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

Maref, W.

National Research Council Canada
Conseil national de recherches Canada

NRC · CNRC

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

Maref, W.

IRC-ORAL-477

www.nrc.ca/irc/ircpubs

NRC · CNRC

From Discovery to Innovation...

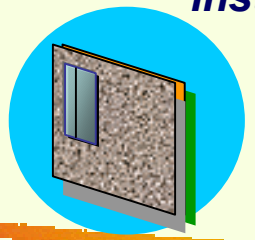
Methods for evaluating the moisture management of wood-frame wall systems

Presented by Wahid Maref

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

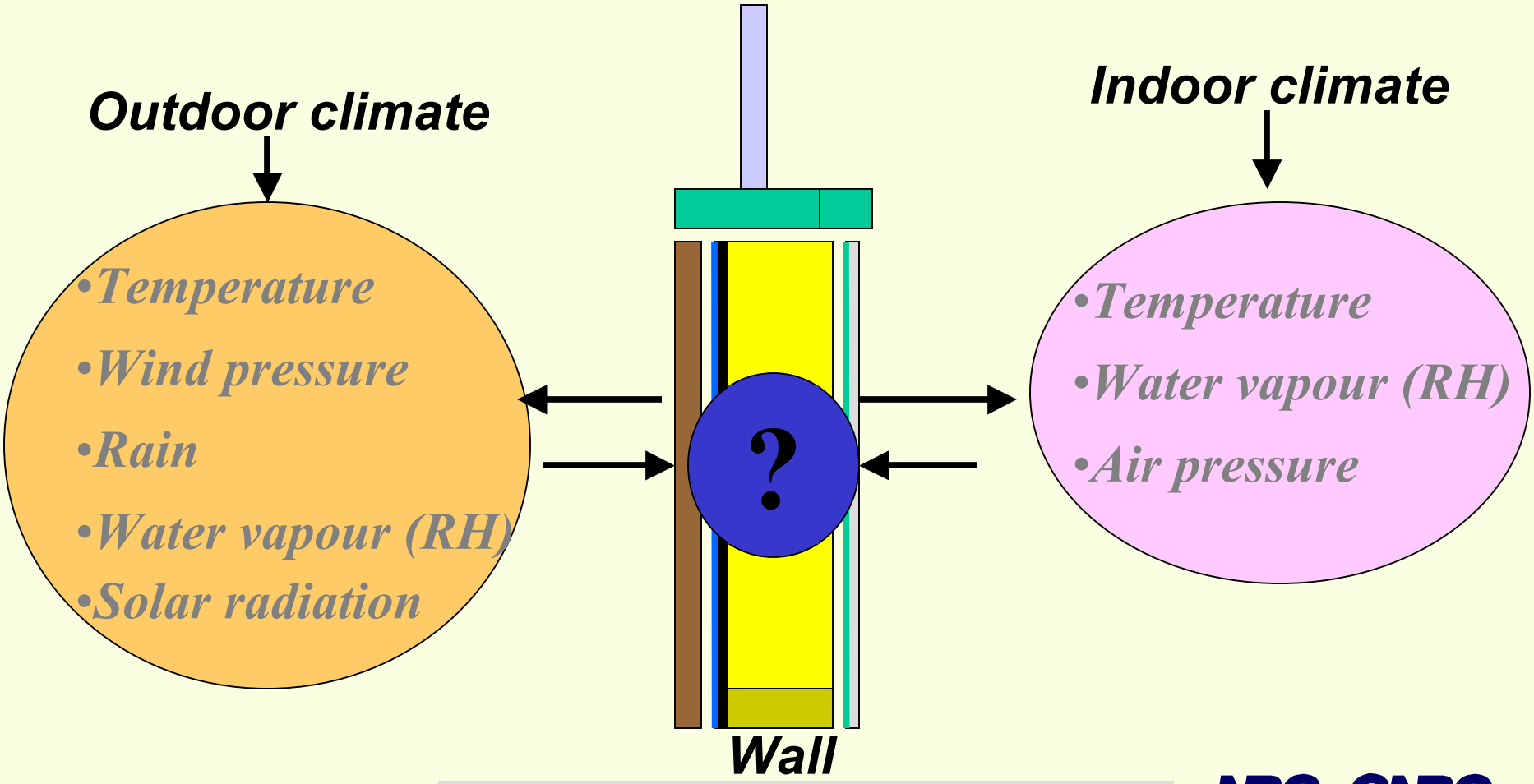
Context for the Project

- **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

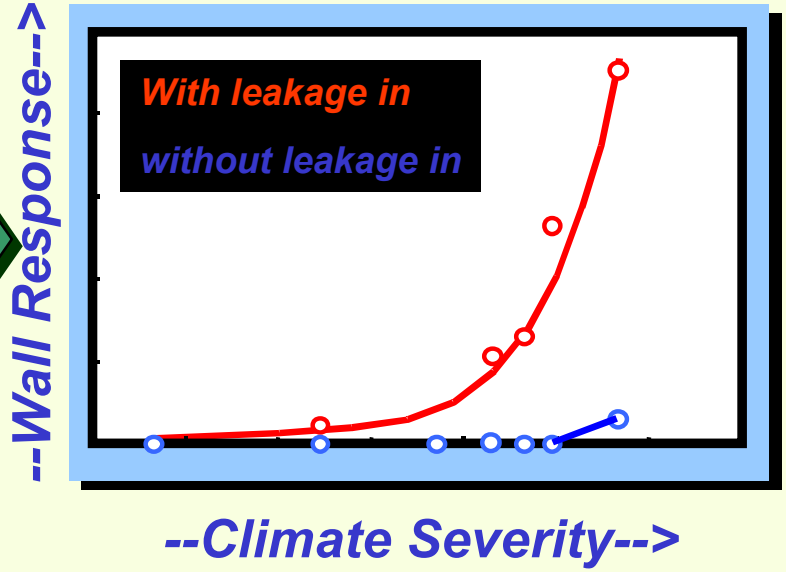


Materials, assembly and deficiencies

NRC · CNRC

Approach

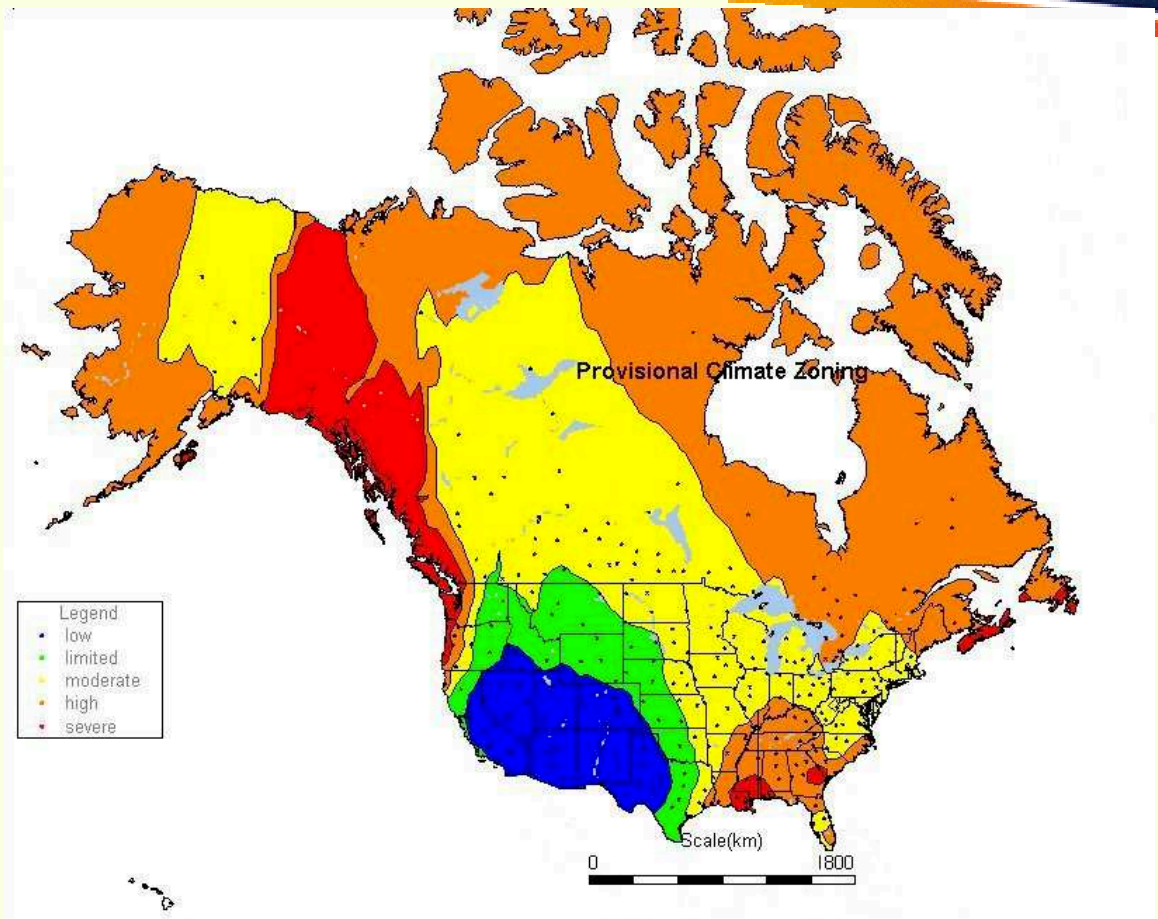
Response curve



NRC · CNRC

Climate Severity

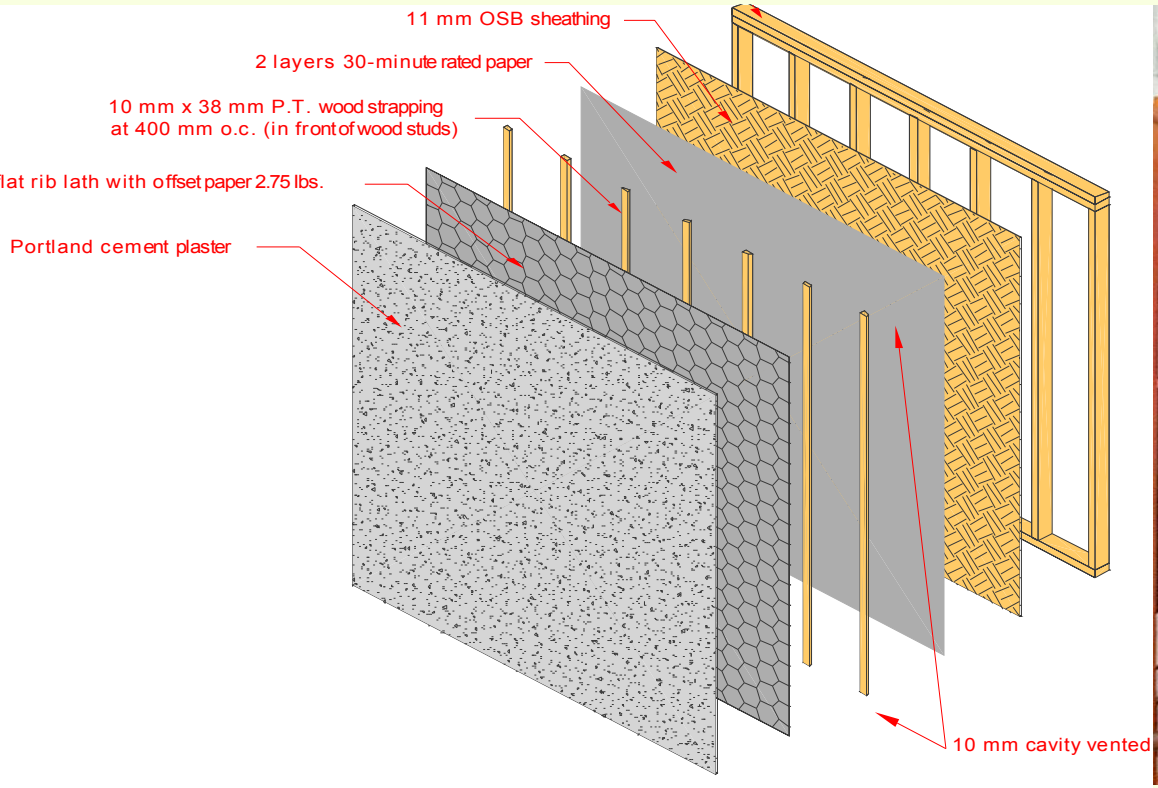
Wetting and Drying indices for North American climates



Provisional map

NRC · CNRC

Wetting of 17 Wall Specimens & Detailing



Dynamic Wall Testing facility

NRC · CNRC

Envelope Environmental Exposure Facility (EEEF)

Wetting of material or assembly

↓

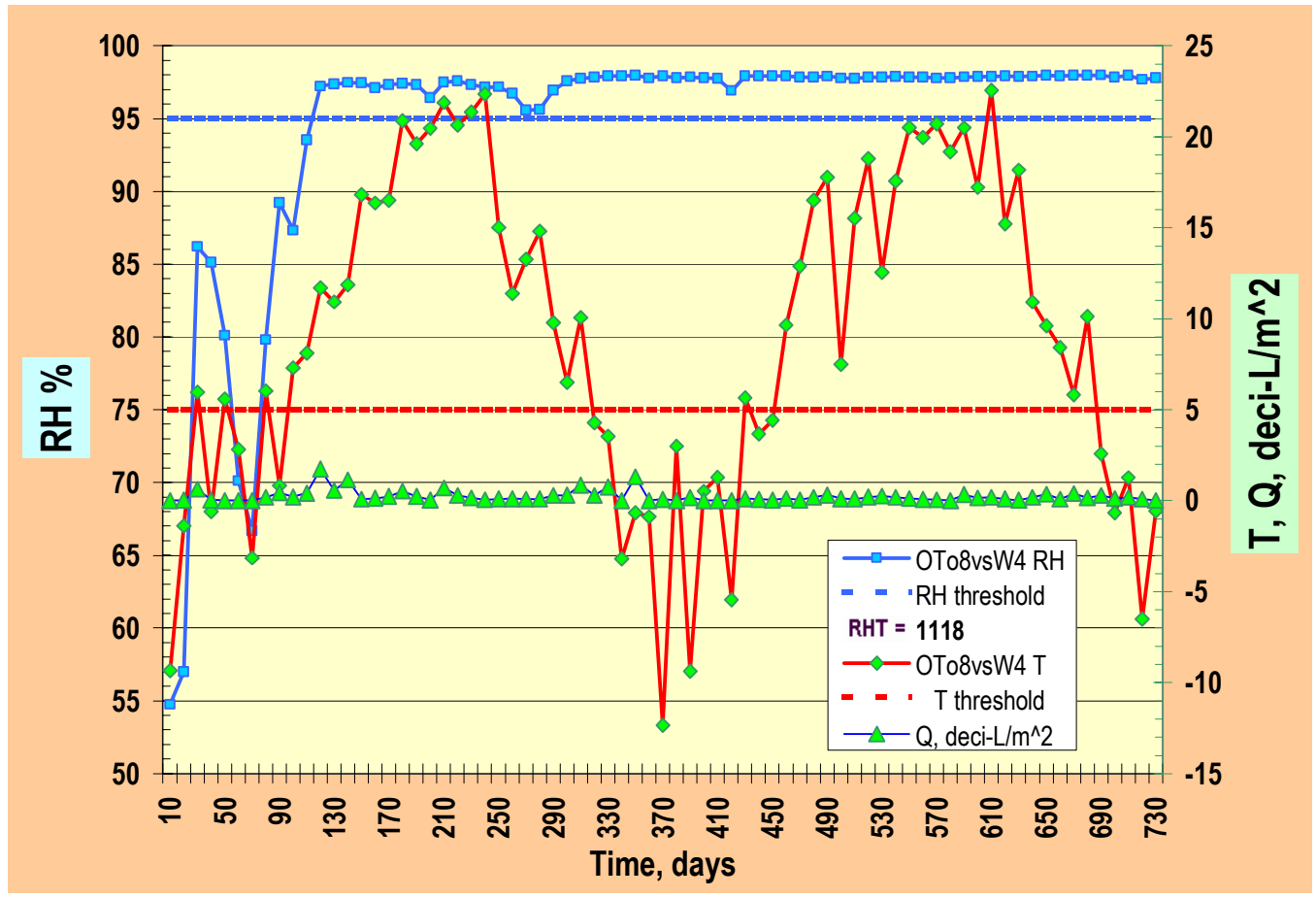
measure rate of weight loss (drying) under controlled conditions

↓

Comparison to model predictions

NRC · CNRC

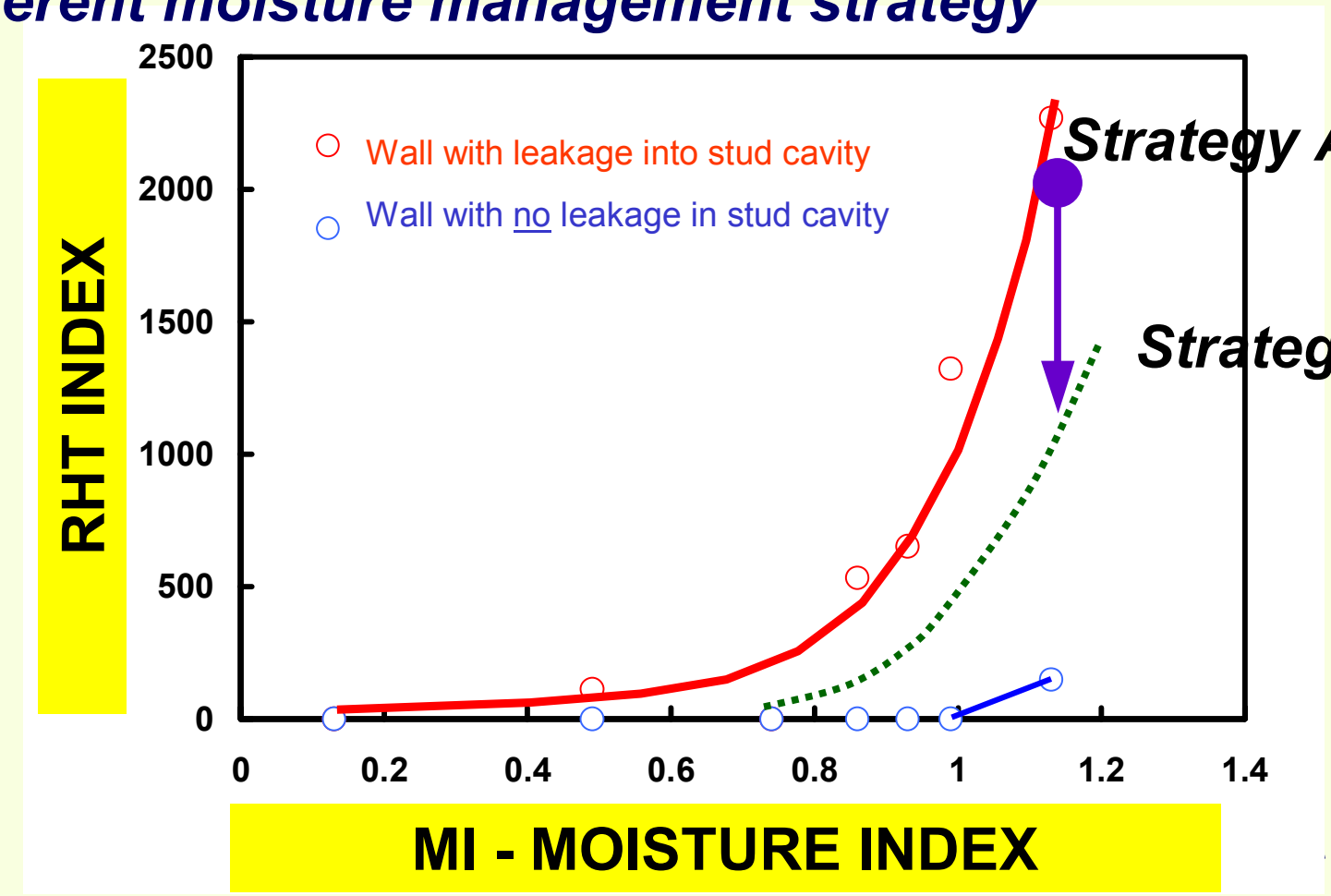
Predicting Hygrothermal Response



NRC · CNRC

Comparison of Moisture Management Strategies

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



CNRC

Accomplishments

- *Integrated approach*
- *Climate characterization*
- *Hygrothermal properties* - Database of 40 building materials
- *Unique full-scale testing facilities* - 17 wall assemblies
- *Application of hygIRC 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 / BCBEC

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

- Peter Beaulieu
- Mark Bomberg
- Steve Cornick
- Alan Dalgliesh
- Guylaine Desmarais
- Reda Djebbar
- Kumar Kumaran
- Michael Lacasse
- John Lackey
- Wahid Maref
- David van Reenen

Phalguni Mukhopadhyaya
Mostafa Nofal
Nicole Normandin
Mike Nicholls
Tim O'Connor
David Quirt
Madeleine Rousseau
Nady Said
Mike Swinton
Fitsum Tariku

NRC · CNRC