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Technical Consultant to the
Sprayed Polyurethane Foam
Industry

To: CUFCA **Date:** June 21st, 2003
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Attn: Laverne Dalgleish

Exterior Insulation Basement System (EIBS) – Spray Polyurethane Foam

Spray polyurethane foam (SPF) insulation has been used below grade for a variety of applications for over 25 years. These applications range from buried pipelines to freezer floors. In each case the foam has been subjected to bulk water, vapour drive, and thermal cycling. SPF can perform in these environments as long as the products' properties are suitable for the intended environment. Specifically in the case of basement walls SPF can be used successfully. This letter report is intended for use by industry personnel including suppliers, contractors, specifier's and architects for technical back-up or submission to authorities having jurisdiction for site specific use of this EIBS utilizing SPF.

The product is suitable for below grade installation directly to foundation walls without any additional protection except where it is exposed above grade where it can be protected by a cement board finish to protect it from mechanical damage. This letter report references the National Research Council (NRC) report "In-situ Performance Evaluation of Exterior Insulation Basement (EIBS) – Spray Polyurethane Foam Summary Report" which was part of a broader study of basement envelope systems intended to form the basis for change to building codes throughout Canada reflecting current technology on basement design. The full study report is available from NRC or from the Canadian Urethane Foam Contractors Association.

Currently there is no specific clause in building codes dictating material type for this location (below grade) other than it must not be affected by exposure to water. It is my opinion that SPF meets the intent of building codes. The basement research project conducted at NRC established that SPF is suitable for below grade installation. Briefly, this research project exposed foam below grade on a foundation to record rains and winter thaws. Further, to create a worst case scenario, the grade was sloped 5% toward the wall to simulate a settled condition. As expected, water was observed at the outer surface of the foam insulation during the periods of heavy rain and major thaws throughout the two year test period. The outer surface of the concrete foundation showed no evidence of water penetration through the insulation layer which is effectively sealed by the SPF. After the 31 month exposure period, the foam was analyzed and showed no deterioration in the physical properties of the foam. Properties such as thermal resistance and vapour permeance were unchanged after the test period thereby meeting the material standard CAN/ULC S705.1 – 01 "Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density , Material – Specification".

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This test foundation was constructed with the foam protected above grade with cementitious (cement) boards secured to z-bars. Two options for securement of the cement boards were evaluated: horizontal z-bars where the cement boards were cantilevered over the SPF and vertical z-bars. Not surprisingly the option with horizontal z-bars performed best from the thermodynamic standpoint (no thermal bridges). I have presented these two options as design drawings allowing for maximum flexibility for the builder, while maintaining the integrity of the designs evaluated by NRC. The one significant variation is that I have included for short z-bar/clips to be installed below grade at the joints in the cement board to prevent offset joints as the system is backfilled (SPF having a tolerance in thickness of ±6mm). This "flush" system will allow the application of any commercially available acrylic-modified mortar/stucco finish system to the cement board to complete the above grade installation for aesthetics.

Again, these proposed EIBS's with SPF do not need any additional protection boards or damp-proofing. Damp-proofing is applied to create a capillary break at the concrete surface, but with SPF it is the insulation that provides the moisture protection as well. The SPF is installed in a seamless fashion from the top of the foundation wall down to, and sealing the joint between the wall and the footing. Further, at this location the SPF is installed in such a mannerthat a chamfer or slope is created away from the footing to direct water to the drainage tile. This type of seal keeps the liquid water from reaching the foundation wall. Based upon the proven performance of polyurethane foam in this important basement research project and its outstanding performance in tougher environments like below grade freezer floors I am confident that SPF meets the intent of building codes throughout Canada.

In all cases due consideration must be given to the selection of the basement envelope system appropriate to the soil conditions, drainage characteristics and construction materials of the specific locale. It is recommended that this selection procedure follow the guidelines set forth in the "Good Practice Guide for Basement Envelope Systems and Materials" developed by NRC. Should you have any questions regarding this report or the design options for specific application please contact the undersigned at your convenience.

Regards,

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