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CCMC NEWS

Globalization : Changing Our Horizons

Canada's national model code and product evaluation centres at NRC are strengthening their international linkages with similar organizations around the world.

In his report to government on the competitiveness of Canada's industry, Michael Porter wrote, *"Canada today faces unprecedented challenges to its future viability and prosperity...it is under tremendous strain because of sweeping changes in the globally competitive environment – rapid growth of trade and investment, more open competition, the globalization of industries, shifting corporate strategies, rapid technological change and increased economic integration among countries."*

Successful multilateral trade arrangements under GATT and the liberalization of regional trade with agreements like that of the European Community, the Canada/US Free Trade Agreement (FTA) and its replacement, the North American Free Trade Agreement (NAFTA), reflect these developments in international trade.

The globalization of markets is already affecting the building regulatory field in most countries and its pace is expected to increase. Rapid globalization also is causing Canada's national model code and product evaluation centres at NRC to strengthen their international linkages with similar organizations around the world.

CCMC is working to establish these linkages with its counterpart organizations throughout the world, with a view to assisting both manufacturers and regulatory authorities in Canada. Not only could manufacturers avoid the need for redundant testing, but building officials would have greater confidence in the results of assessments of foreign products.

North America

The United States of America is the major market under NAFTA and an important trading partner for Canada. The preparation of U.S. model building codes is done by three organizations: International Conference of Building Officials (ICBO), Building Officials and Code Administrators International, Inc. (BOCA) and Southern Building Code Congress International, Inc. (SBCCI). These three groups, which are regionally based, operate an umbrella organization, the Council of American Building Officials (CABO). A special committee of CABO, the Board for the Coordination of Model Codes (BCMC), coordinates formats and publishes common documents where possible. Richard Desserud, Head of the Canadian Codes Centre, serves as an observer member on this Board.

The evaluation of products as conforming to or as equivalent to the three model codes is done independently by each of the model code groups. All three groups generally publish their evaluation results as Research Reports. A joint national evaluation by the three groups can be done through the newly incorporated National Evaluation Service (NES), formerly operated by CABO. Findings on national evaluations are published as National Evaluation Reports. John Berndt, Head of CCMC, recently met with the three representatives of NES to explore the potential for cooperative arrangements. The discussions are expected to lead to a formal relationship between the two organizations.

Europe

Gordon Walt, IRC's staff member responsible for international relations and strategic planning, has studied recent developments in the European Community (EC) and given a briefing to the Canadian Commission on Construction Materials Evaluation(CCCME). Under the common market arrangements, the member states have created a new organization, the European Organization for Technical Approvals (EOTA), to evaluate innovative products to their common regulation, the Construction

IRC Staff at International Conference

Several members of the Codes and Evaluations Branch attended the Third Congress of the World Organization of Building Officials (WOBO) in New Orleans in early May. The congress was held in conjunction with the Annual Meeting of the Council of American Building Officials and was attended by people from many countries, including the United Kingdom, Australia, New Zealand and Hong Kong. Four papers were presented by the IRC staff, including two related to international cooperation in the evaluation of building products. Richard Desserud was elected as one of the two Canadian Governors of WOBO.

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Products Directive (CPD). This organization, headquartered in Brussels, consists of 23 member evaluation organizations from the 12 member states of the EC (some states, such as the Netherlands, have designated more than one organization). Several of the European Agrément bodies are EOTA members. Eventually, under mandates from the European Commission, EOTA will prepare European Technical Guides as common evaluation criteria for use by EOTA members. While 1992 was an agreed deadline for implementation of the CPD, much work remains to be done on approximately 2000 construction-related standards that will support the CPD.

During the month of March, Gordon Walt visited several organizations in Europe to investigate current trends in building regulations and methods for assessing conformity to them. One purpose of the visits was to establish operating linkages for Canada's national model code and product evaluation centres with major European organizations through the exchange of information. Meetings were held with standards, codes and conformity assessment groups in London, Paris and Brussels. Information on Canada's model codes and evaluations was given to these organizations and first-hand information was gathered on European standardization activities in the construction field. As a direct result of these visits, CCMC has begun to develop a working relationship with the British Board of Agrément, a member of EOTA. ✦

Access Floor System

Access floor systems add flexibility to office areas and permit easy access to cable reticulation.

CCMC, in concert with researchers of Forintek Canada Corp. and the Institute for Research in Construction (IRC) has developed criteria for the assessment of access flooring. The system is a free-standing, accessible floor assembly made of modular panels, with an elevated support system forming an underfloor cavity for the distribution of mechanical and electrical services. These systems add flexibility to office areas and permit easy access to cable reticulation, due to the raised floor and the cavity it provides. The system can be installed in new buildings or existing buildings which require greater cable reticulation for computers.

Access floor systems are evaluated for compliance to Parts 3 and 4 of the National Building Code of Canada 1990 (NBC). The structural capacity of the access flooring must comply with the requirements of the NBC; when the test results for the loads, maximum deflections and residual deformations comply with the CCMC Technical Guide for Access Floor Systems, the flooring is deemed to meet the intent of the NBC for structural capacity and deflection. Floor serviceability has been divided into two categories: one is for offices with heavy computer hardware and strong boxes, which must resist a point force of 4.5 kN with a maximum displacement of 2.0 mm; the other is for general offices, which must resist a point force of 2.7 kN with a maximum displacement of 2.0 mm.

The fire safety of the system is examined when an access floor incorporating one or more combustible components is to be used in non-combustible construction. A test procedure developed by researchers at the National Fire Laboratory of IRC compares the smoke development, flame spread and heat release of the system to a non-combustible system and to a combustible system described as acceptable by the NBC. The test results must be between the test results of the other two systems to be considered acceptable.

One access floor system has been evaluated, only for combustible buildings, and another such system is presently being evaluated. For further information on CCMC Technical Guide Masterformat 10272 for Access Floor Systems, contact Luc Cécire. ✦

Evaluation Officer: Luc Cécire

Luc Cécire has been an Evaluation Officer since the beginning of CCMC's operation in 1988. His areas of specialization are masonry, composite wall systems, prefabricated buildings, adhesives, connectors, sheathing, caulking, sealants, fire and sound resistance, gypsum and foundations.

He graduated in 1982 from the University of Ottawa with a bachelor of applied science in civil engineering. He worked for five years for CMHC, three years as a building inspector and two years as an evaluation officer, until that program was transferred to NRC.

Mr. Cécire is a member of the Association of Professional Engineers of Ontario and is active on several CSA and CGSB committees. ✦

Evaluation of Metal Roofing Systems

Enhanced knowledge of basic metals, and technological advancements in roll forming, drawing, heat treating and coatings, have contributed to metal roofing systems being again considered as viable roofing alternatives.

Metal roofing is gaining popularity and recapturing a considerable share of the roofing market. As no product standards exist for metal roofing systems, CCMC has developed a Technical Guide for the evaluation of such systems. A CCMC Evaluation Report for a metal roofing system is the only third-party guide for building officials to assess a metal roofing system's adequacy and conformance to the National Building Code (NBC).

The NBC offers only a minimum thickness for sheet metal roofing and the general statement that "roofs shall be protected with roofing, including flashing, installed to shed rain effectively and prevent water due to ice damming from entering the roof." The intent of the NBC has been translated in the CCMC Technical Guide into prescriptive requirements for the base metals and performance-based requirements for traffic loads, uniform live loads, wind uplift and water infiltration.

Metal roofing products available on the market and evaluated by CCMC are pre-engineered to function and should be referred to as roofing 'systems.' They take the form of shingles, shakes, corrugated panels and interlocking flat panels. Size, shape and installation procedures vary greatly from one product to the next. CCMC evaluates the performance of the finished product installed to the manufacturer's instructions, while durability is evaluated based on the type of base metal and coatings used.

Raw material

The base materials used in such systems include copper, steel, aluminum, zinc and stainless steel. The physical properties needed for such base materials have already been established through prescriptive standards.

Copper is still considered the most durable material for metal roofing. Its disadvantage is its relatively large coefficient of thermal expansion. Aluminum is light and is durable because it is noncorrosive; its structural characteristics are adequate. Although aluminum is more affordable than copper, its equally high coefficient of thermal expansion makes it undesirable for certain applications. Stainless steel's high strength, and resistance to corrosion make it maintenance free, but it is less popular than aluminum.

Steel appears to be the most popular material for roofing systems. While its structural characteristics are considered to be excellent, its durability does not match that of copper, aluminium or stainless steel. Steel rusts, so protective metallic coatings are required. Metallic coatings for steel roofing are metallurgically bonded to the base material and should not be confused with paint. Zinc coating is commonly known as galvanizing; it is a sacrificial type of protection. Aluminum coating includes the application of pure aluminum to a steel sheet. This is a barrier type of protection. Alloy coatings, in particular, aluminum-zinc, combine the barrier protection of aluminum with the sacrificial protection of zinc, and provide superior weathering properties.

Design

Metal roofing systems fall within two types of applications, structural and architectural. Each type could be designed either as a hydrostatic (watertight) system or hydrokinetic (water-shedding) system.

Most metal roofing systems can be divided into three general designs: standing seam, single-lap, and component panels. The three designs can be used in structural as well as architectural applications. Usually, standing seam and single-lap are designed as hydrostatic systems, while component panel systems are designed as hydrokinetic.

Single-lap and standing-seam systems are usually applied on slopes as low as 1:48. Component panel systems are usually limited to 1:4 slope. Some systems span from purlin to purlin, while others require a continuous substrate. The fastening technique is usually specific to the system, as is the seam design, which is the main control for the prevention of water infiltration.

The complexity of a roof system, the interdependency of its parameters, and the nonlinearity of its mechanisms must all be taken into consideration when assessing its performance. Roof panels, clips, fasteners, and flashings are all components of a particular roof system and must be designed in conjunction with the other components and the elements to which it will be exposed.

The thermal expansion and contraction of metal roof systems must always be assessed. Panel movement on gabled buildings is relatively small; however, on wide span buildings, the roof expansion and contraction, especially when using long panels, is critical. Allowance for movements up to 50 mm is sometimes required. Wrong attachment of the roofing can destroy its floating action and have devastating performance results.

Durability

The durability of a roof system is investigated through assessing the base materials of all its components vis-a-vis the prescriptive requirements of their respective standards.

Corrosion resistance of the base material, fasteners and clips, and metalurgical compatibility between the different metals in the system must be investigated.

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For example, noble metals, such as lead and copper, should not be in contact with less noble metals, such as aluminum or zinc.

Weathertightness

The weathertightness of a roof system is concerned with the penetration of wind and rain through the joints. A dynamic water penetration test simulates rain accompanied by wind pressure equivalent to various wind velocities undergone by gabled roofs, while a hydrostatic pressure test is used to assesss low-slope roof systems.

Strength

A roof system must have the ability to sustain loads imposed by snow, wind and temporary human traffic during installation and maintenance. The strength required for snow loads is assessed on the basis of engineering analysis and design, while the strength due to wind and traffic loads is assessed through a wind uplift test and a traffic load test.

It is well established that wind causes uplift action on a roof. By translating wind speeds into a force per unit area, a reasonable assessment of the wind resistance of the roof system can be obtained. The effects of wind on a roof are complex and differ depending on the area of the roof. Many factors relating to roof geometry, height, slope, parapets and the variability of wind (gusts or oscillations) make it difficult to find a linear relationship between the wind effect and the roof. A lot of research is still being conducted to determine the best ways to assess such effects.

Similarly, plastic deformation due to traffic on a roof system could have adverse effects on its performance. Metal roofing systems should always be designed to support a traffic load equivalent to the weight of a person, having an average weight of 90 kgf(900 N), walking on the roof. Roof systems that don't meet this criteria must be equipped with independent walkways.

When selecting a metal roof system, it is always important to know how much of the system is pre-engineered. Products that simply copy some aspects of true pre-engineered systems, have the greatest problems. Through the assessment of the primary attributes, the systems that have the potential to perform adequately can be separated from those that don't. CCMC presently has thirteen metal roofing systems evaluated; these are published under Masterformat Section 07323 and should be consulted for product-specific detailed information.

Information: Fadi Nabhan ✦

Notice to Readers

With this fifth edition, CCMC News begins its second year of publication. We hope that the CCMC-related and other conformity assessment news contained in the first four issues have been useful to you and your colleagues.

During its first year, CCMC News has been sent to readers of NBC/NFC News on the assumption that most code users would be interested in CCMC activities, which are aimed at ensuring that new and innovative products meet code requirements. However, we will now be creating a separate mailing list for CCMC News. If you wish to continue receiving CCMC News, please complete and return the enclosed survey card.

We also depend on your feedback to know whether the articles we publish on key CCMC activities, current product trends and other news are pertinent to your line of work and interests. Your suggestions for topics are welcome. They will help us program future issues to meet your expectations.

The survey card is pre-addressed and pre-stamped for your convenience. Please return it promptly to avoid missing future issues of CCMC News.

Guy C. Gosselin, M.B.A., P.Eng.
Ass't Head, CCMC

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