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CCMC NEWS

Letter of Agreement Signed with Composite Materials Centre

The Composite Materials Centre will offer the services of CCMC as part of their own services to manufacturers and product developers.

In August 1994 the Composite Materials Centre (CMC), a Quebec organization located in Saint-Jérôme, announced the signing of a Letter of Agreement between the Canadian Construction Materials Center (CCMC) of the Institute for Research in Construction (IRC) and CMC. This agreement will enable CMC to offer the services of CCMC as part of their own services to manufacturers and product developers. Mr. Robert Guillemette, General Manager of CMC, recognized the importance of an association with an evaluation center such as CCMC. He stated that this agreement will not only accelerate the marketing of CMC clients' products but will also provide them with the added value of being associated with the National Research Council of Canada.

The Letter of Agreement also provides CMC with the opportunity to obtain research services either through CCMC or directly from IRC's research laboratories. Since most of the construction products developed by the Composite Materials Centre are either innovative materials or use existing technologies to form innovative systems, they are not covered by existing standards or specifications. CMC clients will thus benefit from the expertise of both CCMC's evaluation officers and IRC's researchers to prepare the evaluation criteria and develop new test methods for these innovative products as they are developed.

This is the first agreement of this type between CCMC and a corporate organization offering development and testing services. Through such strategic alliances, IRC and CCMC can contribute to the success of innovative products in the Canadian construction industry by ensuring that their performance and durability meet or exceed the requirements of the National Building Code. ✦

Materials, Products, Buildings of Tomorrow

Materials performance, in future, will integrate the concepts of function, time and end of life.

The first part of this article was published in CCMC News fall issue no. 10. Although originally intended as a three part series, due to upcoming changes to the CCMC Newsletter format, the remainder of the article is presented in this issue. (Original article published in "Cahiers du CSTB," Cahier no. 2670, 2 Sept. 1993.)

Materials of Tomorrow

Materials of the future will have the following characteristics:

Smart

In other words, they will react 'spontaneously' with their environment, without human intervention, much as sunflowers turn toward the sun.

Smartness will thus become a feature of the material.

There are already such materials, e.g., shape-memory metals with some general applications as in retractable headlights for automobiles, or photochromic glass.

Some smart materials will also be **programmable** (materials engineering and computer-aided materials design)

It will be possible to formulate, organize and structure matter so as to meet certain specifications.

Some materials will have core properties that are different from their surface properties.

Instead of simply ensuring minimal performance, the goal will be to achieve suitable performance levels for a specific application or function.

Materials performance, in future, will thus integrate the concepts of function, time and end of life. Materials engineering can be expected to program the self-transformation or self-destruction of a given material at a given time.

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Materials, Products, Buildings of Tomorrow... *continued from page 1*

Processes used to manufacture materials and products must use materials and techniques that involve little or no risk, generate a low volume of easily managed waste, and use a minimum of energy.

Multiphase or composite

These are materials that until now could not coexist, e.g., alloys of incompatible polymers such as polypropylene and polycarbonate. Polymers offer vast possibilities for innovation.

It will be possible for these hyper-mixtures or hyper-alloys*, containing not only two or three phases but a multitude of phases, to be deprogrammed; the regeneration of elementary phases at the end of the life of multiphase and composite materials will be a key issue in view of environmental protection requirements.

As for the composite materials of the future, they will contain hyper-reinforcements or hyper-performance fibers, such as industrial carbon fibers and laboratory whiskers, within a hyper-performing matrix that is also complementary.

Ceramic-ceramic composites are already being used in items exposed to severe thermal and mechanical stresses, such as aircraft turbines and space shuttle protective shields.

Biomimetics or general bionics, an interdisciplinary science based on models provided by nature, will help develop high-performance materials and products along the lines of spider webs and certain mollusk shells.

Hyper-performance and multi-performance

Certain hyper-performance materials can already be found in laboratories:

- **very-high-performance concrete** (with compression strength values reaching 250-300 MPa);
- **thermal insulators** (vacuum powder insulators or vacuum micronic powders): such insulators will allow the design of the 'zero' energy house (no heating, no air conditioning);
- **silica aerogels** (insulating and transparent): such materials will help ensure thermal continuity of the envelope wherever windows and other transparent openings are located;
- **load-bearing insulators** (e.g., autoclaved aerated concrete): glass and other expanded ceramics.

Other hyper-performance or multi-performance materials of the future include:

- **faultless materials** with a very high modulus, e.g., whiskers;
- **amorphous materials** such as metallic glass, already used for added strength in mortar;
- **high-modulus materials** providing considerable viscoelasticity to help design light-weight components with high mechanical cushioning properties (noise or vibration damping);
- **controlled-isotropy materials** that are flexible in one direction and rigid in another;
- **diode-effect materials** providing, for example, thermal conductivity in one direction and within a given temperature range, and insulating properties outside that range;
- **green materials,** as described below.

High-performance skin or treated surface

Examples of such materials are synthetics such as PVDF-coated ABS (coextruded).

Placed judiciously on the surface of a product, certain materials provide good appearance as well as screening properties while playing a structural role at the mechanical level.

PVDF (polyvinylidene fluoride)-coated ABS (acrylonitrile-butadiene-styrene), for example, provides the thermoforming properties of ABS (useful in car bodies) while PVDF enhances the characteristics of ABS, which is sensitive to solar radiation.

Fluorinated films offer interesting properties, but are difficult to associate with other materials. Nevertheless, recent developments in adhesive technology are leading to the design of such composites as ABS-PVDF or PVC (poly vinyl chloride) -PVDF, thanks to an adhesive film that is compatible with PVDF.

Another example concerns glass polyester laminates coated with PTFE (polytetra-fluoroethylene): the appearance of such composites used to show characteristic signs of aging. PTFE, applied on the bottom of the mould during processing for the last fifteen years, has had a screening effect. Now this solution is being replaced by the application of a modified resin-based gel coat.

PC (polycarbonate) has recently been coated through an enriched surface treatment (PC containing a significant percentage of anti-UV agents) for improved resistance to ultraviolet radiation.

Environmentally friendly

These are the green materials that can be recycled both technically and economically. Their limited life will be programmed and their processing will be maximized in terms of energy, environmental conservation, ergonomic and other criteria.

** An alloy is a repetitive sequence of elements undergoing physical and chemical interactions, whereas a mixture involves no regular spatial arrangement.*

It will be possible to separate and reclaim products made with these materials.

Such materials are often described in terms of ecobalance, life cycle, etc. In this context, it would be more realistic to apply the concept of life spiral to materials whose performance is based on a series of uses prior to the final stage of residue or waste.

Regardless of energy considerations, mineral materials in general and glass in particular, as well as metals (aluminum, copper, steel, etc.), provide a very dense life spiral as their performance changes very little over time.

Comfort

The description of comfort is a delicate matter, and always subjective. Comfort is generally associated with surface properties of esthetic and sensory value, the surface acting as an interactive membrane between the material and its environment.

Such properties include:
- touch (tactile relationships),
- esthetics (visual relationships),
- hygrothermal comfort,
- safety,
- amenity.

The design of textile flooring (carpets), for example, involves economic factors as well as considerations of tactile comfort.

Manufacturing Processes for Products of the Future

Materials themselves do not have any inherent usefulness; they are only useful when they become products.

To become products, materials must be transformed through specific processes that bring out their particular characteristics in an environmentally friendly way. Much research is being carried out to design optimal manufacturing processes for the products of the future.

Processes used to manufacture materials and products must be environmentally friendly; that is, they must use materials and techniques that involve little or no risk, that generate a low volume of easily managed waste, and that use up a minimum of energy.

If the materials of the future are to be suitable complex systems integrating a number of functions, the processes and techniques used to manufacture such systems will themselves have to be 'smart'. They will have to allow for the spatial and chronological handling of the constituents of a formulation, or allow a number of functions to be stored within materials.

Fabrication processes will have to be guided in terms of the microstructure of matter during the various phases of the process. This approach to microstructure will be carried out in real time and will require new non-destructive sensors providing data that will be handled by expert systems and integrated computors.

Such a scheme involves two fundamental steps within a smart manufacturing process:

- observing, measuring, analyzing and modeling the links between formulation and properties and/or between microstructure and properties;
- observing, measuring, analyzing and modeling the manufacturing process itself.

Observations and measurements will, of course, be based, in turn, on smart metrology.

While materials may be considered as performance pools, their potential can only be realized through manufacturing processes that provide reliable end products in accordance with the initial specifications.

While processing applications are expected from the development of artifical intelligence, new technologies are even now helping to manufacture multimaterial components, for example, coextrusion and pultrusion.

Some Products of the Future

The functional approach to materials described earlier can be applied fairly unchanged to the products. Suffice it then to describe a few specific examples.

Two major classes of industrial products are of particular interest: linear products and multilayer products.

Concerning linear products, multimaterial sections (PVC-aluminum; PVC-wood; wood-aluminum) are already being used to manufacture higher-performance products; reinforced and insulated pipes distribute fluids under more severe pressure and temperature conditions; linear composites are being used to implement structures having a very high mechanical performance to weight ratio.

A very large number of multilayer or sandwich panels have also been introduced in recent years. Gypsum board and drywall have practically become traditional components. On the other hand, the potential of metal-faced microsandwiches and smart windows is still being developed. Smart windows are a particularly good example of multifunctional products (assuming optical, thermal, mechanical, acoustical, architectural and other functions within the envelope) where certain characteristics might be self-regulated in terms of environmental conditions.

Methods of assembly must ensure continuity of function and performance in materials that make up products, for example, reversible adhesives: replacing wallpaper is at present labour-intensive, whereas in the future easily-removed self-stick products will be used.

Buildings of the Future

Buildings of the future will be constructed on an ever more densely populated planet.

Underground
Such buildings can already be found throughout the world:
- the central railway station in Tokyo (several square kilometres on a number of levels: shops, offices, recreation, etc.);
- several buildings in Montréal for reasons of climate;
- les « Halles » in Paris.

On the ocean and under the ocean
Examples are the Kansaï (Osaka) airport in Japan, built on a man-made island of 511 hectares, and the port of Yokohama planned for the 21st century, which will cover 180 hectares, including 76 reclaimed from the ocean.

In space
There are a number of space concept buildings:
- totally in space, e.g., Japan's Space Project ;
- on the moon, e.g. ,the lunar concrete envisaged by Société Lafarge.

Information: B. DiLenardo ✦

Trilateral Meetings Promote North American Trade in Construction

The Canadian Standards Association is preparing a cross linking of building standards from the three countries.

In the past year, IRC staff played a key role in two meetings on building codes and standards resulting from the North American Free Trade Agreement (NAFTA).

Canada/U.S./Mexico - Los Angeles, May 1994

As a result of three previous Construction Sector Trilateral meetings, a Building Codes and Standards working group met in Los Angeles. The Canadian representatives at the meeting were P. Higginson (Canadian Chair), Underwriters' Laboratories of Canada; H. Krentz, Canadian Institute of Steel Construction; P. Rideout, Canadian Standards Association; and J. Berndt, CCMC.

Ad hoc working groups were formed to determine the most suitable approach to resolving trade issues related to codes and standards (concrete, wood, steel fabrication, fire protection, laboratory accreditation, product evaluation and codes). Industry representatives generally felt that existing networking within their respective industries was an effective approach to resolving issues. In support of the effort to better understand the standards processes in each of the three countries, the Canadian Standards Association (CSA) is preparing a cross linking of building standards from the three countries. This initiative is expected to be completed in 1995 and will be a useful reference guide for exporting manufacturers.

Canada/U.S./Mexico - Mexico City, October 1994

At the fourth Construction Sector Trilateral meeting, Canada was represented in the Building Codes and Standards working group by R. Bowen (Canadian Chair), Director, Codes and Evaluation, IRC; J.F. Fournier, Bureau de Normalisation du Québec; H. Krentz, President, Canadian Institute of Steel Construction; and P. Higginson, President, Underwriters' Laboratories of Canada. Although little progress was made on any substantive issue, the Chair from each country agreed to act as a contact, responsible for responding to incoming questions relating to building codes and standards, and for identifying the appropriate agencies in their respective countries responsible for the area. The Mexican and U.S. contacts are:

Franco M. Bucio Mujica
Director Tecnico del ONNCCE
Insurgentes Sur 1673-5 piso
Guadalupe Inn, C.P 01020
Mexico, DF
Ph 662-57-31
Fax 661-32-82

John H. Nosse
ICBO Evaluation Service Inc
5360 Workman Mill Road
Whittier, CA 90601 USA
Ph (310)699-0543
Fax: (310) 695-4694

Manufacturers wishing to be kept informed of future Trilateral Standardization Forums should write to Ellen Lesiuk, Standards Council of Canada, 1200-45 O'Connor, Ottawa, Ontario, K1P 6N7.

Construction Sector Trilateral meetings were jointly sponsored by the Standards Council of Canada (SCC), the American National Standards Institute (ANSI) and the Direccion General de Normas in conjunction with the Mexican National Chamber of Industry of Transformation (CANACINTRA). ✦

New Product Evaluations

CCMC is pleased to announce the following new product evaluations that have been completed between the publication of the Winter 94-95 issue (1 October 1994) of the CCMC Registry of Product Evaluations and 1 February 1995.

Accurate Dorwin Company	Fiberglass Vertical Slider Window	Vertical Slider Fiberglass Windows	12652R
Bonneville portes et fenêtres, Division du Groupe Bocenor inc.	Fenêtre à battant en P.C.V., Gamme ARGENT	Casement/Awning/ Hopper Vinyl Windows	12656L
Cosella Products Ltd.	DORKEN Delta-MS/MS-20 Dampproofing Membrane	Rigid Polyethylene Dampproofing Membrane	12658R
Hi-Therm Corporation	Custom 300/Ener-Smart 2000 Horizontal Slider	Horizontal Slider Vinyl Windows	12659L
Indal Metals Division of Indal Ltd.	Contessa Roofing System	Metal Roofing Systems	12648R
International Bildrite, Inc.	Bildrite Sheathing	Insulating Fibreboard	12649L
Isolation Marquis Inc.	Marquis #9 Blowing Wool	Loose-Fill, Mineral-Fibre Insulation	12650L
Riverside Forest Products Limited	Riverside Ulay	Plywood Underlayment	12653R
Schuller International Canada Inc.	Manville Climate Pro Blowing Wool	Loose-Fill, Mineral-Fibre Insulation	12642L
Schuller International Canada Inc.	Manville Blended Blowing Wool	Loose-Fill, Mineral-Fibre Insulation	12654L
Trus Joist MacMillan Ltd.	TJI®/55SP and TJI®/55 C Joists	Prefabricated, Structural Wood Beams and Joists ✦	12657R

IRC Newsletters to be Amalgamated

In an effort to improve its service to readers and to tell more of its story, the Institute for Research in Construction (IRC) is amalgamating its six sectoral newsletters, including CCMC News, into a single, Institute-wide publication, which will debut this June.

As a regular part of the new publication, CCMC will bring you articles on industry trends and international trade, as well as our announcements of new CCMC product evaluations. While relying on us for vital product evaluation information, you will become acquainted with other technologies and information about IRC's construction research and its code support activities.

CCMC News has been one of our most vital links to the construction industry we serve. IRC's new publication will reinforce that link while providing you a broader perspective on research and new technologies across the industry. Your comments are always welcome and will help us to meet your needs. We hope you like the change. ✦

Commission Directs CCMC to Continue Window Evaluations

CCMC will continue to offer an evaluation service for windows and patio doors until there is demonstrated industry support for the CWDMA program.

The Canadian Commission on Construction Materials Evaluation (CCCME) was established by the National Research Council to support innovation, technology transfer, productivity and competitiveness in the Canadian construction industry and enhance public safety in the built environment. The 18 member Commission comprises people from across Canada with a broad range of expertise in the construction industry.

Windows

At its yearly meeting in November, CCCME passed the following resolution with respect to the CCMC evaluation listing program for windows and patio doors: "CCMC should continue to offer an evaluation service for windows and patio doors while seeking co-operation with CWDMA (Canadian Window and Door Manufacturer's Association) with a view to termination when there is demonstrated industry support for the CWDMA program."

This decision came on the heels of an inconclusive national survey of window manufacturers comprising CCMC clients and CWDMA members. Of 176 ballots distributed, 46 respondents replied "yes" and 41 replied "no" to the question, "Now that the CWDMA Voluntary Certification Program for windows and doors is available, do you wish CCMC to discontinue its standard evaluation service for these products?"

The Commission applauded the work done to date by the self-certification group and felt that, if done right, it would be good for the whole industry. Some concern was expressed about the small manufacturers, who generally are not members of the CWDMA. The Commission agreed to revisit this subject on a yearly basis.

ISO Standards

The Commission agreed that CCMC should continue to encourage manufacturers to move voluntarily to ISO 9000 quality assurance standards. This represents a relaxation of its initial view that ISO 9000 should become a mandatory part of a CCMC evaluation. Members also agreed that CCMC should not conduct any assessments of quality control in relation to the requirements of ISO 9000 but should rely on the SCC-accredited organizations.

Product Performance beyond Product Standard

Commission members agreed that CCMC could evaluate standardized products to enhanced levels of performance where that level of performance is maintained and exceeds the level outlined in the standard. Also, CCMC could evaluate those standardized products which do not meet the standard in its entirety but which would nevertheless be suitable for specific and limited end uses. In both cases, CCMC's evaluation would establish an equivalency to the requirements of the National Building Code through one of its Technical Guides. The Commission noted that the committees responsible for preparing the requirements in the NBC express their intent in a number of ways, ranging from pure performance expectations to detailed prescriptive requirements. Referenced standards serve as an alternative to preparing detailed requirements in the Code itself. They represent the key factors of performance that characterize a family of products as of that edition of the standard. Because products are always evolving, and standards may not account for such evolution, CCMC evaluations are set against the intent of the Code requirements. CCMC's evaluations are not intended to bypass the use of product standards, but rather, to assess conformity of these evolving construction products to the intent of the Code.

New Appointment

Mr. Helios MuÑoz has been appointed to the Standing Committee on Technical Evaluations, which has reviewed 21 CCMC Technical Guides since its formation in the fall of 1993.

The next meeting of the Commission is scheduled for the fall of '95 in Ottawa.

Information: R.C. Waters, Secretary, CCCME

Build Green Label Program

Members were briefed on the Build Green Label Program which is a national certification program founded jointly by the Greater Toronto Home Builders' Association and ORTECH Corporation. The program certifies building related products which have a recycled content or demonstrate efficient use of renewable resources. The Build Green Label Program offers participants the opportunity to become part of an industry program to encourage the specification and use of Build Green products. The program is being administered through Build Green Inc. Under this program, CCMC has been designated as the agency to establish the technical requirements for those products which do not fall under a recognized standard. ✦

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