Session VII-A: Wall Systems II

Tuesday, December7, 2004
3:30 p.m. to 5:00 p.m.
Grand Ballroom – Beach

Session Chair:

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3:30 p.m. to 3:40 p.m. Introduction
Eric Burnett

3:40 p.m. to 4:00 p.m. *"Simplified Approach for Quantifying Driving Rain on Buildings"*
Bert Blocken

4:00 p.m. to 4:20 p.m. *"Behavior of Wall Assemblies with Different Wood Sheathings Wetted by Simulated Rain Penetration"*
Anik St-Hilaire

4:20 p.m. to 4:40 p.m. *"Rain Protection of Stucco Facades"*
Hartwig Kuenzel

Simplified Approach for Quantifying Driving Rain on Buildings

Bert Blocken – *FWO-Flanders*

Jan Carmeliet – *Catholic University of Leuven and Eindhoven University of Technology*

A simplified approach for quantifying driving rain loads on building facades is presented. It is based on the well-known semi-empirical driving rain relationship (driving rain intensity = coefficient * wind speed * horizontal rainfall intensity). The coefficient in this relationship has often been assumed constant, but in reality it is a complicated function. For use in the simplified approach, this coefficient—as a function of building geometry, wind speed, wind direction, horizontal rainfall intensity— will be determined in advance by a set of numerical simulations with CFD (computational fluid dynamics). The resulting catalog with driving rain coefficients is then made available to users, and the simplified quantification approach consists of using these coefficients in combination with the driving rain relationship and standard weather data (wind speed, wind direction, horizontal rainfall intensity). In this paper, the philosophy of the simplified quantification approach is presented and illustrated for the case of a low-rise building.

Behavior of Wall Assemblies with Different Wood Sheathings Wetted by Simulated Rain Penetration

Anik Teasdale-St-Hilaire, Dominique Derome, and Paul Fazio – *Concordia University*

Field observations over the last two decades have shown that water infiltration through building envelope defects and into wall assemblies can cause serious damage if water accumulates within the core of the wall. If at high moisture content and appropriate temperature for sufficient time, wall components, such as wood framing or wood-based sheathing, are vulnerable to mold growth and biodegradation.

Several hygrothermal studies have looked at large amounts of water introduced in wall assemblies. The objective of the present study was to investigate the capacity of a wall assembly to manage small amounts of water penetration. The work performed is experimental and includes 19 specimens, grouped into a testing hut within a large environmental chamber, subjected to a series of three tests. The behavior of three specimens during two of these tests is discussed. The paper presents the experimental protocol including the test specimen design, the monitoring instrumentation, the two wetting methodologies used, and the environmental conditions to which the panels are subjected during the wetting and drying phases of the experiment. One wetting method consists of injected water according to a measured leakage rate in an actual window/wall failure and actual rain frequency and duration extracted from a 20-year database of Montreal weather. The second method involves uniformly wetting a framing component by initial partial immersion. The results presented illustrate the role of the wood-based sheathing materials in the wetting and drying behavior of the wall assemblies. The sheathing materials include oriented strand board, plywood, and asphalt-impregnated fiberboard. Moisture content and relative humidity measurements for series of identical specimens built with different sheathing panels are presented during wetting and drying modes. The rate of drying is compared and the role of temperature gradient is demonstrated.

Rain Protection of Stucco Facades

Hartwig M. Küenzel, Helmut Künzel, and Andreas Holm – *Fraunhofer Institute for Building Physics*

In the 1960s extensive investigations were carried out at the open air test site of the Fraunhofer-IBP (specializing in building physics res. building science) testing the driving rain protection of masonry walls coated with innovative synthetic resin renders (polymeric stuccos). Some of the exposed test walls did not perform as well as others, and a correlation between the water absorption and the vapor diffusion properties of the facade coatings was established. This correlation was subsequently introduced into the German Standard for exterior rendering systems in regions with a high wind-driven rain load.

When models were successfully applied in the middle of the 1990s to simulate transient heat and moisture transport processes in the building envelope, parametric studies confirmed that the empirical correlation established 40 years ago was indeed appropriate to classify the rain protection characteristics of facade systems under Central European climate conditions. Today validated hygrothermal calculation tools may be employed to design facade systems for different climate zones. Thus, adequate definitions of water absorption and vapor permeance limits may be specified by hygrothermal simulations depending on expected exposure conditions.