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Canadian Building Digest

Division of Building Research, National Research Council Canada

CBD 200

Building Technology and its Use

Originally published November 1978.

C.B. Crawford

Please note

This publication is a part of a discontinued series and is archived here as an historical reference. Readers should consult design and regulatory experts for guidance on the applicability of the information to current construction practice.

The technology applied to building involves almost every facet of pure and applied science. For successful application it must be understood by all whose work touches on building: owners, architects, engineers, contractors, material suppliers and operators. Most cannot be expected to have either depth or breadth in the knowledge available. It is clear, therefore, that participants in the building industry require assistance in matching available technology with the specific problems encountered in their day-to-day activities.

It was to help satisfy this need that the Canadian Building Digest series was begun in 1960. It was noted in the first issue that "Each Digest will be restricted to one topic and will present, as concisely as possible, a summary of the subject for the information of those who must deal with the technical and related aspects of buildings." This, the 200th issue, describes briefly the scope of activities of the Division of Building Research and the mechanisms being used to make the vast store of technical knowledge more easily available to the construction industry.

The Problem of Technology Transfer

The cost of obtaining new knowledge is not recovered until the knowledge is applied. It is essential therefore that an applied research agency put considerable effort into transferring technology. "The term *technology transfer* refers to the diffusion of new or existing technical know-how into and throughout the constructions industry." "It is important to distinguish between the transfer of technology and the transfer of expertise. In other words, it is not enough simply to *know* something it is important to know how to *use* it."¹

Transferring technology is not easy; and as the volume of information increases it becomes more and more difficult for the non-specialist user to cope with it. More than 30 years ago the famed American scientist Vannevar Bush wrote that because of the "growing mountain of research," methods of transmitting the results are totally inadequate. Since then the volume of technical literature has probably increased four-fold, so that even improved methods of storage and retrieval have not been able to compensate for the information explosion.

The problem of technology transfer in construction is compounded by the nature of the industry. In the narrow sense it is made up of some 100,000 contractors and sub-contractors employing approximately 700,000 workers in an industry with a production worth about \$36 billion a year. In the broader sense, the construction industry encompasses many of the

100,000 or so professional engineers and architects in the country, as well as several thousand suppliers of building materials.

How can good building practice and the best technical information on the thousands of building products be made available to users? How can designers be best made aware of the latest research results related to building technology? The difficulties are immense, but so is the need for technology transfer; that is why the Division since its establishment in 1947 has regarded the transfer of technical information to the construction industry as one of its prime objectives.

Technology Transfer -- DBR

Although all Sections of DBR are involved with technology transfer, some have a special mandate in this endeavour.

The *Design and Use Section* is primarily concerned with the development and promotion of information to aid the designer, builder and user. The research program includes user problems, movement of people in buildings, documentation of building details and building performance and maintenance.

The *Information Services Group* includes the Building Research Library, which serves the public as well as Divisional staff, the Publications Section, which processes and distributes all Divisional reports and publications, and a Technical Information Unit. The Library and Publications Section are the two main resources used by the Technical Information Unit in responding to inquiries and coordinating the output of building practice documents.

The Division's three Regional Stations in Halifax, Saskatoon and Vancouver have a primary role in the transfer of information to and from the areas they serve. Both the Atlantic Regional Station and the Prairie Regional Station have laboratory facilities and carry out investigations on regional problems. Masonry research dominates the laboratory program at Halifax; research on swelling and shrinking clay soil and on roofing and energy-related problems is of special interest at the Saskatoon laboratory.

Specific ways in which information-oriented staff supported by laboratory research seek to transfer building technology include the following:

Publications

Hard copy provides the basic mechanism for disseminating information. The Division now has more than 3500 publications ranging from detailed reports of research to publications written for non-specialists, bibliographies, abstracts, translations, etc. Anyone may, on request, be advised of new publications as they become available. Lists of publications indexed by subject matter are also available on request.

Building Research Library

The DBR library provides a central source of library material for the construction industry, with holdings of architectural, construction and engineering literature. As a branch of the Canada Institute for Scientific and Technical Information (CISTI) its resources include literature on science and applied science relevant to building. Loans of books and reports can be made through technical libraries to those unable to use the facilities directly.

Technical Inquiries

General inquiries are handled by the Information Services Group. When possible, questions are answered by sending one or more relevant publications. In this regard a major role of two publications series, *Building Digests* and *Building Practice Notes*, is that of outlining general principles so that the user can apply his own judgement in assessing various building techniques or materials. Detailed scientific or technical inquiries are referred to appropriate research staff.

Seminar/Workshops

Since 1964 the Division has presented one or more seminar/workshops every year in centres across Canada. Lectures are followed by workshop sessions in which participants can explore individual problems. The 1977 program on "Construction Details for Air Tightness" was presented in ten cities from coast to coast to a total audience exceeding 1500 people. Many of the lectures are available in published form or as audio/visual packages.

Films and Audio/Visual Packages

Several films on construction subjects are available on loan from the Division, which also has a number of other A/V packages dealing with specialized subjects. These can be borrowed or purchased from Ottawa or the Regional Offices. Audio/Visual packages have become increasingly popular, especially with teaching institutions.

Field Investigations

Various kinds of field studies are undertaken by DBR staff of problems with existing buildings. Although such investigations are limited because of staff restrictions, they provide invaluable information on the kind of research that is needed to prevent building failures resulting from faulty design, poor building practice or the misuse of building materials.

Educational Activities

In addition to the regular seminar/workshops, DBR staff members are called upon to lecture at special courses and educational institutes. Much time is also spent in discussion of post-construction problems with the building sector or, more usefully, potential problems identified during the design phase.

Guest Workers

Inviting guest workers for varying periods of time is another effective means of transferring building technology. Between 1973 and 1977 18 guest workers, eleven from outside Canada, served a total of 9 ½ man years in DBR laboratories. Only one of the 11 non-Canadians received any financial support from Canada. Clearly it would be most desirable to have more Canadians benefit from the expertise and facilities available at DBR.

Industry Fellowships

Another effective way of promoting technical transfer is by having personnel from industry work with DBR staff members as "Industry Fellows" for a period of time on a shared cost basis. Fellows work on specific research programs of interest to both industry and DBR.

Laboratory Sections -- DBR

The primary role of the laboratory sections is research on new materials, new methods and new technology. Unless it continues there will be little new technology to transfer. Nevertheless, research staff devote, on the average, about one third of their time to information activities, service on code and standards-writing bodies, and other non-research functions. The writing of Canadian Building Digests is one example of the input of researchers to technology transfer.

The work of the six research sections that provide the solid base and source of technical information is outlined below:

The Building Materials Section is concerned with the technology of building materials in use, including brick, concrete, and aggregates, clear and pigmented coatings, plastics, bituminous and polymeric roofing systems.

The Building Structures Section deals with structural safety and causes of structural failure mainly as an aid to code development. Projects include snow and wind loading, limit states design, and masonry construction.

The work of the *Energy and Services Section* is devoted primarily to problems of energy conservation, e.g., developing improved thermal requirements for building enclosures and more efficient heating, ventilating and lighting systems. The program includes studies of the thermal

performance of walls, windows and roofs, ventilation and air quality, illumination levels, district heating, heat pumps and solar heating.

High priority is given in the *Fire Research Section* to subjects related to the National Building Code; for example, the development of fire, criteria for ignitability and flame spread, production, movement and toxicity of smoke, combustion and decomposition of materials, and fire protection features in buildings.

Construction problems associated with soils, rock, peat, snow, ice and permafrost are studied by the *Geotechnical Section*. Here, the emphasis is on field research on the ground thermal regime, the distribution and character of permafrost, structures on frozen and unfrozen ground, frost action in soils, tunnelling, and avalanche engineering.

The Noise and Vibration Section has special laboratory and mobile field facilities for evaluating and testing the sound transmission and absorption characteristics of building elements and systems. The program involves studies of outdoor noise propagation, insulation of buildings from external noise and dynamic loads on buildings due to wind, earthquake and traffic vibrations.

A service provided by some of the research sections is the *testing of products and equipment* if commercial testing laboratories are not available. Test reports are paid for and become the private property of the customer, but the information cannot be used for advertising purposes or considered as product approval by NRC.

Codes and Standards

New technology is put to work through codes and standards, and as such can be considered part of the technology transfer process. The support given by research staff to the National Building Code and the National Fire Code is coordinated by the *Codes and Standards Group*. This involves the coordination of technical advice and secretariat services to the code-writing committees and the production and distribution of codes and code documents.

Canadian Committee on Building Research

In 1974 the National Research Council formed the Canadian Committee on Building Research (CCBR) "to provide an interdisciplinary forum for the stimulation and application of building science and technology in Canada with particular reference to the design, performance and use of buildings." The Committee draws its membership from industry, universities and government; the Division of Building Research provides secretarial and other support.

One of the first achievements of the CCBR was the organization, with appropriate joint industry sponsors, of the First Canadian Building Congress. This Congress, dealing with "Energy and Buildings," was held in Toronto in October 1976 and attracted 600 delegates from every province and the Northwest Territories. It marked the first occasion on which the various disciplines involved with building came together to discuss a common problem. It is hoped that a building congress on a topic of interest to Canadians will be held every three years.

The CCBR has also established several task forces to deal with specific building problems. In this regard the Committee has recommended that technology transfer be given top priority by DBR, and has identified a number of problem areas where technology transfer could be more effective.

Concluding Remarks

The Division of Building Research is the only comprehensive research and information agency serving the construction industry, the largest single industry in Canada. Although the transfer of technology has always had the highest priority in the Division's program, it is, despite all efforts, the weakest link in the knowledge system. It is hoped that this Digest, outlining briefly the facilities available at the Division and the various ways in which transfer can take place, will help improve the two-way flow of information. The successful transfer and application of

building technology is only assured if research workers and users act as partners in an open-ended arrangement.

References

1. Boyd, A. D., and A. H. Wilson. Technology Transfer in Construction. Science Council of Canada, Background Study No. 32, 1975, 163 p.