

## FireStop Sandwich Panels



### Why FireStop ?

A new macro molecular structure called polyisocyanurate (PIR) is formed by making isocyanate, one of the main components of polyurethane foam, enter into reaction with other isocyanate molecules like itself, and fire resistance of this constructed structure is higher than the current polyurethane systems. Therefore, PIR systems have been more widely used at fire insulation in Europe and all over the world.

High isocyanate rates and fire-retardant additives are decisive in fire performances of PIR foams. For example, the critical fire resistance duration has exceeded 30 minutes, at the tests conducted with foams of certain thicknesses.

PIR structures are constituted of the polyisocyanurate chains (trimer) formed by the reaction of three MDI molecules with each other.

In general, the first reaction in PIR formulation is the reaction of MDI with water and polyols. And then, the liberated MDI groups enter into reaction with each other and perform trimerization. This polymeric structure (PIR) formed is one with three dimensions and many cross-links, and has a very high dissociation energy since it is constructed of a combination of isocyanurates and strong chemical bonds of cross-linked structures. The fact, the higher aromatic content in a material, the better the resistance against fire, is an issue well known by the organic chemistry industry. The required temperature to dissociate the isocyanurate bonds is higher than 400 °C. And this explains why the PIR is a good solution for the applications requiring high heat and fire resistance.



### Neden FireStop?

- Fire Stop sandwich panel is designed with features to meet fire regulations.
- Assan Panel Firestop sandwich panel systems help the buildings maintain their integrity during fire.
- It has a high R value (heat flow resistance) and high thermal performance.
- PIR foam used in firestop sandwich panel systems acts as a burnt apron at the surfaces it is exposed to fire.
- Assan Panel FireStop sandwich panel systems do not contribute in the spread of fire to different areas in the buildings in which they are used.
- Fire Stop sandwich panels do not contribute in the fire load by not dripping during the fire.  
The smoke resulting from Assan Panel FireStop sandwich panels' being affected by fire is less than the smoke resulting from combustion of many conventional construction materials.
- Its dimensional stability value is high.

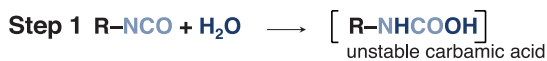
### PIR Formulation

#### Reactions of isocyanate

with poly-alcohols (–OH groups) **PUR (main) reactions**

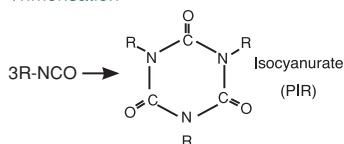


with water (–OH groups)



#### PIR (main) reactions

##### Trimerisation



### Fire Performance of PIR / FireStop Sandwich Panels

Fire Performance of PIR / FireStop Sandwich Panels		
Sandwich Panels with PIR Insulation	B.s1.d0	EN 13501-1

	PUR	PIR	EPS
The Temperature at which dimensional durability is lost (°C)	~180	~200	~90
Combustion Temperature (°C)	285	500	245
Fire Performance	Well	Well	Poor

### Structural Features of PIR / FireStop Foam

Density (kg/m <sup>3</sup> )	40 (+ - 2)	EN 1602
Coefficient of Thermal Conductivity $\lambda$ (W/mK)	0,022	EN 13165
Closed Cell Percentage (%)	95	EN 14509
Vapour Diffusion Resistance (·)	30-100	EN 12086
Dimensional Durability	DS(TH) 11	EN 13165
Compression Strength (Mpa) (·10)	min. 0,095	EN 826
Water Absorption (% Volume)	2	Mill Test

### Fire Performance Tests of PIR / FireStop Sandwich Panels



**Small Scale Test**  
5-7 cm Flame Height

This test is conducted to observe the burning behavior of the core insulation material used in the panel system.



**Medium Scale Test**  
 $B, s_1, d_0$

The addition of the material to the fire mass, the amount of smoke to be released by the material at time of fire, and whether the droplets causing fire growth are formed, are checked at this test.



**Large Scale Test**  
EI - 30

The preservation duration of the insulating character and integration of the sandwich panel is checked.