

Millennium will bring harmonization challenge for U.S. and Canadian condensation resistance standards

In early 1998, both the U.S. and Canada issued their latest amendments of structural and thermal performance standards for windows. It's the first update in a number of years for both countries — and a lead-up to an end-of-1999 deadline, after which a NAFTA-inspired harmonization process is supposed to begin.

Among the more substantive changes in each nation's 1998 amended versions is the addition of new technical language relating to condensation resistance.

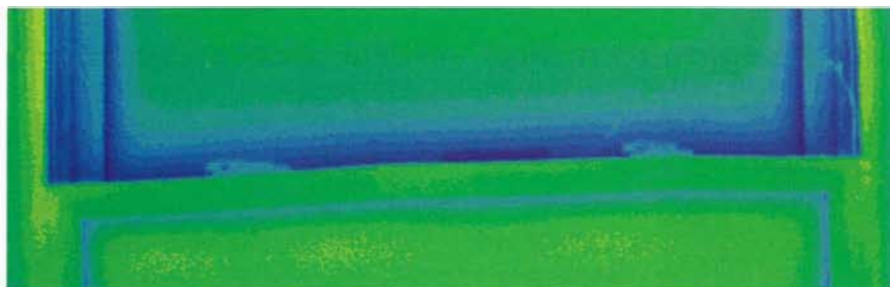
U.S. Amendments

The U.S. document is the American Architectural Manufacturer Association's condensation resistance standard AAMA-1503, a paper in which the most important change this time around is the streamlining of test procedures.

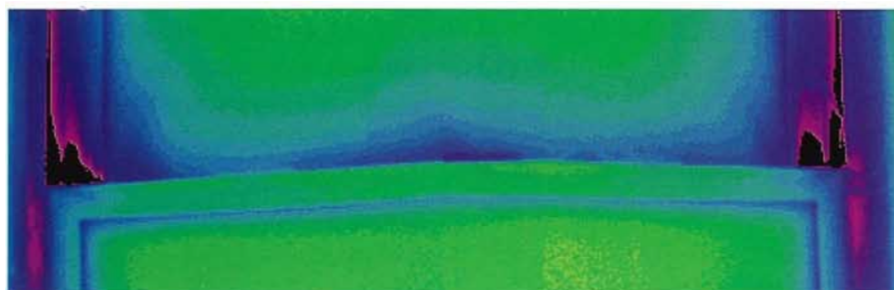
Under AAMA 1503-98, permission is now given to pair condensation resistance (CRF) testing with thermal transmittance (U-Value) testing, the latter handled by the National Fenestration Research Council.



The question left unanswered, therefore, is the effects of air infiltration and air exfiltration — and



0 Pa Pressure Differential



20 Pa Pressure Differential

Infrared thermographic images showing air infiltration impact on the meeting rail of a PVC double hung window

industry representatives say, "It's a trade-off."

"Trying to quantify varying pressure becomes a physical nightmare," says Dave Moyer, Vice-President of Architectural Testing Inc. in York, PA. "Not only that, it's the varying direction and limit of pressure — covering all the possible scenarios becomes impossible."

"So negating it," he says, "from the condensation resistance standpoint and the thermal transmittance standpoint, too, at least makes the procedure do-able and quantifiable. If all the windows are sealed, at least at that point, you have apples and apples."

Canadian Amendments

Canada's 1998 amendments as they relate to condensation re-

sistance are contained in a portion of an omnibus window standard, CSA A440, published by the Canadian Standards Association.



More changes have been made to this document's condensation language than to AAMA 1503.

CSA A440-98's measurement test is a considerable refinement over the previous one. Changes include more accurate test equipment, more closely specified test conditions and a more realistic instrumentation placement — thermocouples, previously two inches away from the glazing perimeter, are now a half inch away.

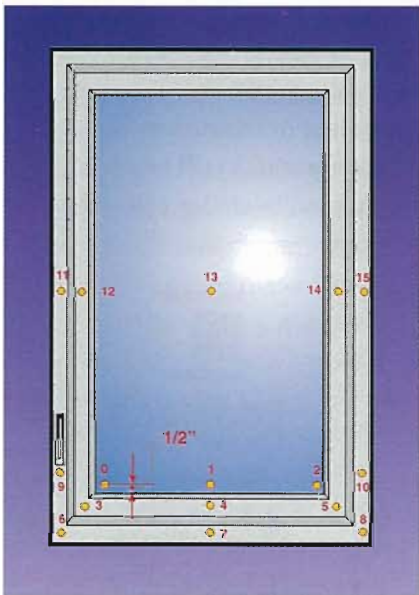
The Canadian procedure tests an

unsealed window, under balanced conditions so that the impact of air infiltration is partially evaluated.

The most significant change in A440-98's condensation standard is the introduction of computer simulation, made feasible through the development of

FRAME 4.0 software upgrades that evaluate air-cavity convection flows.

In computer simulation, air infiltration effects are not evaluated, but the issue is very much recognized with all windows having to



New CSA A440 thermocouple locations for casement windows

pre-qualify with an A-3 airtightness rating, A440's highest.

Initially, calculation-only procedures will just apply to fixed and casement windows. The less-airtight sliders are excluded for the time being until additional research is completed. Thermally-broken, metal frame windows are also excluded from the calculation-only procedure

because cold air infiltration can easily bypass the thermal break. With some restrictions, however, computer analysis can be used to evaluate different glazing options and this provides significant financial savings for curtain-wall manufacturers.

Computer Simulation

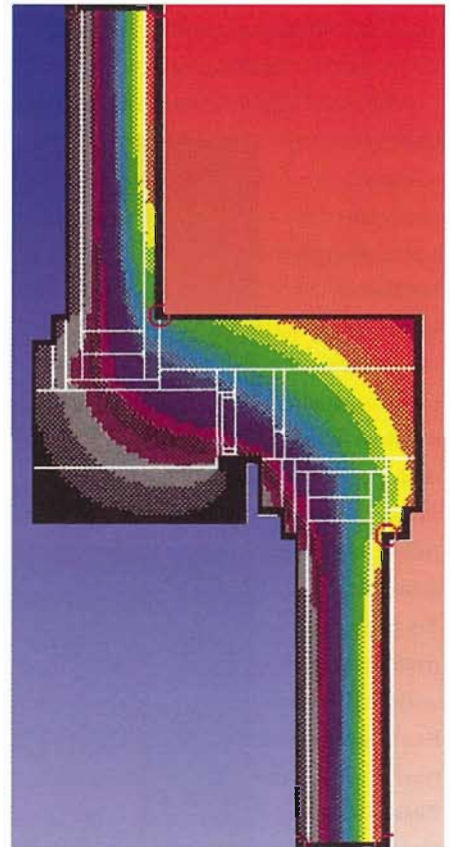
The move to a greater reliance on computer simulation in Canada has not come without concern for the knowledge gap that still exists — most notably air infiltration, but also with hardware features such as latches, balances, actuator arms, etc.

This is why a comprehensive test-schedule, looking at a number and array of window configurations is set to begin later this summer at the National Research Council of Canada's Institute for Research in Construction in

Ottawa.

“It will provide needed benchmark data for computer modelers to allow them to more accurately portray condensation resistance in a fenestration setting,” says NRC researcher, Dr. Hakim Elmahdy.

Improving computer simulation techniques seems like a wise avenue to follow, especially in



Typical graphic output from FRAME 4.0 computer program

bridging another gap that exists — a confidence gap between the U.S. and Canada in the permissible amount of simulation use in-lieu of testing, a very important issue in any cross-border harmonization of condensation standards in the fenestration field.

