Permanent Moisture Detection and Monitoring

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Leakage aligned with control joints and their fasteners
Concrete leaks through tie hole and joint between column & window

Above Photo from CHMC – Study of Poured-In-Place Concrete Wall Assemblies in Coastal British Columbia

HOW DO WE PREVENT MOLD AND FUNGI??

The Basics:
1. Oxygen
2. Food Source
3. Temperature Range
4. Moisture
5. Time
• Mold problems evolve from moisture problems

• To solve the mold problem, you must solve the moisture problem

Pro-active Moisture Management Is the Key to Risk Management!!
The concept is straightforward

- Detect and locate water ingress **BEFORE** serious damage and fungal growth occurs
- Identify and repair the problem **BEFORE** undetected mould and fungal growth requires $$$ in repair
- Avoid expensive warranty repairs, poor IAQ, health problems and law suits

**YOU CAN’T ENGINEER THE RISK TO ZERO!**

- **Design** – Errors and Omissions, conflicting codes and guidelines, energy codes Vs. moisture control
- **Execution** – Contractor workmanship, training, quality assurance, and construction scheduling
- **Materials** – manufacturer quality control
- **Maintenance** – Operating deficiencies maintenance oversights, gaps in technical knowledge
- **Natural events** – Seismic forces and high winds
The Moisture Detection and Monitoring System

Moisture Detection Tape

Remote Zone Unit

Detec 6000

STRUCTURE MONITORING TECHNOLOGY

Telco Moisture monitoring for over 25 years

Moisture ingress into communication cable system is an on-going challenge
Air pressurization, water blocked cable and monitoring systems are used extensively

Norscan.com

STRUCTURE MONITORING TECHNOLOGY
An Envelope Monitoring System

- Calibrated to industry standard moisture measurement methods
- Provides for resistance readings between the probes

Moisture Measuring Probes

- Calibrated to industry standard moisture measurement methods
- Provides for resistance readings between the probes
Establishing the % MC Event Level

- Scupper & downspout
- Parapet cap flashing
- Control Joint
- Wall-window interface
- Balcony door threshold
- Balcony rail attachment
- Vent hood
- Downspout attachment
- Saddle detail
- Deck Drain
- Jct between different materials
- Window head
- Window jamb
- Windowsill
- Overflow scupper
- Planter
- Wall concrete slab interface
- Balcony-wall interface

From CHMC

Providing thorough Coverage

Detec systems

STRUCTURE MONITORING TECHNOLOGY
Noncombustible Installation

- Tape placed in the base track to detect water collecting at the lowest point
- Detects water from intrusion through the envelope or from condensation
Curtain Wall Monitoring

Envelope / Roof Penetrations

Vent hoods, skylights, mechanical services
Active Roof Monitoring

Active Roof Monitoring - Continued

Detec systems
STRUCTURE MONITORING TECHNOLOGY
Mechanical Room / Interstitial Space

- Flood Alarm
- Quick Response reduces cost of remediation
- Insurance Issue

The information reported by the on-site MDMS is collected, interpreted, reported and stored.
1. Periodic Reports
2. Active Event Reports
3. Event History Reports

Confidential

Building Science Research

Sensors
- Moisture
- Temperature
- Pressure
- Heat Flux
- Relative Humidity
- CO2
- Calculated Dew Point
- IAQ – CO2,RH,T
Case Study: 4 story Timber Frame - Victoria

• 3 levels timber frame over 1 level non combust
• Rain Screen – 19mm AG, Bldg Wrap, Fibre Bat Insl., 6 mil poly VB

• Professionally Designed, Built and Commissioned

Moisture related events during construction
Case Study: 4 story Timber Frame - Victoria

![Image of workers examining documents and equipment]

Detec Systems

STRUCTURE MONITORING TECHNOLOGY

Case Study: 4 story Timber Frame - Victoria

![Image of a multi-story building under construction]

Detec Systems

STRUCTURE MONITORING TECHNOLOGY
Continuous monitoring of the building envelope against moisture intrusion is the ultimate risk mitigation tool.

January 8

MDMS Envelope Report - East Elevation

area OK  caution  wet

February 13

MDMS Envelope Report - East Elevation

area OK  caution  wet
CONTINUOUS MONITORING OF THE BUILDING ENVELOPE AGAINST
MOISTURE INTRUSION IS THE ULTIMATE RISK MITIGATION TOOL

February 14

MDMS Envelope Report - East Elevation

area OK  caution  wet

CONTINUOUS MONITORING OF THE BUILDING ENVELOPE AGAINST
MOISTURE INTRUSION IS THE ULTIMATE RISK MITIGATION TOOL

February 17

MDMS Envelope Report - East Elevation

area OK  caution  wet
CONTINUOUS MONITORING OF THE BUILDING ENVELOPE AGAINST MOISTURE INTRUSION IS THE ULTIMATE RISK MITIGATION TOOL

March 7

MDMS Envelope Report - East Elevation

area OK  caution  wet

March 10

MDMS Envelope Report - East Elevation

area OK  caution  wet
CONTINUOUS MONITORING OF THE BUILDING ENVELOPE AGAINST MOISTURE INTRUSION IS THE ULTIMATE RISK MITIGATION TOOL

MDMS Envelope Report - East Elevation

area OK  caution  wet

March 12

March 22
CONTINUOUS MONITORING OF THE BUILDING ENVELOPE AGAINST MOISTURE INTRUSION IS THE ULTIMATE RISK MITIGATION TOOL

March 31

MDMS Envelope Report - East Elevation

- Green: area OK
- Yellow: caution
- Red: wet

Other Projects – Winter 2006/07

- Marcato-Reverie, Tacoma, WA
- Harriet Gardens, Victoria, BC
- Bellagio, Seattle, WA
- The Pearl, Victoria, BC

STRUCTURE MONITORING TECHNOLOGY
Case Study: Nine Story Non Comb. Mid Rise – Victoria

- Electronics Installed Before Drywall
- Curtain Wall monitoring
- Roof Deck Monitoring
- Green Space over Parkade active monitoring

Case Study: Nine Story Non Comb. Mid Rise – Victoria

Line 1: Swallows Landing CAN Line

- GPU B192: Roof Monitoring
- GPU B242: Unit 111
- GPU B243: Unit 112
- GPU B244: Unit 113
- GPU B245: Unit 114
- GPU B246: Unit 115
- GPU B247: Unit 117
- GPU B248: Unit 211

Detec systems TECHNOLOGY
Case Study:
Nine Story Non Comb. Mid Rise – Victoria
Library of Parliament

Long Term Protection of building assets.
Quality Assurance during construction process
Tear in Protective Construction Curtain Detected and Repaired
Active Moisture Monitoring
Mitigates Risk for,

- Developers
- Contractors
- Architects & Engineers
- Insurers
- Lenders
- Owners

- Reduce the risk of loss
- Reduce the legal expenses to defend claims
- Avoid expensive Air Quality Issues, consequential damages and law suits

Questions?

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Ph: 204 233-9138

Tacoma
711 St. Helens Ave
Tacoma, WA
98402
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Brentwood Bay Inn

- Three story wood frame structure
- Cedar lap siding over rainscreen
- Pan-flashed sliding patio doors
- Envelope monitoring system installed in cavity on perimeter walls
Coverage Comparison

TYPICAL POINT MONITORING VS. DETEC CONTINUOUS MONITORING

Typical System Installation

STRUCTURE MONITORING TECHNOLOGY

Detec systems
RMU to MDT Connection

Figure 1. Single pair 24 AWG to MDT Connector

- 24 AWG wire should be folded prior to inserting into MDT connector.
- Amp 52584 connectors must be used for the MDT connection.

Notes:

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- Amp 52584 connectors must be used for the MDT connection.

MDMS Installation

Figure 1. Typical Wiring for Remote Measurement Unit

- 24 AWG, Zones 1-4 (4 x 1 pair stranded)
- 24 AWG, Zones 5-8 (4 x 1 pair stranded)
- 4 pair 22 AWG Shielded Control Wire

Notes:

- MDT wiring requires four single pair stranded twisted 24 AWG wires. 2 pair cables can also be used should the electrical contractor desire to connect two zones in close proximity to each other.
- RMUs are connected in series to one another and back to the Detec 6000. Star configurations and distances over 300m are also supported. Consult the installation literature for details.
- See the Remote Measurement Unit datasheet for specific connectivity and wiring assignments.
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DETEC 6000 Monitoring Computer

- Has capacity to monitor a large multifamily project, hotel, office, school or medical building
- Provides reliable 24/7/365 coverage of all critical zones
- Stores “as-built” zone locations in computer database
- Forwards full event data and controlled via Ethernet or modem

Primary parameters of interest:
- Carbon Dioxide (CO2)
- Relative Humidity
- Temperature
CSA S478-95 (2001)
Guideline on Durability in Buildings

- **Durability** – the ability of a building or any of its components to perform the required functions in its service environment over a period of time without unforeseen cost for maintenance or repair.

- **Design Service Life** – 50 to 99 years - Most residential, commercial and office buildings.

ASTM 2266
Standard Guide for Design and Construction of Low-Rise Frame Building Wall Systems to Resist Water Intrusion, states that:

“building wall systems are supposed to maintain their structural integrity for a period in excess of a traditional 30-year mortgage, and by extension, that water intrusion over that period is restricted to such a degree that water-induced structural damage is avoided” “given that the building is not subject to abuse, and receives a reasonable level of maintenance”
Most offices in this new building reported leakage around windows.

Risk Mitigation - Case Study

Laurel Station Condominiums
- 33 du. two and three bedrm condos
- Wood frame on concrete foundation
- Windows and base plates zoned on each floor
### LAUREL STATION REPORT – THIRD FLOOR

<table>
<thead>
<tr>
<th>Room</th>
<th>Front Bedroom</th>
<th>Living Room</th>
<th>Back Bedroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Window 1</td>
<td>Window 2</td>
<td>Window 3</td>
</tr>
<tr>
<td>Base 1</td>
<td>Window 1</td>
<td>Window 2</td>
<td>Window 3</td>
</tr>
<tr>
<td>Base 2</td>
<td>Window 1</td>
<td>Window 2</td>
<td>Window 3</td>
</tr>
</tbody>
</table>

**OK**
- Window 1
- Window 2
- Window 3

**CAUTION**
- Window 2

**WET**
- Window 1
- Window 3

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### LAUREL STATION REPORT – SECOND FLOOR

<table>
<thead>
<tr>
<th>Room</th>
<th>Front Bedroom</th>
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<td>Window 3</td>
</tr>
<tr>
<td>Base 2</td>
<td>Window 1</td>
<td>Window 2</td>
<td>Window 3</td>
</tr>
</tbody>
</table>

**OK**
- Window 1
- Window 2
- Window 3

**CAUTION**
- Window 2

**WET**
- Window 1
- Window 3

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**Structure Monitoring Technology**
**Moisture Content Measurements**

- OSB sheathing next to bottom plate at 30% MC
- Drywall at plate level damp at about 2% MC
- Mold growth apparent on surface of drywall
Condos—Analysis of Water Intrusion

Construction Out of Sequence
- Wall-window interface not sealed
- Trim detail flashed instead of window
- Rough vent opening – hood missing
- THE INSIDE IS COMPLETE AND THE EXTERIOR IS NOT

Knoxville Condo – A Case Study