In Situ Thermal Performance of VIPs in Northern Canada

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OUTLINE

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2. Pilot of VIPs on a Commercial Building
3. Monitoring Results
4. Conclusions
5. Acknowledgements

1. INTRODUCTION

Photo credit: Robert Postma, https://500px.com/photo/60049380/blackstone-valley-by-robert-postma?ctx_page=6&from=user&user_id=6797214

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In Yukon, temperatures can reach -55 ° C – lower in more isolated Northern areas

1. INTRODUCTION

VIPs have a high thermal resistance per unit of thickness, and use much less space than conventional insulation alternatives

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Vacuum Insulation Panels (VIPs) with their lower volume, weight, & thickness offers the North:

- lower insulation transportation cost, (transportation cost can equal material cost),
- lower construction cost (e.g., less framing & labour),
- less construction time (important weather benefit), and
- potential higher customer satisfaction.

1. INTRODUCTION

There is a recognized need for pilot projects for this promising new product to

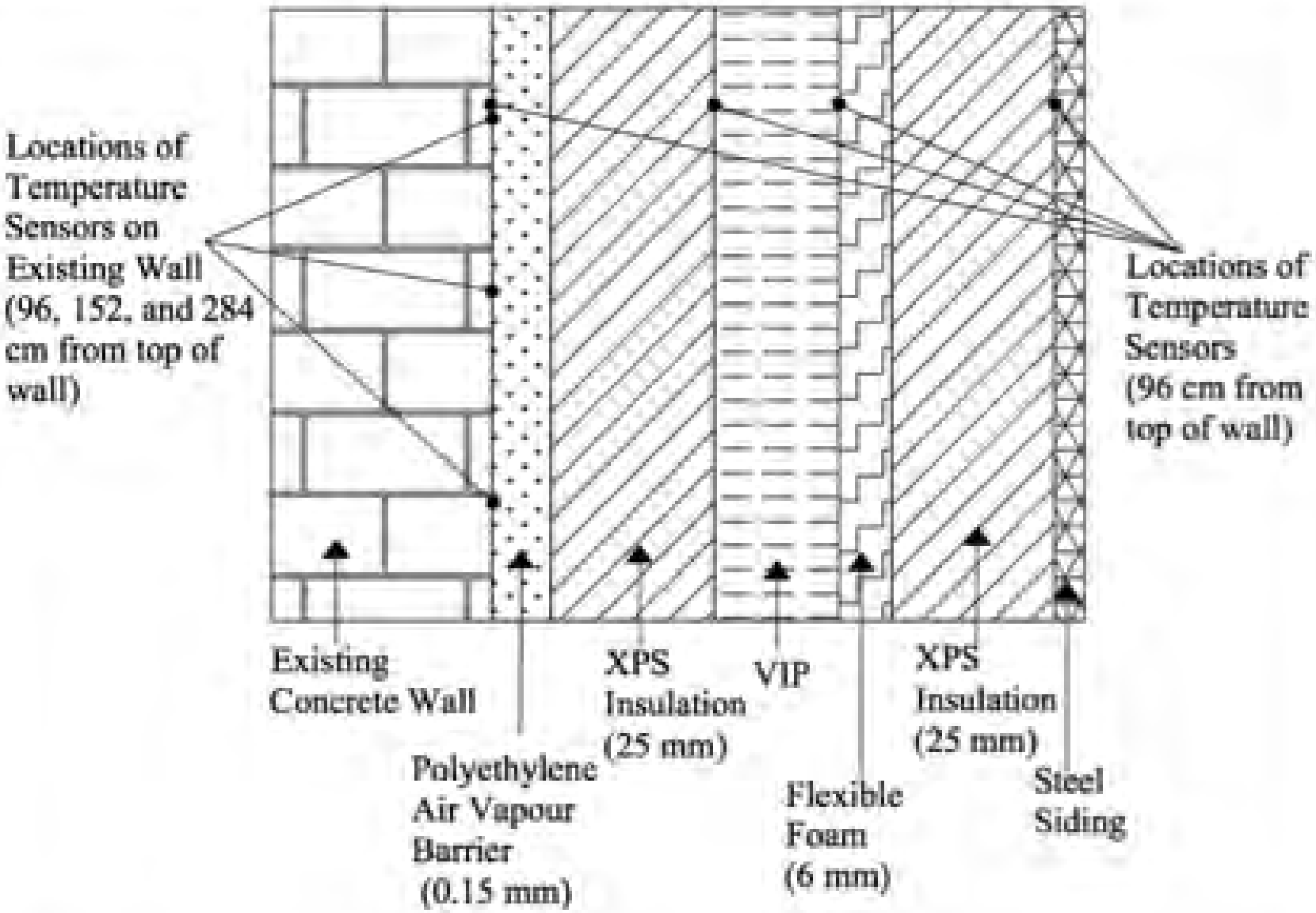
- see what local adaptations may be needed, and
- evaluate durability in the North.

1. INTRODUCTION

In all cases, the VIPs used

- were 457 x 558 x 12 mm (18” x 22” x 0.5”) in size; and
- have a centre of panel thermal resistance of RSI 3.7 (R 21).

2. PILOT OF VIPs ON A COMMERCIAL BUILDING

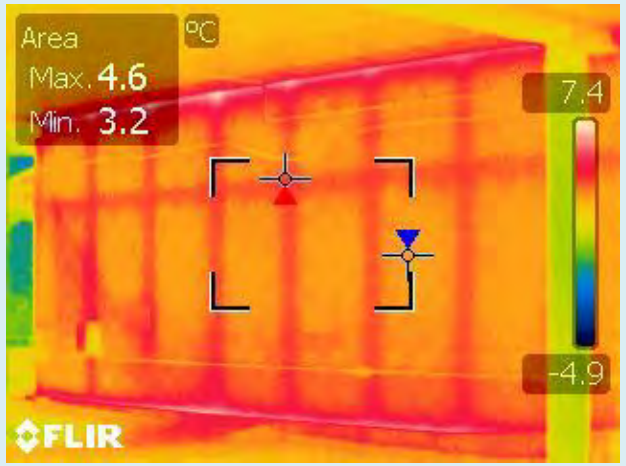

Locations of Temperature Sensors on Existing Wall (96, 152, and 284 cm from top of wall)
Locations of Temperature Sensors (96 cm from top of wall)
Existing Concrete Wall
Polyethylene Air Vapour Barrier (0.15 mm)
XPS Insulation (25 mm)
VIP
Flexible Foam (6 mm)
XPS Insulation (25 mm)
Steel Siding

R-5
25
RSI-0.88
R-5
25
RSI-0.88

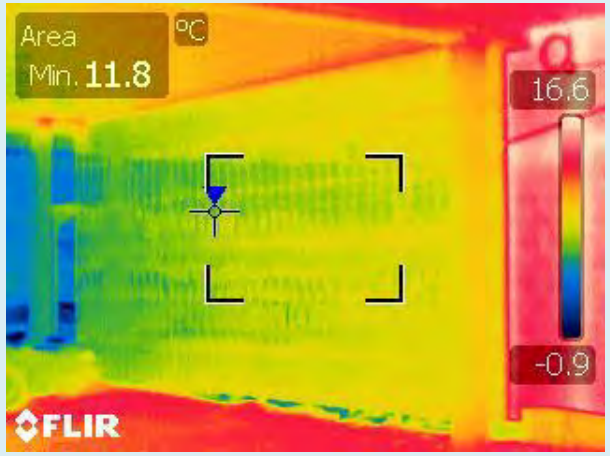
3. MONITORING RESULTS

Infrared Images

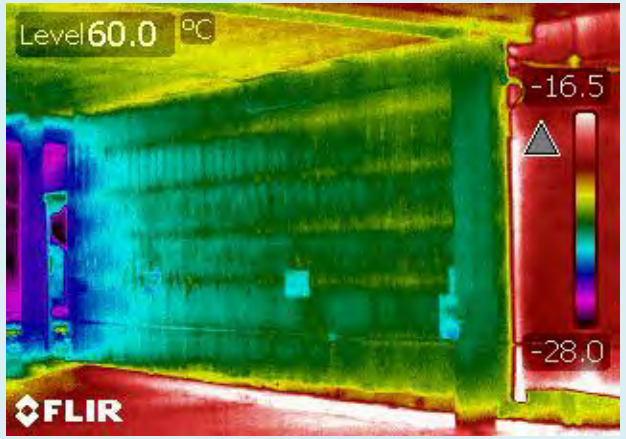
- VIPs reduced heat loss and thermal bridging.
- No failure of any VIPs over time.



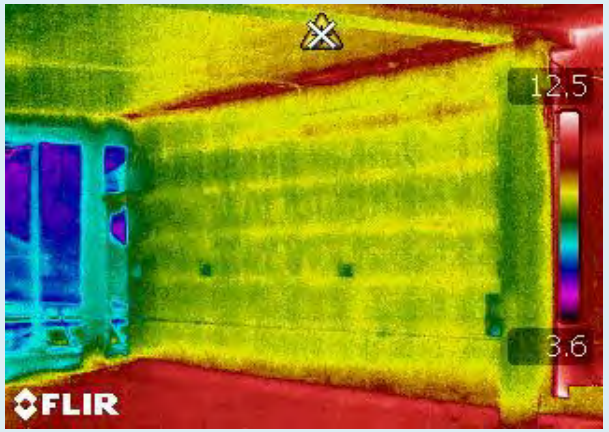
2011 Pre-retrofit



2011 Post-retrofit



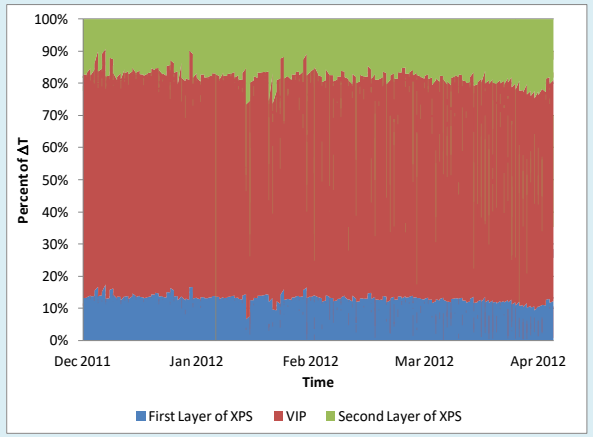
2014 Post-retrofit



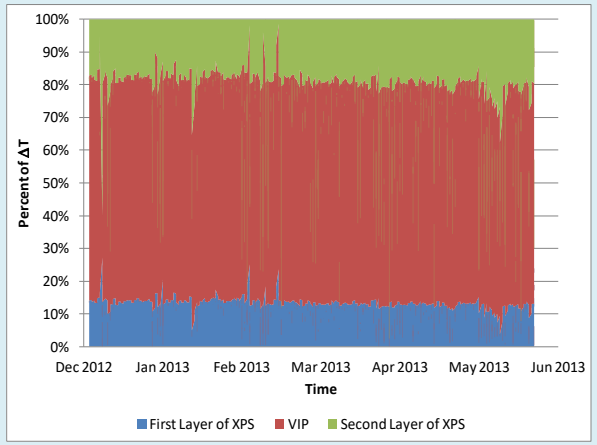
2016 Post-retrofit

3. MONITORING RESULTS

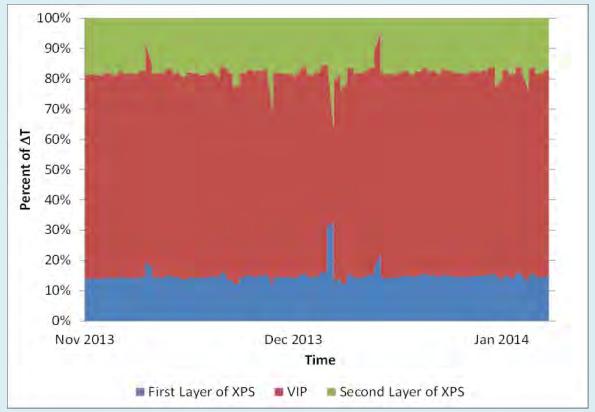
Temperature Data



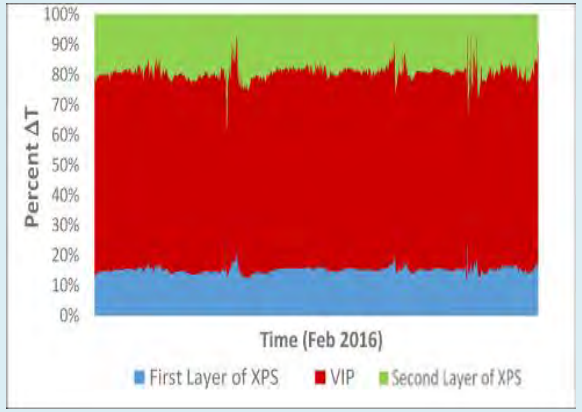
Insulation Performance Winter 2011-12



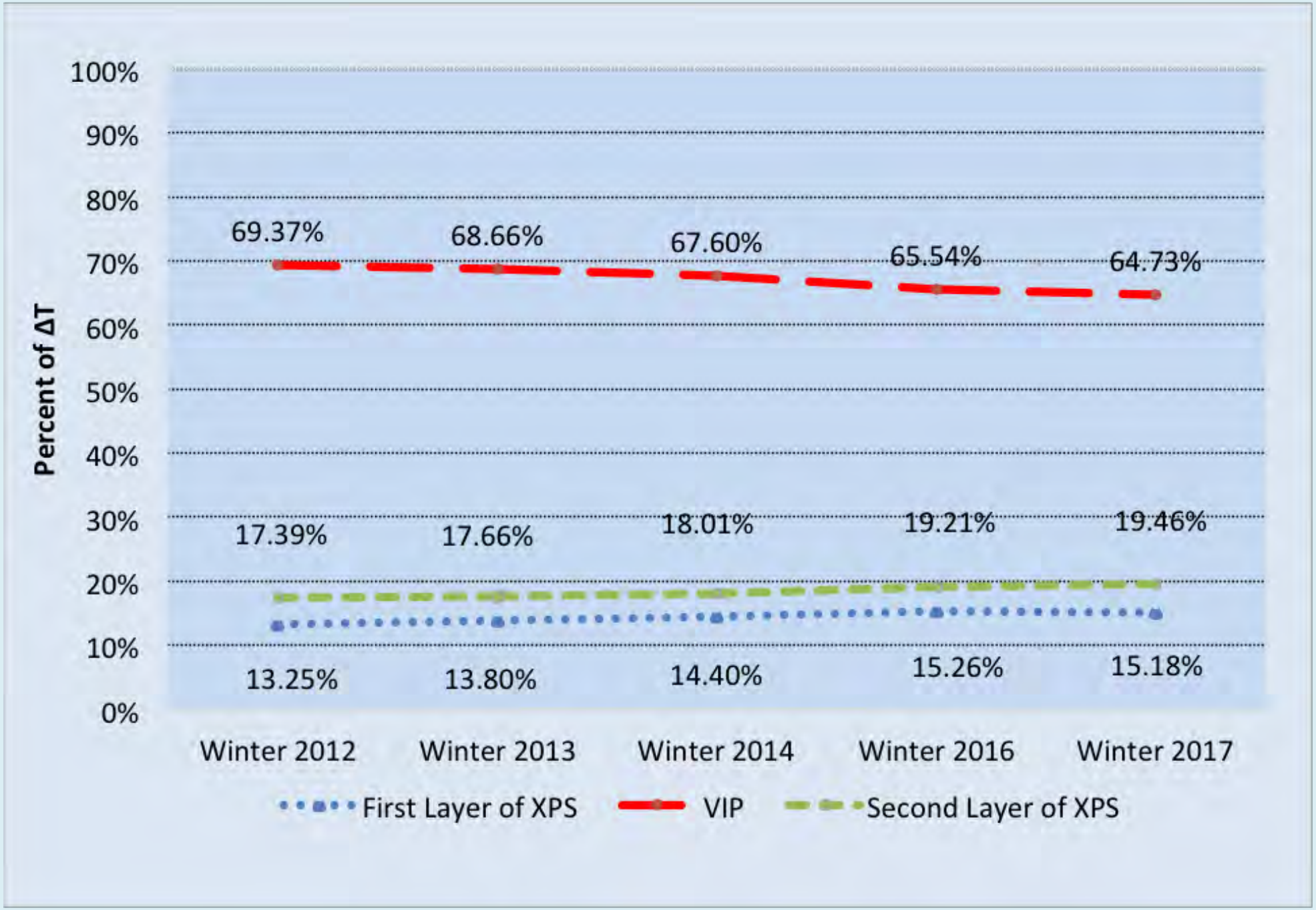
Insulation Performance Winter 2012-13



Insulation Performance Winter 2013-14



Insulation Performance February 2016


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of ΔT
69.37%
68.66%
67.60%
65.54%
64.73%
17.39%
17.66%
18.01%
19.21%
19.46%
13.25%
13.80%
14.40%
15.26%
15.18%
Winter 2012
Winter 2013
Winter 2014
Winter 2016
Winter 2017
First Layer of XPS
VIP
Second Layer of XPS

4. CONCLUSIONS

- Policy, regulatory, environmental, economic, and developmental concerns in Northern Canada are driving forces for the development of energy efficient building envelope construction, and use of advanced thermal insulation materials such as vacuum insulation panels (VIPs) is a practical necessity.

4. CONCLUSIONS (continued)

- There are and will continue to be concerns about the long-term thermal performance of VIPs.

4. CONCLUSIONS (concluded)

- Field performance data over a period of six years (2011-2016) show insignificant aging of VIPs in an exterior retrofitted wall assembly construction located in Whitehorse, Yukon.

5. ACKNOWLEDGEMENTS

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- Panasonic Canada Inc. and Panasonic Corporation -- for supplying the vacuum insulation panels used for these pilot projects and for their technical expertise and support,
- Yukon Housing Corporation -- for allowing us to use a wall of one of their buildings for a pilot project and for providing monitoring equipment,
- Yukon College -- for financial help and technical contributions, and
- The University of Victoria for their technical expertise.

Thank you!

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[4] Mukhopadhyaya, P., MacLean, D., Korn, J., van Reenen, D., and Molleti, S. (2013) "Field Application and Long-term Thermal Performance of Vacuum Insulation Panels (VIPs) in Canadian Arctic Climate", Proc. of 11th International Vacuum Insulation Symposium (IVIS-XI), Switzerland, September 2013, pp. 97-98.