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Decision Aids for Durable Wood Construction

by

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Abstract

For several years, Decision Aids has been addressing knowledge and technology transfer gaps in the design and construction sector that have had negative consequences for the image of wood. Since June 2000 we have been operating a public web site, together with the Canadian Wood Council, as a primary mechanism for conveying information to the building industry on wood durability. The web site's popularity is growing, with October 2002 a record month for visits (3,748). In 2002/2003, we added substantial new material to the site, we brought the French side fully up-to-date, and we reconfigured the site's appearance and structure. In 2002/2003, we also continued to develop our participation in building science academic development at UBC and BCIT. This kind of involvement with the universities that are teaching tomorrow's building designers and consultants has become the preferred route for Decision Aids to meet its mandate for filling current knowledge gaps in durability. In particular, we have stayed closely aligned with BCIT in its pursuit of funding for the development of an outdoor test facility for building envelope assemblies. Such a facility will be an important tool for filling information gaps regarding best practice design with wood in rainy climates.

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1 Objective

Expand markets for wood products and systems through global recognition of wood as a high-performance building material in terms of durability.

- Develop two-way technology transfer instruments that achieve a connection with specifiers, designers, builders, homeowners and maintenance supervisors.
- Explore opportunities for collaborative field studies of durability performance where information gaps exist.

2 Introduction

For several years, Decision Aids has been addressing knowledge and technology transfer gaps in the design and construction sector that have had negative consequences for the image of wood. A growing perception that wood is less durable than steel and concrete is being exploited by those two competing industries. The potential market impact is large. For example, if the steel industry were to realise its target of capturing 25% of the U.S. residential framing market, and assuming any reduction in U.S. wood demand would affect imports more than the domestic market, this could mean a loss of 4.8 billion FBM of Canadian lumber exports and 0.3 billion FBM of domestic consumption. A similar substitution of non-wood products for sheathing could impact 2.7 billion square feet, 3/8 basis, of OSB across North America. The concrete industry has also announced a 25% market share target.

One key to stopping future market erosion is by shifting the responsibility for durable performance away from the material and on to the designer, builder and homeowner. Much like structural performance is considered to be the result of an engineer's decisions and not a function of basic material properties, durability performance should also be identified with the decisions of the user. However, we cannot achieve this shift until the decision-maker has been equipped with adequate knowledge and tools in how best to use wood. Some knowledge already exists and merely needs to be more effectively communicated. In addition, Decision Aids continually seeks methods to fill in areas of information gaps.

Impact of this project includes:

- An improved perception of wood durability, which will inhibit product substitution or restrictive legislation.
- A better pathway to the building industry, which will assist the wood industry in pursuit of new markets.
- Savings in resource use and replacement costs over the life of a structure, for the building owner.
- Better assurance of long-term performance for designers and builders, reducing their risks.
- Potential point-of-sale aids for lumber retailers.
- A cohesive knowledge base useful for consumer education by the treated wood industry.
- Identification of knowledge gaps to help guide future research priorities.

3 Staff

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4 Method

The Decision Aids project is part of Forintek's Durability Program and is thus guided by the research strategy for that program. The current research strategy was established with the assistance of a joint CWC/Forintek Guidance Group on durability, and it is structured around eight broad areas of work. Decision Aids contributes to three of those areas: 1) the identification and plugging of knowledge gaps in design and construction; 2) the development of field assessment, maintenance and repair recommendations; and 3) the identification of influences on design and construction decisions around durability. Where Decision Aids takes on technology transfer tasks, it generally does so in coordination with CWC.

It is recognized that Forintek's ability to influence design and construction decisions is limited by our remoteness from the decision makers, our lack of an established reputation among this group, and our relative inexperience with whole-building design, construction and performance, among other factors. We are further hampered by general and well-known hurdles in the building industry such as resistance to change, poor infrastructure for technology transfer, little value placed on well-performing buildings, marketplace forces that outweigh performance objectives, declining skill levels in the building industry, and an extreme level of fragmentation in every aspect of this multi-disciplinary industry. To overcome these challenges, Decision Aids typically uses a strategy of partnership to influence durability design, construction and maintenance decisions. By aligning ourselves with partners more directly linked with the building industry, and with other researchers, we can best leverage our limited resources for the most impact.

The specific approach for Decision Aids is structured along two complimentary paths:

1. Improve or create technology transfer vehicles on durability.
   - Where information already exists but is not having the intended effect, provide the technical support necessary to improve the delivery and usefulness of this information.

2. Generate new knowledge or tools for better moisture control in the building envelope.
   - Where critical information does not exist, assist in the creation of this information.

5 Key Results

5.1 Web Site

The most significant activity in 2002/2003 was a major overhaul to the joint Forintek/CWC durability web site www.durable-wood.com. Changes included updates to existing material, substantial additions of new material, a clearer and more intuitive structure, better navigation, and a new look (Figures 1-4). We also made the web site easier to modify in-house (by CWC), so that we can best keep the web site up-to-date. The upgraded web site was substantially completed and went "live" at the end of September, although some new sections, as well as the French portion, took several months longer to complete. Both Forintek and CWC announced the upgrade through their newsletters.

The durability web site is having a beneficial effect on traffic to the Forintek corporate site. The Forintek web master reports that www.durable-wood.com is the 4th most referring site to www.forintek.ca.

Usage of the durability web site has been excellent and continues to grow – October 2002 was a peak month for the site. More than 3,100 unique IPs connected to the site. In other words, individuals from more than 3,100 different organizations or internet service providers viewed the site that month, and they made a total of 3,748 visits. Pages from the site were viewed 13,853 times in October. External sites currently pointing their visitors to our site via a links page, etc., include Trus Joist, US Forest Products Lab, CMHC, LSU Ag Center, Univ. of Waterloo (Building Engineering Group), Canply, Canada Wood Export Bureau, Southern Pine Council, Western Wood Preservers Institute, and more. External web sites that offer any link regarding durability typically point to ours – this indicates that our durability web site is quite likely the primary North American source for wood durability information, as we intended.

5.2 BERC

The Building Envelope Research Consortium (BERC) continues to be active in Vancouver with local building industry individuals (with additional participation from some national representatives as well as from Washington State). Nine projects have been completed to date under the BERC umbrella. In June, fourteen new projects were put up for priority ranking by vote of participants. The top 4 projects: a "model buildings" investigation, where buildings designed and constructed according to best practice protocols will be fitted with sensors to track performance; a study of indoor air quality issues in condos; a best practice guide for window installation; and a guide for envelope maintenance. The status of these projects as of February 2003 is as follows. The Model Buildings project is unfunded and currently stalled. The indoor air quality project and the envelope maintenance project are in a similar state. Canada Mortgage and Housing Corporation (CMHC) is proceeding with its own windows-related projects – the role of BERC members in this work is limited.

The future of BERC is currently in question. BERC has never developed into the true consortium originally envisioned, where the building industry would pool research funds for collaborative work. However, it has functioned quite effectively as a forum for discussion regarding research needs and priorities, and has thus been useful in guiding CMHC's decisions of work it wishes to fund. BERC has

previously also had some success in serving as a catalyst for small groups of co-funders to join forces, but this ability has declined in the past year. CMHC remains the only substantial funder of envelope research, and has no formal relationship with BERC regarding the delivery of that research. The BERC membership is currently considering a proposal to transform BERC into a subcommittee of the BC Building Envelop Council.

5.3 Test Hut / BCIT

The test hut project, a Decision Aids spin-off (phase 1 completed in February 2001; phase 2 still in process by the BC Institute of Technology), is an example of a successful funding collaboration (Forintek, CMHC, Homeowner Protection Office, and BCIT). We undertook phase 2 (objective: transition the project from feasibility study to preliminary project development) as a small separate project under Forintek's national research program. We completed that project on March 31, 2002, which consisted of finding a suitable project "custodian" and assisting as required. BCIT emerged early as that custodian and is still in the process of completing the work. As our role is now fairly minimal – we are serving on the steering committee – we have continued to participate in the project under the banner of Decision Aids and have been reporting on test hut progress accordingly. BCIT is currently preparing a CFI grant application for the test hut development, to be submitted in May 2003. This process includes continued activity towards establishing a Chair in building science.

5.4 UBC

UBC resolved its temporary set-back in hiring an Adjunct Professor in building science, as the successful candidate from the first hiring exercise declined the job at the last minute due to unexpected health problems. Greg Johnson, a registered architect and engineer in Vancouver, filled in as a visiting lecturer for the 2001/2002 academic year and has since been formally hired as the Adjunct Professor. This 40% position is cost-shared by Polygon Homes, Forintek (under Decision Aids), and UBC. Mr. Johnson is filling a critical gap in UBC's training program for future architects and engineers.

5.5 Other Tech Transfer Activities

Forintek's wood protection fact sheets "Discolourations on Wood Products" and "Borate-treated Wood for Construction" were translated into French. PDFs were made available under "publications" on both the Forintek corporate web site and the wood durability web site. Fact sheet work such as this is cost-shared between Decision Aids and Building Systems Technology Transfer.

6 Durability Research Update

Decision Aids reports annually on current research activity relevant to wood-frame building durability.

The issue of mould in buildings has recently experienced dramatic growth in public interest and has relevance within the general durability topic area. Decision Aids stays informed on the subject in order to

determine what information, if any, ought to be presented on the durability web site. Adnan Uzonovic is Forintek's key researcher in that area and provided an excellent overview of the situation in his Indoor Air 2002 trip report "Review of Current Knowledge and Trends in Building Microbiology and Indoor-Air Quality" (A. Uzonovic, January 2003). Although wood, as an organic substrate suitable for supporting mould growth, is potentially at risk of being swept up in the current media hysteria over mould, it has not been strongly identified with human health effects, to date. The scientific community worldwide is actively working to fill the many knowledge gaps in building microbiology and associated health effects, however the media is running somewhat ahead of the science. Public awareness of mould and its demonstrated association with moisture have increased the importance of providing appropriate information to designers and builders.

The Ninth Canadian Conference on Building Science and Technology was held in Vancouver in February 2003, with good representation from most well-known Canadian researchers and a few from the US. The focus of most presentations was wood-frame construction, with much attention given to rot and mould. The presentations as well as the audience reactions revealed a substantial split still exists between the worlds of academia and design practice regarding durable construction. In other words, the research rigour of academics and the field experience of practitioners are not often combined for best effect. The audience was particularly skeptical of current work on hygrothermal modeling, presented both by Achilles Karagiozis of Oak Ridge National Laboratory (US) and Kumar Kumaran of the National Research Council Canada / Institute for Research in Construction (NRC/IRC). It was acknowledged that these types of tools have a long way to go before they are usable by designers. John Straube of Waterloo presented work on crawl space ventilation, confirming the belief of some building scientists that ventilating this space with outside in hot climates will cause condensation problems. This work is significant, because building codes – particularly in the US south – generally dictate worst practice, leading to mould growth and wood decay on floor joists. Several presenters discussed mould, and not all appeared to be appropriately informed on the subject. Mark Lawton and Bill Brown of Morrison Hershfield presented work supporting the use of the polyethylene vapour barrier in temperate climates such as Vancouver, adding a solid argument to this on-going debate.

At the February BERC meeting, NRC/IRC presented its current work in the area of envelope moisture management. The MEWS consortium project was completed in December 2002, and NRC/IRC continues to work in this area on their own. They are intending to release a public version of their hygrothermal model, "hygIRC 1-D." They will also hold a series of 1-day building science seminars across Canada, where they will address basic principles, give a demo of the model, and discuss MEWS results. They expect to be in Vancouver in November 2003. New research projects underway include a window-wall interface investigation that will use the Dynamic Wall Testing Facility also used in the MEWS work. This will be performed in conjunction with CMHC's new project on window/wall performance and the development of a CMHC best practice guide. Results are also expected to influence standards. NRC/IRC will also be investigating "high performance stucco." The aim is development of a Portland cement stucco with both water repellency and good drying ability.

7 Conclusions

Best practice in wood construction for durability remains hampered by lack of knowledge among practitioners due to educational or technology transfer weaknesses, and by general knowledge gaps due to lack of verified performance data. Continued effort towards solving both these problems is warranted.

8 Recommendations

It is recommended that we continue with the current course of action. In particular, emphasis will be placed on further maintenance of the web site and continued interaction with BCIT and UBC in their on-going development of building science capability.

9 Publications

www.durable-wood.com

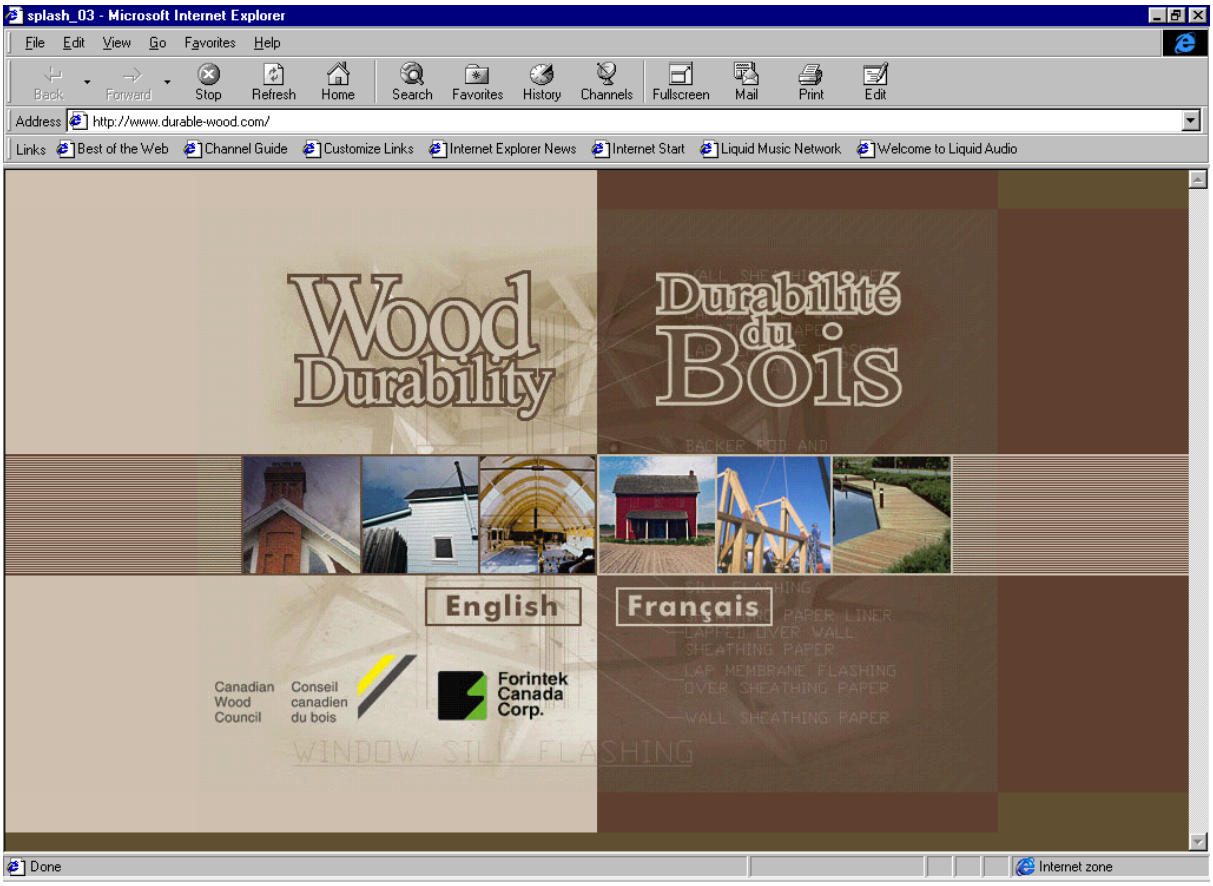

Figure 1: Splash Page for www.durable-wood.com

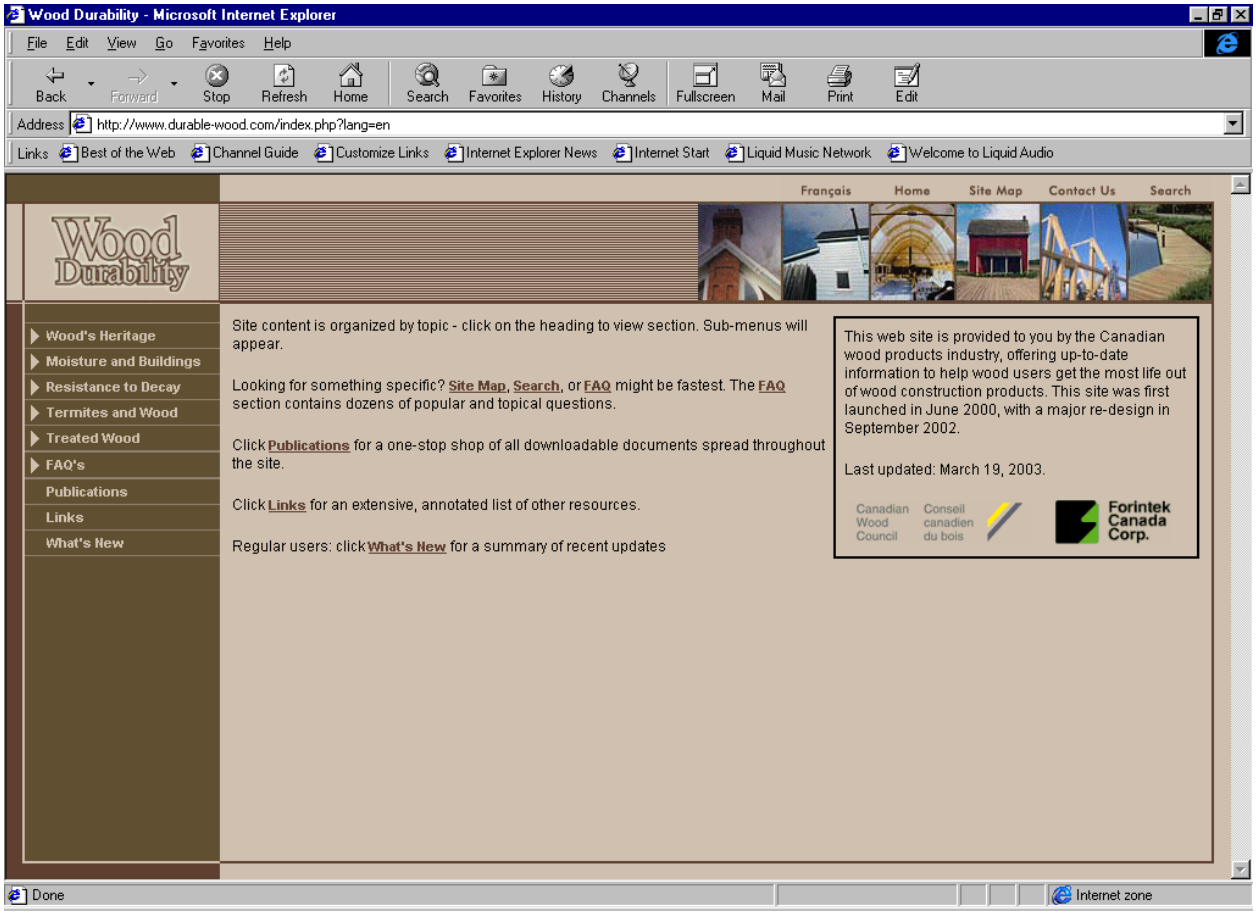

Figure 2: Home Page (English) for www.durable-wood.com

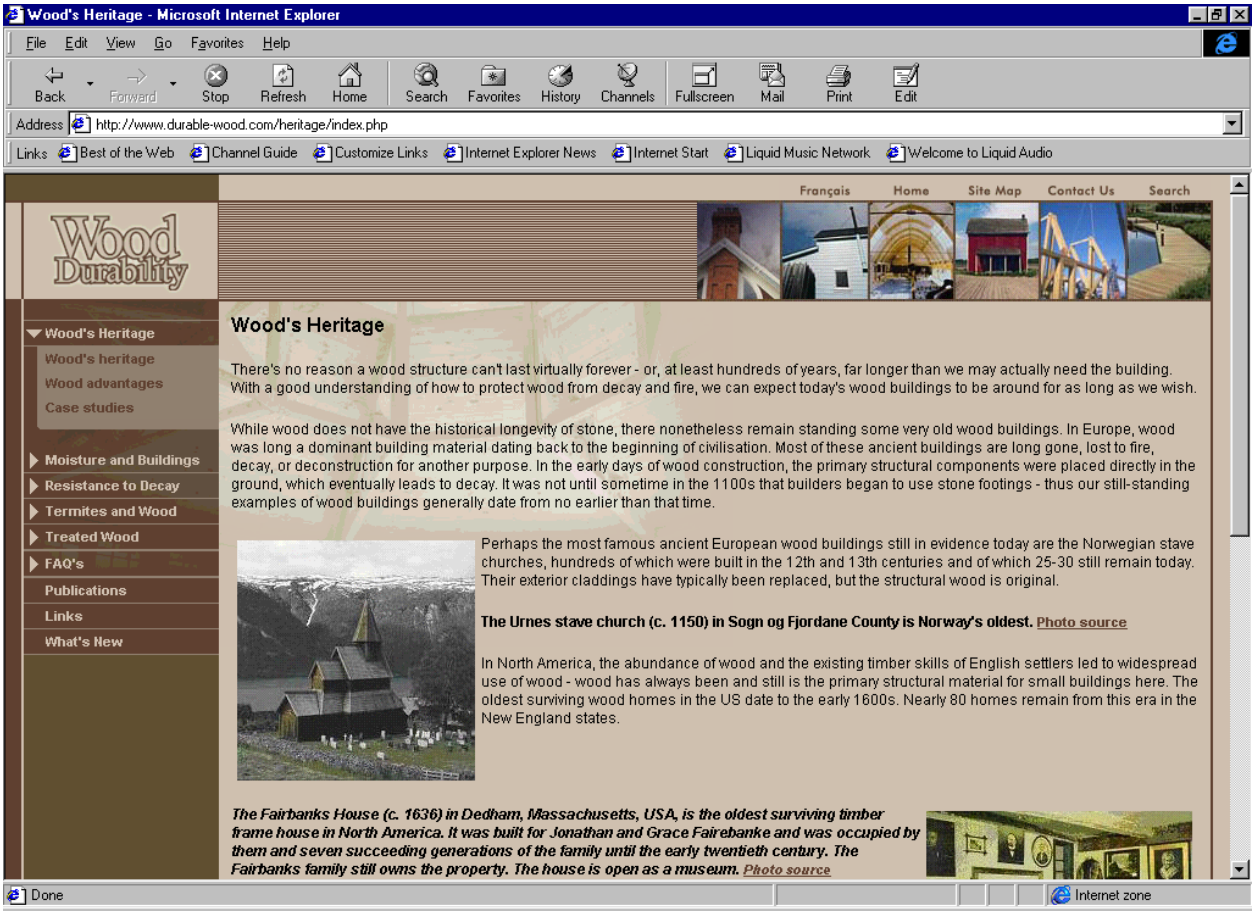

Figure 3: "Wood's Heritage" page

As part of an effort to add more "positive" information to the web site, this new material addresses history and successes of wood-frame construction

Figure 4: Links Page

The Links page has been further strengthened with more resources, all carefully targeted and well-annotated. Similarly, the FAQ page has been extended and is regularly updated.