Masonry Canada

MEWS Delivers Good News To Canada's Masonry Industry

Masonry Canada is pleased to present this technical bulletin about Canada's latest building science research results that further reinforce the quality, durability and value of masonry products in Canadian buildings.

Masonry is a traditional and time-tested material that is often compared with new and innovative alternatives. The durability of masonry wall systems is witnessed across Canada and around the world, and the numerous advantages of masonry are well appreciated by builders and designers alike.

The Moisture Management in Exterior Wall Systems (MEWS) project was conducted by a building industry consortium, coordinated through the National Research Council of Canada's Institute for Research in Construction. It looked at how well residential, wood-frame wall systems managed moisture. Exterior walls clad with masonry, stucco, exterior insulation and finish systems (EIFS) and siding were examined in this 4-year study.

The good news from MEWS is that masonry provides excellent performance and a moisture tolerant wall system that delivers durability.

Why Moisture Management?

Moisture is the leading cause of building envelope problems, and is of special concern in wood-frame buildings. Over the past decade, wide scale moisture deterioration problems, such as those experienced in the condominium market of lower British Columbia, served notice of the need to research and implement better moisture management practices. Most low-rise housing in Canada employs a wood structure that is highly susceptible to moisture damage. Deterioration may lead to damage of the structure or cause indoor air quality problems associated with mould growth.

Good moisture management practices in residential construction protect not only the safety of the structure and the health of the occupants, but also protect Canadians' biggest and most important lifetime investment. Masonry Canada is proud of its contribution to improving moisture management design and construction practices in Canadian housing.

"Except for structural errors, about 90 percent of all building construction problems are associated with water in some way."

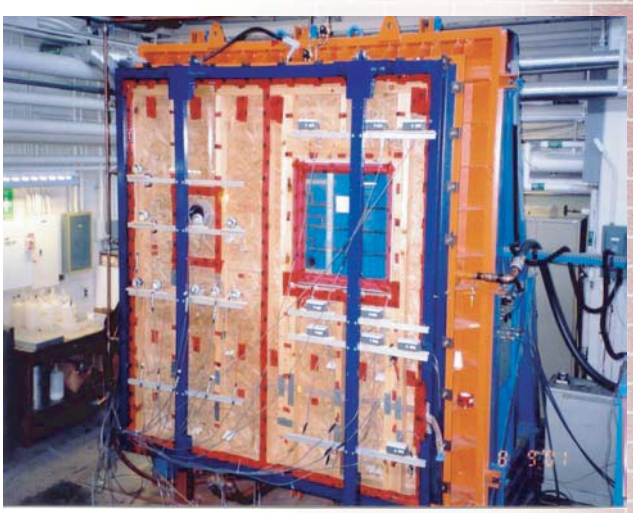
ASTM E 241-77, *Recommended Practices for Increasing Durability of Building Constructions Against Water-Induced Damage.* American Society for Testing and Materials, Philadelphia, PA, 1977.

Performance Testing

We do not live in a perfect world and to err is human. There will always be imperfect materials and workmanship, no matter how hard we try to avoid them. To counter against this reality, it is important to design and construct forgiving wall systems. One of the major objectives of the MEWS project was to determine how typical residential wall assemblies with real world flaws would manage moisture.

A key aspect of the project was performance testing in a laboratory environment chamber (DWTF) where worst-case scenarios could be simulated. Extremely intense rainfalls and driving wind pressures were induced in sophisticated test chambers, and then the moisture accumulation was monitored with moisture sensors and calibrated collection trays.

This testing was performed to simulate different types of outdoor climates, and how sensitive the various wall assemblies were to the climatic factors.



A fully instrumented wall assembly undergoing moisture testing at the Institute for Research in Construction illustrates the advanced and intensive examination of the moisture management performance of various wood-frame wall systems.

A series of wall assemblies with brick masonry veneer were constructed and tested for the MEWS project. Flaws were deliberately introduced to assess the moisture management performance of the various wall assembles.

Moisture Response Indicator

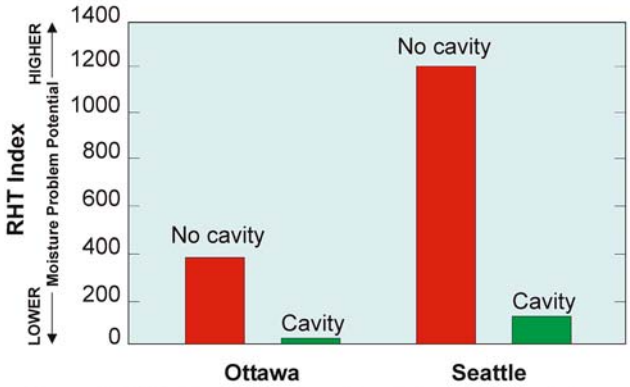
One of the most significant outcomes of the MEWS project is a novel long-term moisture response indicator called the RHT index. The RHT index quantifies the amount of moisture in a specified part of the building envelope in terms of relative humidity and temperature. Using a computer model calibrated by laboratory testing, relative humidity and temperature values at the specific point are recorded every 10 days for two years. At the end of the two years, the quantities are added up to give the RHT index value. Higher RHT index values indicate greater potential for moisture-related deterioration.

The RHT index can provide designers with information that can help them in choosing the building materials and type of wall assembly to use, as well as in determining the need for location-specific construction details. The MEWS project examined a large number of climatic zones across North America to determine the influence of rain and wind on the wetting potential of exterior walls. The potential for drying through evaporation was also investigated by looking at wind speed and direction, seasonal relative humidity, solar radiation and cloud cover. In several cases, this was coupled to various levels of indoor humidity, as may be primarily affected by heating, ventilation and cooling.

The RHT index is an important moisture management indicator because with the rapidly increasing introduction of innovative building materials and assemblies it is important to predict the potential for moisture problems at the design stage, not after the homes are constructed, purchased and occupied. With all of these advances and innovations in building technology, a natural question that arises is, "How does a traditional building technology like masonry veneer over wood-frame walls compare to alternative products and systems?"

Results from the MEWS project indicated that in terms of moisture problem potential, building assembles with drainage cavities exhibited a significantly lower RHT index than systems without drainage cavities behind the cladding.

The significance of the cavity's contribution to moisture management becomes especially important when deficiencies exist in the construction. Not only does the cavity provide a buffer against rain penetration, but walls that become wet are better able to dry than walls without cavities behind the cladding.



Source: *MEWS Project Produces Long-Term Moisture Response Indicator,* CONSTRUCTION INNOVATION, Volume 8, Number 1, March, 2003, Institute for Research in Construction, National Research Council Canada.

The potential for moisture problems was found to be much lower in wall assemblies with drainage cavities, such as masonry veneer walls, than for wall assemblies without cavities. In wet climates such as Seattle (similar to lower British Columbia) cavity construction is a critical moisture management measure.

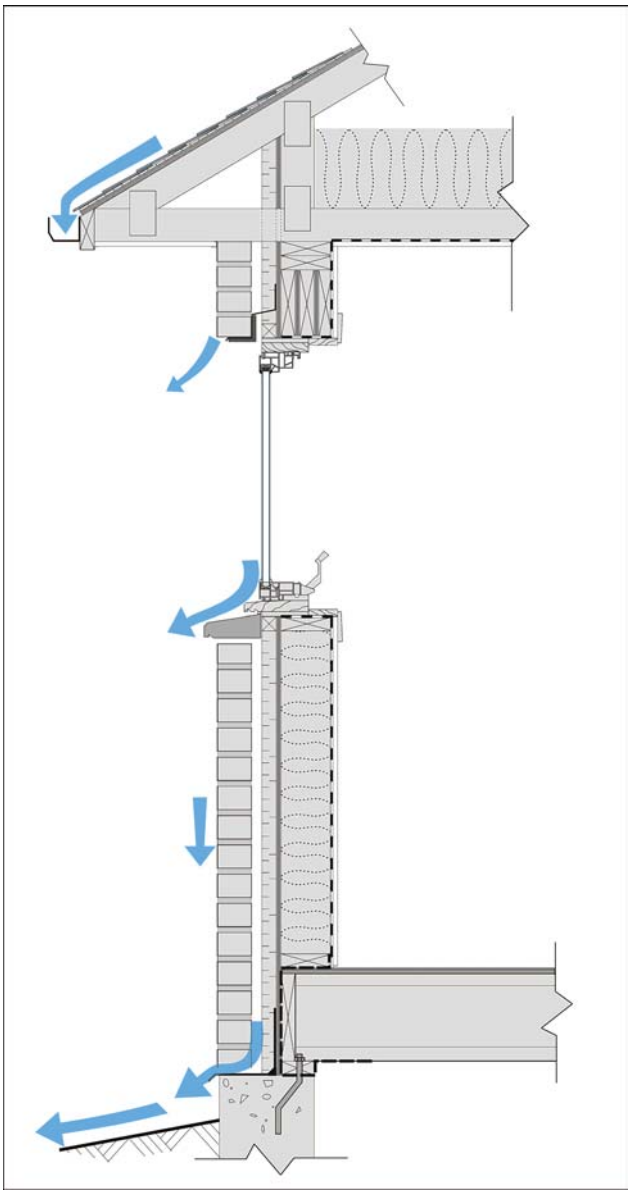
According to an Institute for Research in Construction report following the MEWS project:

"The masonry-clad walls simulated in this study exhibited a level of water resistance that significantly reduced the amount of water getting through the field of the wall. The resistance is largely due to the rain-screen provided by the cladding, the cavity behind the cladding, and the ability of the relatively massive cladding to store and release moisture."

Source: *An Integrated Methodology to Develop Moisture Management Strategies for Exterior Wall Systems*, by Kumaran, M.K.; Mukhopadhyaya, P.; Cornick, S.M.; Lacasse, M.A.; Rousseau, M.; Maref, W.; Nofal, M.; Quirt, J.D.; Dalgliesh, W.A., NRCC-45987, Ottawa.

The Masonry Advantage

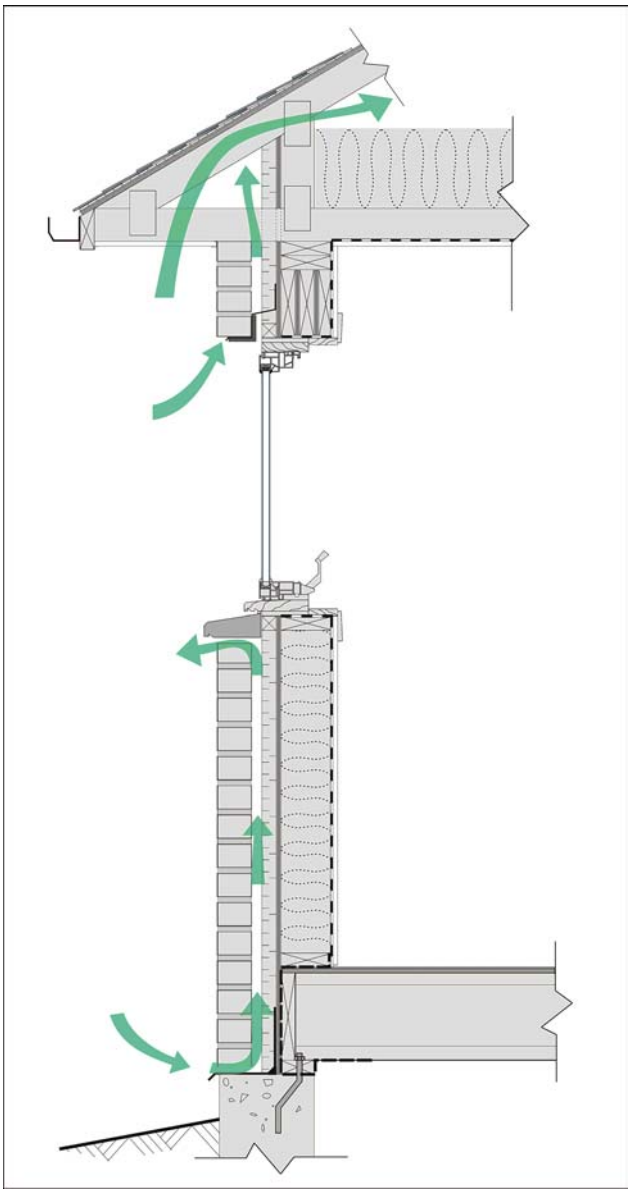
The primary advantages of masonry veneer walls are based on the provision of an air cavity between the masonry and its supporting wood-frame wall system.



The drainage of rain is a fundamental moisture management strategy which deals with the most effective means of transporting the largest quantity of moisture away from and out of the building enclosure.

When masonry construction is properly detailed and deflection of rainfall is addressed through ample roof overhangs and window sills, it provides effective drainage of water away from the wood-frame structure that is susceptible to moisture damage. The air cavity ensures that even under severe rain exposure, wind-driven water is conveyed away from the building structure.

But the air cavity also provides an additional benefit beyond the drainage of water. By providing unobstructed openings at the top and bottom of the air cavity, drying is enhanced through ventilation.



Ventilation of drainage spaces provides an additional measure of moisture protection by drying out materials adjacent to the drainage cavity.

Masonry veneer construction provides both drainage and drying protection against potential moisture problems. In addition, the masonry veneer and mortar act as a storage buffer against moisture, holding water during wetting periods that is later released during drying periods. Both the masonry materials and their method of construction contribute to excellent moisture management and a durable building envelope.

Comparing Wall Systems

There are numerous wall systems used in residential construction and they cannot be judged by a single criterion. In general, the following criteria are used in selecting an appropriate exterior wall system:

- Cost
- Durability
- Moisture Management
- Sound Transmission
- Fire Resistance
- Impact Resistance
- Aesthetics

The table below provides a comparison of the four wall systems examined in the MEWS study. It is important to note that maintenance costs and resale value have not been factored into the data.

WALL CLADDING SYSTEM	ESTIMATED COST* $/m^2 ($/ft^2)	SERVICE LIFE**
Masonry Cladding with Drainage Cavity	**$86 ($8)**	**34.5 yrs**
EIFS Cladding with Drainage	**$86 ($8)**	**Not Rated**
Stucco Cladding with Drainage	**$75 ($7)**	**21 yrs**
Hardboard Siding Cladding with Secondary Moisture Barrier	**$60 ($5.50)**	**Not Rated**

* Based on industry estimates in the Greater Toronto Area (GTA) for low-rise residential construction. Verify actual costs for specific site locations.

** *Service life of multi-unit residential building elements and equipment.* Canada Mortgage and Housing Corporation, May 2000.

A comparison of the four wall systems examined in the MEWS study indicates that masonry cladding provides numerous performance benefits cost effectively.

Traditional masonry veneer construction continues to represent a cost effective means of providing excellent moisture management in residential wall systems. Masonry cladding is generally more durable and requires less maintenance to maintain its attractive appearance when compared to many alternative wall cladding choices. In many housing markets, masonry cladding enhances resale values and contributes to the character of residential neighbourhoods. The MEWS project has reaffirmed one very important aspect of masonry cladding performance – its other qualities are evident everywhere.

Better Practices

In view of the MEWS project results, it is important to recognize that regardless of masonry's many performance advantages, care in design and quality of construction must always be observed. In terms of moisture management, the following practices should be observed:

- ***Provide proper roof overhangs and projections at window sills to deflect water away from the wall.***
- ***Install flashings properly and seal around wall openings to prevent water penetration.***
- ***Properly select and apply a suitable sheathing paper.***
- ***Maintain a clear cavity behind the masonry veneer that is open at the top and bottom.***
- ***Follow better masonry practices so that the quality of the work is worthy of masonry's traditional reputation of quality, durability and value.***

Further Information

Complete technical documentation of the MEWS project may be found at:
http://irc.nrc-cnrc.gc.ca/bes/mews/index.html

Questions regarding the MEWS project and masonry in general may be addressed to: Bob Marshall, P.Eng., Executive Director, Masonry Canada, Infomasonrycan@aol.com
For additional copies of this bulletin, contact a Masonry Canada member or call 888-242-3335.

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The goals of Masonry Canada are to ensure the advancement of masonry technology, to promote the use of masonry materials, components and assemblies in construction across Canada, and to be the national voice of the Canadian producers of masonry products.
Visit our Web site www.masonrycanada.ca

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