

Large Scale Fire Tests

PURPOSE:

The purpose of the tests was to evaluate the large scale fire propagation properties of an extruded polystyrene (XPS) insulation material identified as "Isoboard RF". Isoboard was tested as both an underroof insulation as well as an insulative side cladding. Evaluations of the fire performance of the underroof insulation system when utilised in conjunction with a sprinkler system were also done.

TEST PROCEDURES:

A series of five tests were conducted in the CSIR fire facility (18m x 6m) in Pretoria, and for all of the evaluation the specimen frames were aligned in such a way that the roof slope was equal to 3 degrees. The distance between the top of the fire source and the roof directly above it was also kept constant at 2.7metres. The material was installed as 6m (length) by 600mm (width) panels fitted across the purlins of the specimen frames.

The fire source consisted of 60kg of dry SA Pine stacked in an open crib configuration, in order to stimulate a fire with a slow heat build-up. For the side cladding test two small timber cribs (7.5kg each) were placed up against the insulation on either side of the centre line of the side cladding frame.

Evaluations without Sprinklers:

Test 1

Investigated the fire propagation properties of the material when the purlins were positioned along the width of the test facility.

Test 2

Evaluated the fire spread when the purlins were positioned along the length of the facility.



Evaluations with Sprinklers:

Test 3

Utilised slow response sprinklers which activated at 141°C.

Test 4

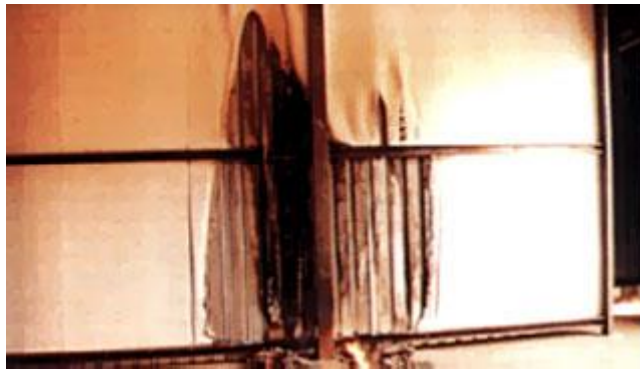
Made use of rapid response sprinklers, with activation at 68 °C. In all cases, the sprinklers were installed 300mm below the insulation material.



Side Cladding Evaluation:

Test 5

Investigated the fire hazard associated with the use of this insulation system as a side cladding.



DISCUSSION OF RESULTS:

Despite being a combustible material per definition, the "Isoboard RF" insulation as evaluated did not support any flame spread. The criterion normally applied when evaluating flame spread properties is that no sustained flaming on the final third of the installation should occur. This criterion was easily fulfilled by the insulation system as tested. Although a large quantity of molten or softened material fell to the ground, this material did not burn at any stage and would therefore pose a minimal risk. The direction of the purlin did not have any significant effect on the flame spread properties of the system.

Evaluation where a sprinkler system was installed showed that the flame spread properties of the insulation system was not influenced by the sprinkler activity, mainly due to the fact that no real fire propagation occurred when the system was tested without sprinklers. The water from the activated sprinklers did cool down the installation, causing less of the insulation material to soften or melt and fall to the ground. Furthermore, the falling material did not drape over the sprinkler heads or pipes and is therefore unlikely to influence the normal operation of a sprinkler installation.

The thermoplastic nature of Isoboard prevented any flame spread from occurring when installed as a side cladding. No ignition of the insulation

material occurred and therefore the roof material was almost unaffected.

CONCLUSIONS:

From a fire safety point of view the insulation system utilising "Isoboard RF" as tested under the specific test conditions may be used in industrial and commercial building as an underroof insulation material.

The use of this system as a side cladding insulation would present a minimal risk as far as flame spread is concerned.

It is also concluded that roof pitch has a minimal effect on the flame spread properties of the system.

Fire reports are also available in the nailed-up and suspended ceiling, composite insulation and acoustical system as well as the toxicity of the combustion gases.

Toxicity - Results **CSIR Test certificate No BF 502/082 - 5600-5664**

Gas detected	Concentration for 10gr of XPS burned (ppm)	
	With Flame Retardent	Without Flame Retardent
Carbon Dioxide	130 000	120 000
Carbon Monoxide	4 000	5 000
Total Toxicity Index	2.3	2.45

The results indicate Toxicity Index to be less than that found when burning wood.