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Methods for evaluating the moisture management of wood-frame wall systems

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IRC-ORAL-477

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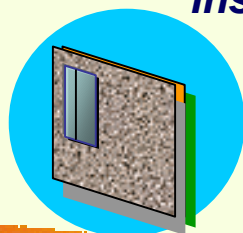
Methods for evaluating the moisture management of wood-frame wall systems



***Presented by Wahid Meref
on behalf of the***



***Moisture Management of Exterior Wall System (MEWS) Research Team
Institute for Research in Construction, Ottawa, Canada***



MEWS Project: Industry Partners

- **Canada Mortgage and Housing Corporation**
- **Canadian Plastics Industry Association**
- **Canadian Wood Council**
- **El DuPont de Nemours & Co**
- **EIFS Industry Members Association**
- **Fiberboard Manufacturers Association of Canada**
- **Forintek Canada Corporation**
- **Fortifiber Corporation**
- **Louisiana Pacific Corporation**
- **Marriott International Inc.**
- **Masonry Canada**



Context for the Project

- **Several field studies in North America:**

Rain penetration in exterior walls of low-rise wood-frame construction leads to premature deterioration of wood-based elements

- **Rethinking of current ways of assembling exterior walls**
- **New appreciation for the levels of severity of outdoor climates**

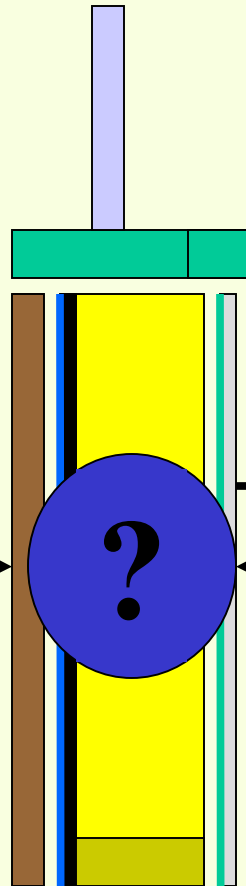
Inter-related System

Outdoor climate

- *Temperature*
- *Wind pressure*
- *Rain*
- *Water vapour (RH)*
- *Solar radiation*

Indoor climate

- *Temperature*
- *Water vapour (RH)*
- *Air pressure*

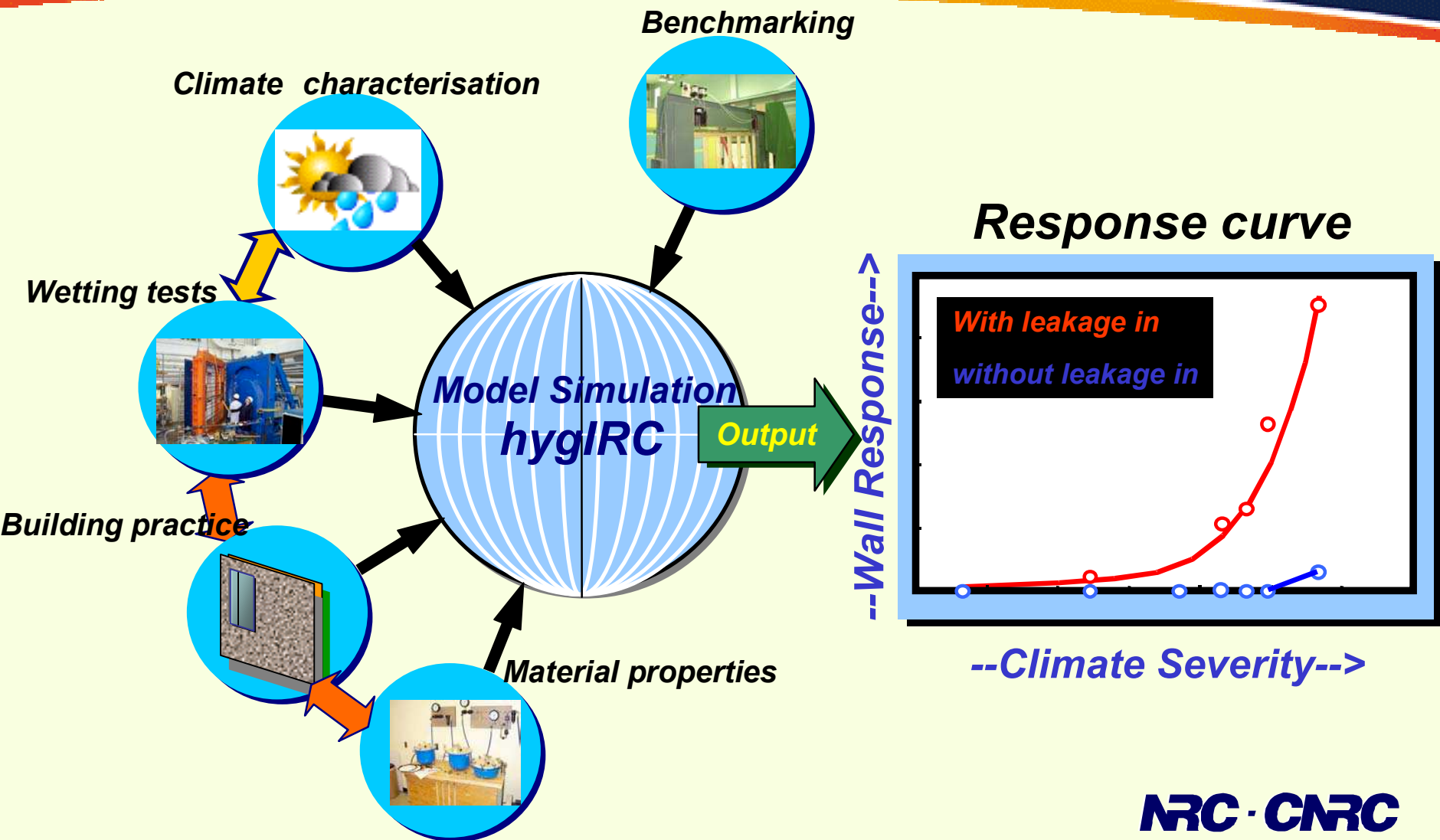


Wall

Materials, assembly and deficiencies

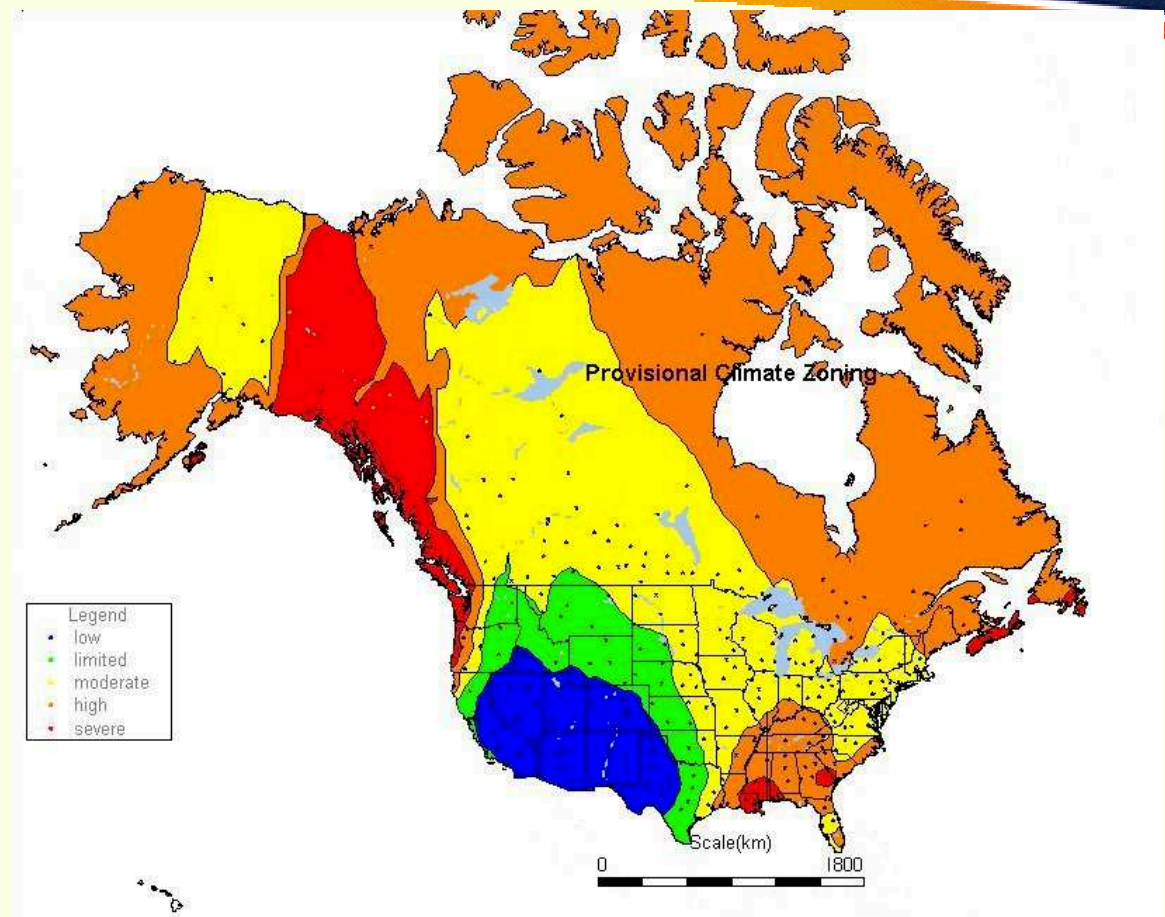
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Approach



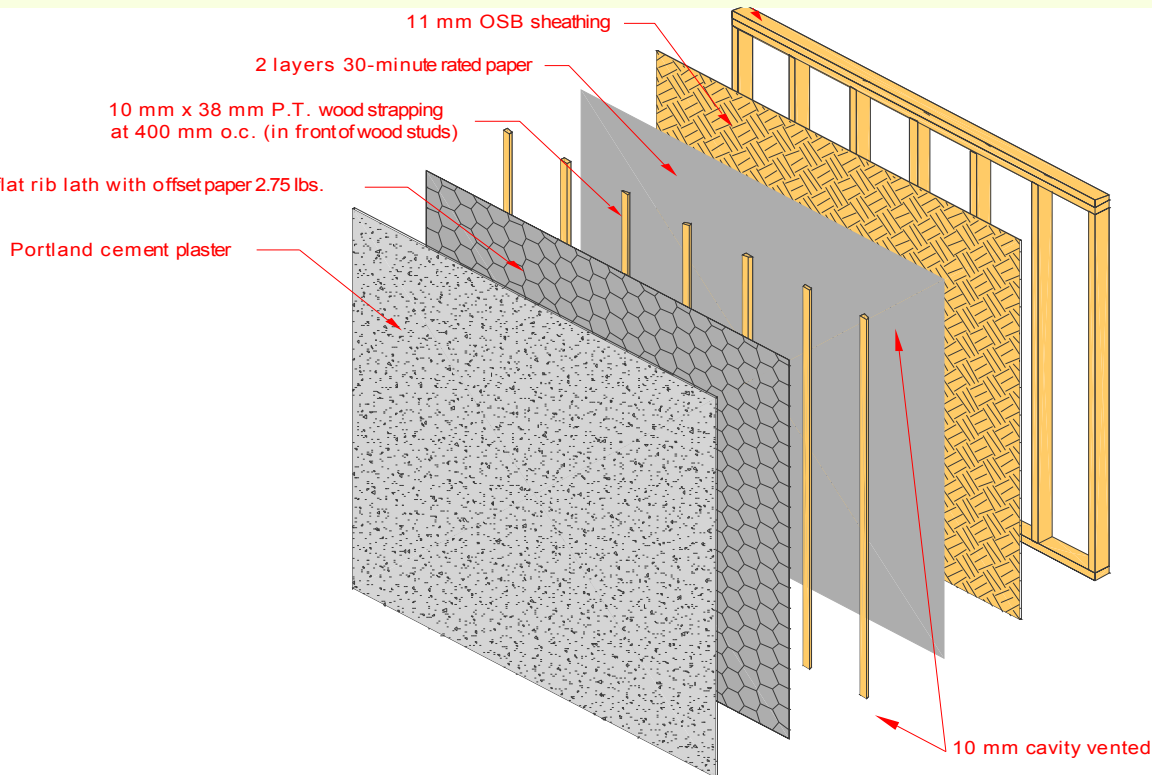
Climate Severity

Wetting and Drying indices for North American climates



Provisional map

Wetting of 17 Wall Specimens & Detailing



Dynamic Wall Testing facility

Envelope Environmental Exposure Facility (EEEF)



***Wetting of
material or
assembly***

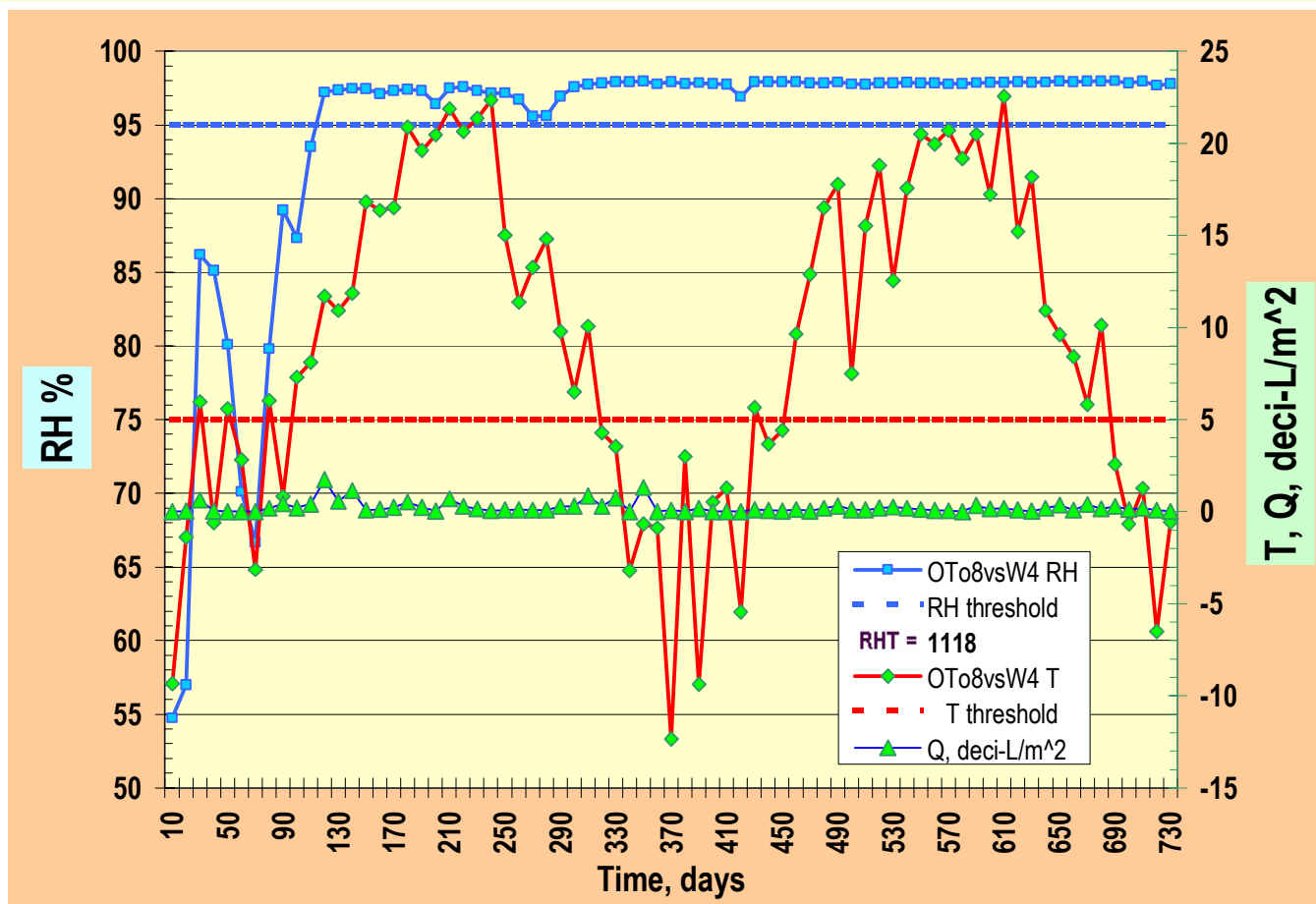


***measure rate of
weight loss
(drying) under
controlled
conditions***



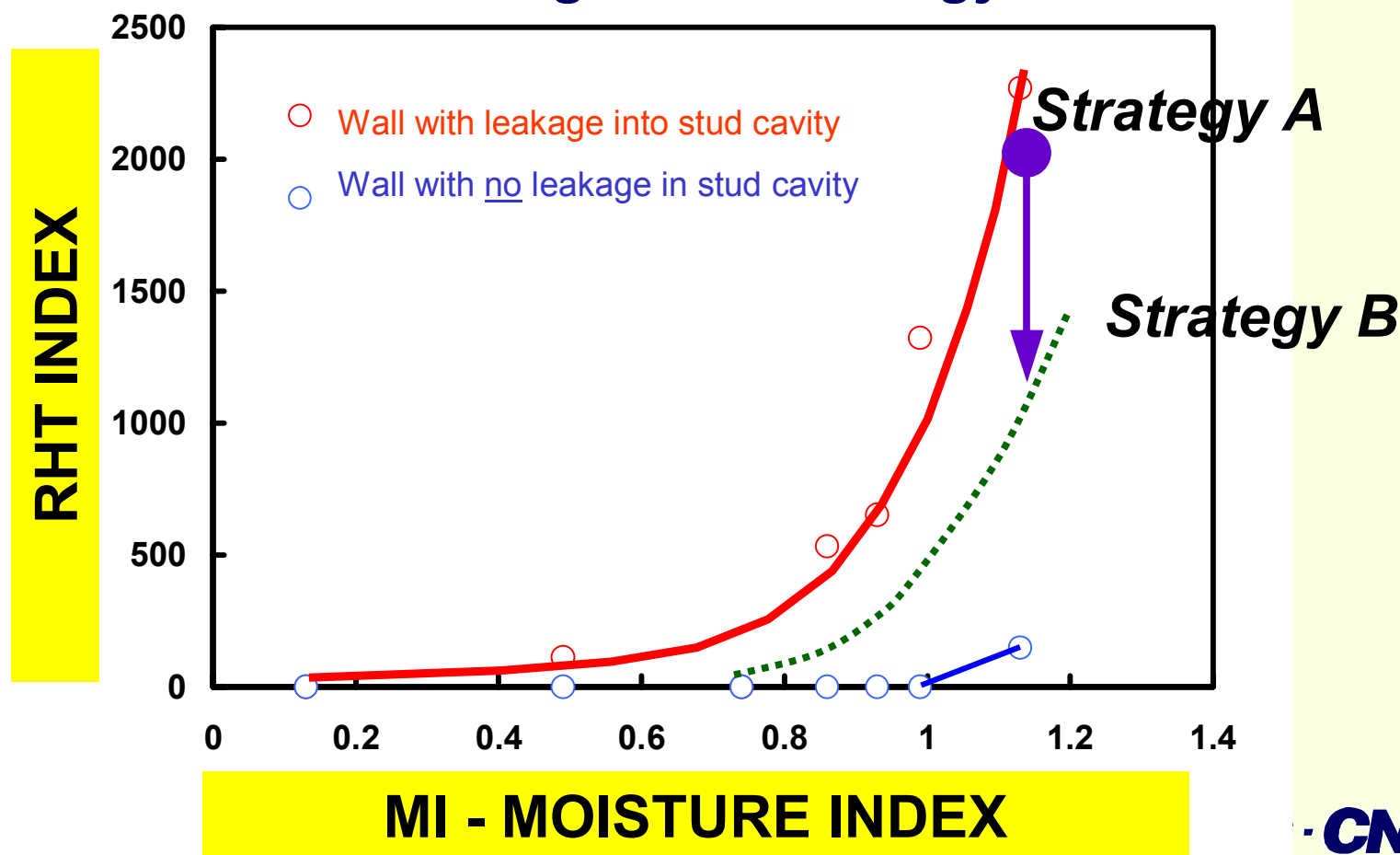
***Comparison to model
predictions***

Predicting Hygrothermal Response



Comparison of Moisture Management Strategies

Goal: to reduce the magnitude of the RHT response using a different moisture management strategy



Accomplishments

- ***Integrated approach***
- ***Climate characterization***
- ***Hygrothermal properties*** - Database of 40 building materials
- ***Unique full-scale testing facilities*** - 17 wall assemblies
- ***Application of hyglRC model*** - large parametric study on four types of cladding systems (over 400 simulations)
- ***Characterization of Wall Response (ex: RHT index)***



New projects

- **Apply the approach to other situations - specific cladding systems**
- **FENESTRA**
- **Optimization of Stucco properties**
- **Building Science Insight Seminar (BSI)**

- **Two Papers at 9th BST in Vancouver in February / BCBECC**

Optimization of Stucco Properties

Project Objective

- ◆ To engineer a Portland cement stucco that minimises wetting (lower liquid diffusivity) and without reducing water vapour permeability of the typical stucco.

Project objective

- To evaluate the effectiveness of window-wall interface details to manage rainwater, using IRC's Dynamic Wall Testing Facility



Public Domain Web-sites

IRC - Building Envelope Research

- **MEWS Website**
<http://www.nrc.ca/irc/bes/mews/index.html>
- **FENESTRA**
<http://www.nrc.ca/irc/bes/fenestra/>
- **ASHRAE/MEWS Property Database (RP 1018)**

MEWS Project: IRC Research Team

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