Session I-B: Materials – Cladding

Monday, December 6, 2004
10:30 a.m. to 12 noon
Grand Ballroom – Palm

Session Chair:

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10:30 a.m. to 10:40 a.m. Introduction
Jonathan Humble

10:40 a.m. to 11:00 a.m. *"Optimization of the Energy Performance of Airflow Windows"*
Dirk Saelens

11:00 a.m. to 11:20 a.m. *"Durability of Hardboard Siding"*
Anton TenWolde

11:20 a.m. to 11:40 a.m. "*Water and Dirt Repellent Treatments for Building Surfaces"*
Ruut Peuhkuri

11:40 a.m. to 12:00 p.m. *"Assessing the Impact of Thickness on the Performance of Stucco Cladding"*
Bill Brown

Optimization of the Energy Performance of Airflow Windows

Dirk Saelens, Staf Roels, and Hugo Hens – *Catholic University of Leuven*

This paper presents an energy performance assessment of airflow windows with a built-in roller blind integrated in a narrow office building. The paper focuses on the use of optimal solutions to improve the performance of airflow windows for typical Belgian climatic conditions. First, the influence of changing the airflow window settings—the control of the airflow rate and the recuperation of the exhaust air—is studied. Secondly, two airflow window properties are scrutinized: the U-factor of the outer glazing and the distribution of the airflow over the cavity. Finally, the influence of a good insulated inlet zone is demonstrated and the effect of the insulation of the return duct is highlighted. The results of the optimized airflow windows are compared against the results of non-optimized variants and against the results of traditional solutions, including high-performance glazing with interior or exterior shading device.

Durability of Hardboard Siding

Anton TenWolde and Charles Carll – *U.S. Department of Agriculture Forest Service*

In response to concerns about hardboard siding failures, a study was performed to assess if performance in a current hardboard industry quality assurance test procedure correlated with in-service performance and how well this performance might be predicted by use of alternative or additional test procedures. A variety of laboratory tests were performed on a large number of specimens, and the in-service performance of matched specimens was periodically evaluated over 38 months of outdoor exposure. Siding specimens were installed on two test fences that were sprayed with water for one hour each day during summer. Commercially available siding was included as well as siding that was specially produced for the study. A total of 13 different hardboards were tested.

It was found that the properties and performance of commercial hardboard siding vary appreciably from mill to mill, as well as within samples of board from the same mill. Performance in the industry standard test procedure for residual edge swell proved to be an imperfect, but nonetheless useful, indicator of some performance characteristics on the test fences. With appropriate pass-fail criteria, the standard test for residual edge swell may be used to limit the likelihood of in-service failures, in particular, edge welting, surface mildew, and cracking of the paint on the drip edge. The authors also believe that the standard would be more meaningful if it included statistically based procedures that would ensure, at a specific level of confidence, that a product would meet the standard's performance requirements.

Water and Dirt Repellent Treatments for Building Surfaces

Eva B. Møller and Lars D. Christoffersen – *Birch & Krogboe*

Carsten Rode – *Technical University of Denmark*

This paper describes important parameters in creating a water and dirt repellent treatment: surface free energy should be as low as possible and the chemical composition and molecule size of the treatment must correspond to the material to be treated. Commonly used hydrophobic agents such as silane and siloxane have low surface free energies, but fluorine-based polymers such as Teflon have a better potential.

Roofing tiles, which were supposed to be dirt repellent, have been tested. The surface of the tiles had a combination of a hydrophobic treatment and protrusions with height and spacing of approximately 25 µm. The self-cleaning method was inspired by the lotus flower. The tiles were naturally exposed for approximately two-and-a-half years and tested for soiling, water runoff, water uptake, porosity, pore size distribution, frost resistance, water vapor permeability, chemical composition, and topography.

The result was that the tiles with this self-cleaning method were neither hydrophobic nor self-cleaning. However, soiling was somewhat delayed. The tiles are no longer manufactured.

Assessing the Impact of Thickness on the Performance of Stucco Cladding

William C. Brown, Mike Dietrich, and Mark Latimer – *Morrison Hershfield Limited*

Stucco, or portland cement plaster, is a traditional cladding material, and the requirements for stucco cladding in building codes are generally prescriptive in nature. The National Building Code of Canada (NBC), which is a model building code, requires that stucco cladding be installed in three coats with a total thickness of 21 mm. The Alberta Building Code (ABC), which is the legislated building code in Alberta, is based on the NBC but also permits two-coat stucco with a total thickness of not less than 19 mm.

Homebuilders in Alberta had requested that the minimum thickness required by the ABC for two-coat stucco be reduced to 15 mm because that thickness would be easier to install in a two-coat application and also because, in their opinion, the performance of stucco at that thickness would meet the intent of the building code. In response, the Alberta Housing Industry Technical Committee (AHITC), the technical committee of the homebuilders association, undertook to obtain clear evidence that 15 mm stucco would provide water management and serviceability performance equivalent to that of code-compliant stucco.

AHITC retained a firm to conduct laboratory and field studies to assess the impact of stucco thickness on water management and serviceability performance. The project had two phases:
Laboratory study: Select an appropriate set of properties and a suitable set of laboratory test methods to measure water management and serviceability performance and conduct laboratory testing of two- and three-coat stucco to evaluate water management and serviceability performance.

Field study: Develop a field survey protocol and conduct a field investigation to assess the effect of thickness on in-service water management and serviceability performance of stucco cladding.

The laboratory study showed that water management performance of code-compliant stucco cladding was inadequate for many situations but provided limited information on serviceability performance. Consequently, the field study was executed to develop a better understanding of serviceability performance. However, the field study unexpectedly identified quality control concerns with the installation of stucco cladding, concerns that had an impact on both water management and serviceability performance.

This paper discusses the approach, investigation, and conclusions of the project phases and summarizes the positive response of the homebuilders to the quality control concerns identified in the field study.