the effects of scaling up. Specimens exposed for up to five years at the BRE marine exposure site near Southend will be assessed for strength and mineralogical changes.



BRE's marine exposure site where the blocks will be assessed in long-term trials

Roger Courtney first President of ENBRI

Roger Courtney, Director of BRE, has been elected the first President of ENBRI — the newly-formed European Network of Building Research Institutes. Initiated in Brussels at the end of last year, ENBRI links principal building research organisations in the European Community. By establishing ENBRI the member institutes aim to contribute, through advice to the European Commission and construction industry bodies, to the development of the single European Market in construction products. The nine founder members are the building research organisations of Belgium, Denmark, France, Federal Republic of Germany, Ireland, The Netherlands, Portugal, Spain and the UK.

New approach to research on sick building syndrome

In spite of extensive international research, there is still no agreement about the cause of sick building syndrome (SBS) or about possible cures. BRE has assembled a multi-disciplinary research team, which includes a number of established researchers outside BRE working under contract*, and is tackling the problem in a new way.

SBS is a group of symptoms, including headaches, lethargy, and irritation of the nose, eyes, throat and skin, experienced more often in certain types of building — notably air-conditioned — than others. It is a prominent problem in the workplace in most European countries, the USA, Canada, Japan and Australia.

Current evidence suggests that no single factor is the cause. However, so far there

have been no large-scale attempts to carry out a systematic modification of environmental conditions in a building; most investigations have relied on comparisons between buildings. These have provided important clues to the cause, which will be tested by a study of the changes in symptoms which occur when environmental parameters are varied. Furthermore, no single study has examined all likely causes concurrently, to identify interactions between factors and to take account of different causes in different buildings.

The new BRE study will seek to rectify this situation. It will be concentrating on a multi-factorial study of a small number of buildings, involving continuous monitoring of building users, building systems and the

indoor environment. During this monitoring, changes will be carried out which might reduce symptoms — for example, cleaning, repairing or adjusting the building systems, changing working or cleaning practices, and altering the degree of control that users have over the environment.

The syndrome undoubtedly affects work efficiency, but there is no clear evidence on the scale of its effects. In a complementary project, a team will be comparing sickness absence records between affected and unaffected office buildings.

*Thomson Laboratories Ltd (lead contractors), Building Use Studies, Ove Arup Partnership, Dr Pickering of Wythenshawe Hospital, and Dr Burge of East Birmingham Hospital.

OTHER APPLICATIONS OF BREDEM

BUILDING REGULATIONS

The Building Regulations for England and Wales and their counterparts for Scotland are currently being reviewed. BREDEM was used to calculate the effectiveness of the review proposals.

ENERGY AUDITING AND ADVICE

A home energy audit is an analysis of energy use in a particular dwelling which identifies how energy is used at present and how energy efficiency can be improved. The best known example is the 'Energy Matters' scheme which was operated by Channel 4 Television and the Open University.

CODES AND STANDARDS

BREDEM has been included by the British Standards Institution as the calculation procedure for its Code of Practice (BS 8211: 1988) on 'Energy Efficient Refurbishment of housing' and associated Designer's Manual. BREDEM is also an important foundation for the development of a draft Eurocode on the 'Rational Use of Energy in buildings' and to a draft ISO standard.

ENERGY LABELS

Energy Labels for housing express the overall energy costs of the dwelling in terms of a simple rating and enable the prospective purchaser to make better informed decisions on which property to buy. The Milton Keynes Energy Cost Index is the best example of such a label in the UK. The Index, which is based on BREDEM, was originally applied only in the Milton Keynes Energy Park

development but is soon to be extended to all new development in Milton Keynes. A scheme based on BREDEM for use throughout the United Kingdom is currently being investigated.

BREDEM and subsidiary products have a crucial role to play in the design and audit of housing.

For further BREDEM information contact George Henderson or Margaret Gidman (Energy Economics and Statistics Section, Building Research Establishment, Garston, Watford, Herts WD2 7JR, Tel (0923) 894040), Brian Anderson (Scottish Laboratory, Building Research Establishment, East Kilbride, Glasgow G76 0RZ, Tel (03552) 33001).

**Code of Practice
for Energy-efficient Refurbishment of Housing**

**BS 8211
PART 1**

Energy efficiency (in the context of housing) means maximizing heat sources and minimizing heat loss. The benefits - effective heating, low fuel bills, added value to property, conservation of energy - are proven. Energy efficiency thus makes sound financial sense both at a personal and national level.

Published on 1 July 1988, BS 8211: Part 1 shows how to apply the principles of energy efficiency to existing housing.

The standard identifies those factors which affect energy use and covers the design and implementation of an energy-efficient system. A section is devoted to the monitoring, maintenance and possible modification of this system. An appendix provides a model for estimating domestic energy use and costs.

Designer's Manual A manual will be published on 1 September 1988 to assist the designer in his application of the principles of BS 8211: Part 1. The manual includes sections on solar gain, insulation (roof, windows, floor, walls etc), draughts and air infiltration, ventilation and condensation control, fuel and heating and lights and appliances.

Essential to all professions involved in the refurbishment of housing, the standard and manual are offered together at a specially reduced price until 31 March 1989 - See order form below.

To order your copies, please complete and return the attached form.

BRE Information Paper In autumn 1988, the Building Research Establishment will publish an Information Paper setting out a method of estimating domestic energy consumption, based on the principles of BS 8211: Part 1. Quick and effective assessment of the energy performance of dwellings is possible by this method, using a hand-held calculator or IBM-compatible microcomputer. Enquiries concerning the Information Paper and computer programs should be directed to: Brian Anderson, Scottish Laboratory, Building Research Establishment, East Kilbride, Glasgow G75 0RZ. Tel: (03552) 33001 or Margaret Gidman, Energy Economics and Statistics Section, Building Research Establishment, Garston, Watford WD2 7JR. Tel: (0923) 894040

BSI

Order Form - BS 8211: Part 1 Energy Efficiency

Please insert number of copies required in appropriate box.

Special price	BSI members		Non-members	
	Cost per copy	No of sets required	Cost per set	No of sets required
BS 8211: Part 1 & Designer's Manual	£51.82		£54.00	

Usual prices	BSI members		Non-members	
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BS 8211: Part 1	£14.58		£29.50	
Designer's Manual	£10.00		£10.00	

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BREDEM CAN BE USED

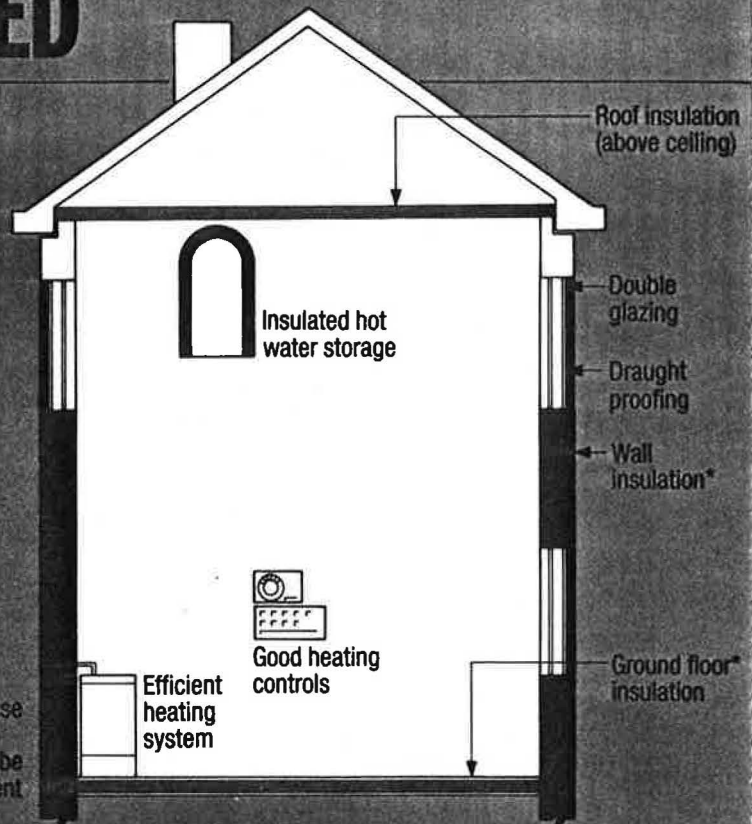
For estimating energy requirements in particular dwellings or groups of dwellings.

For investment appraisal of energy efficiency measures in which estimates of the resulting savings are required.

For estimating the resulting internal temperature conditions for a given energy input.

Investment opportunities in a typical house

*depending on construction, may only be possible for new build or major refurbishment



Investment opportunities in a typical house

WHY ESTIMATE ENERGY REQUIREMENTS?

The client/tenant wishes to know the probable running cost of a property before buying or renting.

Landlords need to know whether tenants can afford to heat their homes in order to reduce complaints and damage to property through mould growth and condensation.

WHY ASSESS ENERGY EFFICIENCY MEASURES?

To provide your clients with cost-effective and affordable combinations of design features to achieve reduced heating bills, whilst monitoring environmental standards.

To ensure the most appropriate measures are selected when upgrading existing dwellings.

Before refurbishment



After refurbishment

