

Building Research Association of NZ Inc

23 August 1999

Building Performance Study
Productivity Commission,
Locked Bag 2,
Colins St East,
Melbourne, VIC 8003
Australia

Fax + 61 3 9653 2305

Dear Sir / Madam,

RE: Improving the Future Performance of Buildings

Please find enclosed our submission for this research study.

An electronic version of this document in Word 2000 format has been e-mailed directly to "bperform@pc.gov.au". We are happy for this submission to be made available on the Productivity Commission's web site.

BRANZ would be happy to provide any additional information you may require, expanding either on this submission or any other aspect of our work investigating the performance of buildings. Our web site (www.branz.org.nz) provides additional information on our research and advisory activities. Please feel free to contact me by phone (+64 4 2357 600), fax (+ 64 4 2356 070) or e-mail (branzwrs@branz.org.nz) if we can be of any further assistance

Yours faithfully

Dr Wayne Sharman
General Manager, Science and Engineering Services

Enc Submission

SUBMISSION TO THE PRODUCTIVITY COMMISSION
on
IMPROVING THE FUTURE PERFORMANCE OF BUILDINGS
from

Building Research Association of NZ Inc

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1. BACKGROUND

The Building Research Association of New Zealand (**BRANZ**) is owned and governed by the New Zealand building and construction industry. It provides the building industry with an independent, research, testing, consulting and information resource. **BRANZ** is a leading Australasian building research organisation, employing over 100 staff in a broad range of building science and engineering skills, as well as providing training and information. **BRANZ** staff play an ongoing role in the development of the New Zealand Building Code (NZBC) and the Building Code of Australia (BCA), as well as participating in a wide range of Standards and professional body committees in New Zealand, Australia and internationally. **BRANZ** clients include energy suppliers, central and local Government, manufacturers, distributors, engineers, architects, builders and building owners.

Our primary sources of income are consulting work for individual clients, contracted research from the New Zealand Government's 'Public Good Research Fund', sales of publications and services and for New Zealand specific work a levy on the value of building work.

Our mission is

“To be the leading resource for the development of the building and construction industry”.

We achieve this through the work of over 100 highly trained, specialist staff located in our head office and research station at Judgeford, near Wellington and market support staff in Auckland, Hamilton, Christchurch and Sydney.

BRANZ has developed a worldwide reputation for excellence and service in such key areas as durability of building materials, weather tightness and ventilation in buildings, energy efficiency and fire and structural engineering. In 1995, its 25th anniversary year, **BRANZ** attained ISO 9001 quality management accreditation. The **BRANZ** Judgeford site, 30 km outside Wellington, covers 5.25 hectares and contains laboratories and testing facilities equipped to meet national and international standards.

2. ISSUES

This submission addresses selected questions raised in the Issues Paper prepared by the Commission. We would be happy to provide additional information on any of the issues raised in this submission.

Building Performance Evaluation

Question: Performance measures used by stakeholders in the building sector

There are at least three systems available to evaluate whole building performance in terms of matching the requirements of users to the facilities offered by the building, as well as a very wide range of other evaluation tools for specific aspects of the building's (non-regulatory) performance in use¹:

¹ Baird G, Gray J, Isaacs N, Kernohan D & McIndoe G (ed.) 1996 **Building Evaluation Techniques** New York: McGraw Hill

- **Building Quality Assessment (BQA)**²: developed by the Centre for Building Performance Research, Victoria University of Wellington for Rider Hunt Ltd. this system is now available for use in New Zealand, Australia (from Rider Hunt Terotechnology Ltd, Sydney) and the U.K. In brief, BQA divides the building performance into assessable components ('words'), and applies a scoring system. As well as an overall 'score', BQA provides a graphical profile of the different aspects of the building's performance which can be compared to the desired profile.
- **Real Estate Norm (REN)**³: was developed by real estate advisors DTZ Zadelhoff and Jones-Lang-Wootton and project management firm Starke Diekstra (Holland). Each performance component is assessed against the 'level' established by a series of descriptive images of ('visual'), for each of the 'supply' (what the building offers) and 'demand' (the user requirements). A graphical presentation of the profiles can be used for matching.
- **Serviceability (STM)**⁴: developed by the International Centre for Facilities (Ottawa, Canada) for Works Canada, in 1995 this method become a series of ASTM standards. "Serviceability" is defined as the "capability of a facility to perform the function(s) for which it is designed, used or required to be used". In brief, STM is based on a series of descriptive statements ('words') dealing with specific performance items used to match the functional requirements (user demand) to the facilities (building supply).

A range of specialist environmental assessment tools have also been developed to permit building users, owners and developers to establish the impact of the building, and optionally seek to reduce this impact. The international lead has come from the UK Building Research Establishment's BREEAM schemes (Building Research Establishment Environmental Assessment Method)⁵. The various BREEAM schemes have been adapted to New Zealand, Canada, Singapore, Hong Kong and Norway.

The New Zealand adaptation of BREEAM is termed the "Green Home Scheme", and is currently only available for new-build houses⁶.

The Building Research Establishment has also developed "*The Office Toolkit*"⁷, in conjunction with PA Consulting Group, which provides office managers with an easy and quick-to-use tool which helps to reduce costs and environmental impacts resulting from building operations. It is particularly suited for the smaller operations which cannot afford to employ a specialist environmental or energy manager. The Office Toolkit can provide an overview of significant information relatively quickly,

² Bruhns H & Isaacs N 1996 *Building Quality Assessment (BQA)* in Baird G, Gray J, Isaacs N, Kernohan D & McIndoe G (ed.) **Building Evaluation Techniques** pp 53-58 New York: McGraw Hill

³ de Jonge H & Gray J 1996 *The Real Estate Norm (REN)* in Baird G, Gray J, Isaacs N, Kernohan D & McIndoe G (ed.) **Building Evaluation Techniques** pp 69-76 New York: McGraw Hill

⁴ Davis D & Szigeti F 1996 *Serviceability Tools and Methods (STM) - Matching occupant requirements and facilities* in Baird G, Gray J, Isaacs N, Kernohan D & McIndoe G (ed.) **Building Evaluation Techniques** pp 58-68 New York: McGraw Hill

⁵ **BREEAM 98 for Offices** London : Construction Research Communications Ltd.

Baldwin R, Bartlett P.B., Leach S.J., Attenborough M.P. & Doggart J.V. 1993 **BREEAM / Existing Offices Version 4/93 An Environmental Assessment for Existing Office Buildings** London : Construction Research Communications Ltd.

Crisp V.H.C., Doggart J & Attenborough M 1991 **BREEAM 2/91 An Environmental Assessment for New Superstores and Supermarkets** London : Construction Research Communications Ltd.

Lindsay C.R.T., Bartlett P.B, Baggett A., Attenborough M.P. & Doggart J.V. 1993 **BREEAM / New Industrial Units. Version 5/93. An Environmental Assessment for New Industrial, Warehousing and Non-food Retail Units** London : Construction Research Communications Ltd.

Prior J.J. & Bartlett P.B. 1995 **Environmental Standard (BREEAM 3/95)** London : Construction Research Communications Ltd.

⁶ Jaques R 1997 **BRANZ Green Home Scheme – Householders Guide** BRANZ, Wellington

⁷ **The Office Toolkit**. 1996. Building Research Establishment and PA Consulting Group. London.

auditing energy use, air quality, harmful substances, legionella disease, electrical equipment hazards and the workspace environment, as well as visual, noise and traffic implications.

Standards and Building Codes

Question : Role of Standards and codes

Standards are technical documents prepared to establish desired levels of performance, whether by prescription or performance. In general Standards are developed under a form of consensus with a representative range of participants. Unless referenced in legislation (or in a structure which derives its legal enforceability through legislation) the use of a Standard is voluntary, permitting their inclusion or exclusion from any contract.

Codes can either be mandatory through legislative reference (e.g. Building Code of Australia) or voluntary (e.g. Code of Practice). A voluntary code can achieve as high a level of performance ('stringency') as is acceptable to the community implementing the code, but for a mandatory code the required performance will be the result of a complex politico-technical discussion.

Given the implicit cost implication of a mandatory, universal building code requirement, it behoves the code designer to ensure that the requirements are well based in science and finance, and they can be met. For example, as part of the 1996 revision of the **New Zealand Building Code Clause H1: Energy Efficiency**, the incorporation of embodied energy and CO₂ emission issues was investigated. It was concluded that the knowledge of both these issues was far from complete, this being especially true for embodied energy. In addition, it was found that the application of embodied energy into mandatory codes would be neither reasonable nor practical, due to the difficulty of the rigorous assessment required, the large amount of assumptions necessary, and the lack of support from most sectors in the building industry⁸.

Life Cycle Costing

Question: Use of Life Cycle Costing for commercial buildings

One process for improving performance is the use of life cycle cost techniques, particularly in the design phase. BRANZ commissioned a research project⁹ on the use of LCC in the New Zealand construction industry. One of the objectives was "To determine the barriers to achieving the full use of life cycle costing as a decision making tool in construction projects in New Zealand." The following barriers were identified in a questionnaire sent to building cost consultants, owners, architect and engineering consultants, developers, quantity surveyors, and project management consultants :

- The availability of reliable data,
- Reliability of the process,
- Selection of the appropriate discount rate,
- Selection of the study period,
- Lack of complexity of data required for the analysis,
- Limited consultant knowledge of LCC,
- Limited client knowledge of LCC,
- Unable to recover fees for carrying out LCC,
- Emphasis by budget holders on initial cost minimisation,
- On-going costs are the responsibility of others.

Other objectives addressed in the report were the "Potential use of LCC", and "Current use of LCC". A copy of the summary or full report is available upon request.

⁸ Jaques R 1994 **Energy Efficiency Building Standards Project - Review of Embodied Energy and CO₂ Emission Issues** BRANZ for Building Industry Authority : Wellington

⁹ Wilkinson S, et al. 1995 **Life cycle costing in the New Zealand construction industry**. UNITEC Institute of Technology, Auckland for the Building Research Association of New Zealand.

Energy Efficiency

Question: what extent is there a demand for energy efficient buildings in the commercial building market

Although energy is a major component of the property outgoings for office buildings¹⁰, and has been long recognised as one of the few outgoings which can controlled by the building manager¹¹, the market failure to deal with excessive energy costs is well documented.

For example the first report (1977) of the Australian National Energy Advisory Committee identified “the use of energy in residential and commercial buildings as an area requiring further investigation”, but this investigation was not completed until its thirteenth report (1981) which concluded (extracts)¹²:

- “Increased efficiency in the use of energy in all its forms in buildings can bring worthwhile private and commercial benefits”
- “The effectiveness of market forces in bringing about the more efficient use of energy in building is inhibited, in some cases, by inadequate availability of information to building owners and operators and by inappropriate building regulation”

Whilst there is now a range of improved energy efficiency information, it is either incomplete, or not considered to be of sufficient importance on which to base action.

The former is at least partially the case. For example the Property Council of Australia (PCA) (formerly known as the Building Owners and Managers Association (BOMA)) “Operating Cost Handbooks” are based on data collected from the building owner - and thus do not cover the entire cost (or use) of energy in the building.

This leads to the situation where it is not possible to compare ‘like’ with ‘like’ - if the base data is unclear as to the extent of building operation covered, then how can it be possible to compare any specific building with the baseline information. The 1994 BOMA Energy Guidelines¹³ have been developed to deal with whole building energy use, but in the absence of regular comprehensive data for a large number of buildings they are of limited (albeit essential) value. If the information to base measure against is not available, it cannot be surprising that organisations do not include such a measure in their reporting system.

Thus as there are no methods to determine whether a building is, or is not, ‘energy efficient’ the market demand cannot be created, and thus does not exist. The approach taken by the ACT to require a ‘star rating’ to be published in any house sale advertisement, has resulted in information on a standard basis to be made available to ensure it forms part of the knowledge base used in house purchase decisions. Such an approach for commercial buildings would similarly permit the creation of an informed market, and thence the opportunity for this to be included in the assessment used in the marketplace.

¹⁰ see for example Property Council of Australia Operating Cost handbooks for each state.

¹¹ Baird G. Donn M.R. Pool F. Brander W.D.S. & Chan S.A. 1984 **Energy Performance of Buildings** Boca Raton, Florida: CRC Press

¹² National Energy Advisory Committee 1981 **Energy Conservation in Buildings**. NEAC Report No 13. Canberra: Australian Government Publishing Service

¹³ BOMA, Victoria Division, *1994 Energy Guidelines* PCA Melbourne