



October 2005

## Use of LTTR in Determining RSI of Spray Polyurethane Foam

**S**pray polyurethane foam insulation starts out with a high RSI value immediately after being sprayed and then this value will decrease over time. Up to and including today, the industry and government regulators have agreed that the RSI value of Spray polyurethane foam insulation would be RSI 1.06 when measured using ASTM C518 using a 25.4mm specimen.

The reason for establishing a set performance level is that years ago, manufacturers were using a multitude of RSI values which had a relatively wide range. This agreement between government agencies took into account that the spray polyurethane foam material would age and the RSI would be lower. The value chosen was to represent spray polyurethane foam which had aged five years. The five-year mark was chosen and the decrease in RSI over time after five years was a relatively flat graph. If a manufacturer has five year old specimens, they were allowed to test the material and use the actual RSI value.

This "aging" of material and resultant change in RSI value is not limited to spray polyurethane foam. It applies to all foamed plastic insulation as they all use a blowing agent which has a thermal conductivity which is less than air. Thermal insulation materials that use air as the insulating material (glass fiber, cellulose, expanded polystyrene, etc) do not change as the air trapped in the materials is exchanged with air therefore no change to the insulating value of the materials. Keep in mind that there are only two main insulation

material categories, one that uses air and one that uses a gas which has a lower conductivity than air.

The complete foamed plastic industry (spray polyurethane foam extruded polystyrene, polyisocyanurate, etc) worked together to develop a test method that would predict the "Long Term Thermal Resistance" (LTTR) of cellular plastic materials. This work was completed with the publication of CAN/ULC S770 Standard "Standard Method of Test for Determination of Long Term Thermal Resistance of Closed Cell Thermal Insulating Foams". This would allow a manufacturer to use this test to determine their long term thermal insulating value.

There are two outcomes from this test method. First, it provides a shorter time frame whereby the manufacturer can predict the thermal performance of their product and second it provides a means where the thermal performance of various thickness of materials can be determined. This becomes important as the thicker the material the greater RSI value per unit of thickness as it takes longer for the insulating gas to escape and be replaced by air when the gas has to come from the centre of the foam.. The gas trapped at or near the surface can be transferred quickly but as you go deeper and deeper to the centre of the material it will take longer. The gas only has to travel 13 mm in each direction when the foam is 26mm thick but would have to travel 100 mm in a 200mm thick piece of material.

Although all this work has been done, as of today, you cannot use the LTTR method with spray polyurethane foam insulation. The manufacturers who currently claim they have a product which meets the CAN/ULC S705.1 Material Standard **ALL** claim that they meet the 1998 version of this standard. In the 1998 version of CAN/ULC S705.1, there is no mention of LTTR. In the latest version – 2001-second Amendment – it does require the results of testing to LTTR (CAN/ULC S770). At this time no manufacturer claims that they meet the 2001 Second Amendment version. One reason is that they have to conduct all their testing using 50mm specimens whereas the 1998 version requires 25.4 mm specimens.

At this time, the Building Codes across Canada reference the CAN/ULC S705.1- 98 version of the standard. Until that is changed with the new Code (sometime in 2006) all of the industry is required to adhere to the RSI of 1.06 per 25.4mm thickness. No manufacturer nor any contractor can claim performance beyond this parameter until the manufacturer have properly tested their material and we have changed the reference in the Building codes.

