Polyurethane

Product Features & Applications



الشركة الكويتية لصناعات البوليوريثين (ذ.م.م.)

Kuwait Polyurethane Industry Co. (W.L.L.)

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KUWAIT

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Product Features (finished product)

- Form and dimensional stability
- Thermal conductivity
- Density of the product
- Compressive strength, tensile strength, impact resistance
- Cell structure, open/closed cell content
- Burning properties
- E-modulus, flexibility and elongation
- Surface hardness
- Moisture vapor and gas permeability

Process Features (during processing)

- Good flowability
- Adjusted reactivity and curing
- Component temperature
- Substrate temperature
- Demoulding time and demouldability
- Easy sprayable, low aerosol formation
- Miscibility
- Wide processing tolerance

Environment
Separate and controlled waste management.

Steered by the environmental care system waste sources within KPI are carefully monitored. Waste material, wherever possible is separately stored and removed. This is applicable for waste from the production process as well as from other sources. KPI has dedicated and controlled storage area and removal for chemical waste.

KPI endeavors in its production process and formulation of its systems to provide the least possible consequences for the environment.





















What is polyurethane?

No matter what you do, the chances are that you will use products containing polyurethane.

Polyurethane plays a large role in our lives even though we may not know it.

Polyurethane is in our car, refrigerator, freezer, boiler and our shoes.

Polyurethane increases our living standard at home, at work and in our leisure time.

Polyurethane is a product which can be used in a wide variety of applications.

PCC is specialized in the development of intermediate products for rigid foam, casting systems and coatings.

Rigid polyurethane foam

Rigid foam is a cross-linked polymer with a predominately closed cell structur.

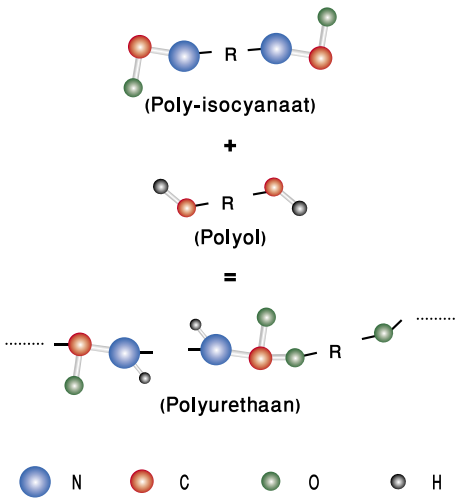
Each cell has a closed cell wall so that gas transmission is minimal.

Rigid foam has good mechanical properties with respect to its density and the closed cell nature provides a high insulation value.



Chemistry

Polyurethane is based on the polyaddition reaction between a polyol (an alcohol with more than one hydroxyl group per molecule) and a diisocyanate.



The reaction is exothermic. The polymerization can be influenced by the type of polyol and isocyanate components as well as additives.
The cell formation is obtained by the addition of a blowing agent or inclusion of air. The blowing agent can be an HFC with a low boiling point but also the presence of water in the reacting mixture produces a foaming effect because the isocyanate groups react with water forming carbon dioxide.

POLYURETHANES TECHNICAL CALCULATIONS



INSULATION VALUES AND REALTED CALCULATIONS:

POLYURETHANE FOAMS ARE TODAY USED WORLD WIDE AS INSULATION AGAINST TEMPERATURE EXTREMES.

IN THE MIDDLE EAST THE BUILDING INDUSTRY HAS AADOPTED POLYURETHANE INSULATION AS ONE OF THE BEEST MATERIALS TO CONTROL INTERIOR CONDITIONS OF BUILDINGS AND TO SAVE ENERGY.

TO BE ABLE TO DETERMINE THE "AMOUNT" OF INSULATION REQUIRED FOR A CERTAIN CONSTRUCTION, THE FOLOWING DEFINITIONS AND FORMULAS CAN BE USED:

"Q" - VALUE:

THE AMOUNT OF HEAT EXPRESSED IN WATTS PASSING THROUGH A HOMOGENEOUS CONSTRUCTION WITH

A = SURFACE AREA OF THE CONSTRUCTION (M^2)

L = THICKNESS OF THE CONSTRUCTION (M)

T = DIFFERENCE IN THE TEMPERATURE ON THE TWO FACES OF THE CONSTRUCTON (^{O}C)

λ = THERMAL CONDUCTIVITY OF THE CONSTRUCTION ($W/M^{O}C$)

$$Q = \lambda \frac{A \triangle T}{L} \quad (W)$$

"λ" LAMDA - VALUES:

THE THERMAL CONDUCTIVITY (λ) OF A MATERIAL IS THE AMOUNT OF HEAT IN WATTS PASSING THROUGH A MATERIAL HAVING A SURFACE OF 1 M^2 AND THICKNESS 1 M UNDER A TEMPERATURE DIFFERENTIAL OF 1^{O}C. HENCE A LOW LAMDA VALUE INDICATES THAT THE MATERIAL IS A GOOD INSULATOR. λ IS EXPRESSED IN $W/M^{O}C$

"K" VALUE:

THE INSULATION VALUE (K) OF A MATERIAL IS THE THERMAL CONDUCTIVITY OF THE MATERIAL (λ) DIVIDED BY THE THICKNESS OF THE MATERIAL (L) EXPRESSED IN METERS (M)

$$K = \frac{\lambda}{L} \quad (W/M^{2O}C)$$

"U" VALUE:

THE TOTAL INSULATION VALUE (U) OF A COMPOSITE CONSTRUCTION IS DETERMINED BY THE INSULATION VALUES OF THE VARIOUS MATERIALS (K1 K2 ETC) FORMING THE CONSTRUCTION, ACCORDING TO THE FOLLOWING FORMULA:

$$U = \frac{1}{0.2 + \frac{1}{K_1} + \frac{1}{K_2} + ETC} \quad (W/M^{2O}C)$$

THESE ARE BASIC INFORMATION ABOUT HEAT-TRANSFER AND INSULATION VALUES FOR CONSULTANT USE AND CALCULATIONS.

POLYURETHANE PRODUCTS

Grade	Applications	Typical Properties			
		Appearance	Viscosity 25°C, cps	Combination ration with MDI	Description
PS 40 / 01	Refrigerator and Freezers	Clear yellow liquid	650 ± 100	100 : 110	With 141B blowing agent and when combined in the given ration with MDI, it gives fine cell structure and good thermal insulation properties
PS 40 / 02	Refrigerated Trucks	Clear yellow liquid	600 ± 100	100 : 110	With 141B blowing agent and gives fine cell structure, very good flow ability, good thermal insulation and good low temperature dimensional stability
PS 40 / 03	Sandwich Panels for profiles and construction	Clear yellow liquid	500 ± 50	100 : 115	With 141B blowing agent and when combined in the given ration with MDI, it gives excellent flow ability, good demoulding characteristics and thermal insulation properties
PS 40 / 04	Rigidisation of Kitchen cabinets, and FRP doors	Clear yellow liquid	700 ± 50	100 : 105	With 141B blowing agent and has a slower reactivity to facilitate for manual mixing and has excellent adhesion, flow and compressive strength.
PS 20 / MH	For water heaters	Clear yellow liquid	200 ± 30	100 : 100	With 141B blowing agent and has a good flow ability, excellent adhesion and good thermal insulation properties
PS 20 / SC	For water heaters	Clear Yellow liquid	400 ± 50	100 : 100	With 141B blowing agent and has good flow ability, excellent adhesion and good thermal insulation properties
PS 30 / GH	For water heaters	Clear yellow liquid	400 ± 50	100 : 100	With 141B blowing agent and has slower reactivity facilitating for manual mix with good cell structure and thermal insulation
SS 40 / GR	Spray on Roof	Clear yellow liquid	650 ± 50	100 : 100	Good surface, excellent adhesion and thermal insulation
SS 40 / GC	Spray on Ceiling	Clear Yellow liquid	700 ± 50	100 : 100	Good surface, excellent adhesion, thermal insulation and non dripping on ceiling
SS 60 / GR	Spray	Clear yellow liquid	700 ± 50	100 : 100	Good surface, excellent adhesion and good thermal insulation
BS 40	PU Slabstock for cutting into boards and pipe sections	Clear yellow liquid	2500 ± 200	Available on request	Foams with very good cell structure, good thermal insulation and compressive strength
BS 40 FR	PIR Slabstock for cutting into boards and pipe sections	Clear yellow liquid	2200 ± 200	Available on request	PIR block foams with very good cell structure, thermal insulation and excellent fire performance
FS 50	For preinsulated pipe	Clear yellow liquid	600 ± 50	100 : 110	With 141B, and has slower reactivity facilitating for manual mix with good cell structure, adhesion and thermal insulation
HD 500	Wood imitation	Clear yellow liquid	2500 ± 200	100 : 105	With 141B blowing agent and has good flow ability, excellent surface finish and good compressive strength

- *The above grades are only an indication of our regular supply and any other need of customers can always be fulfilled by developing new products as per the processing method and the desired properties*

CPS 40 - Continuous Sandwich Panel

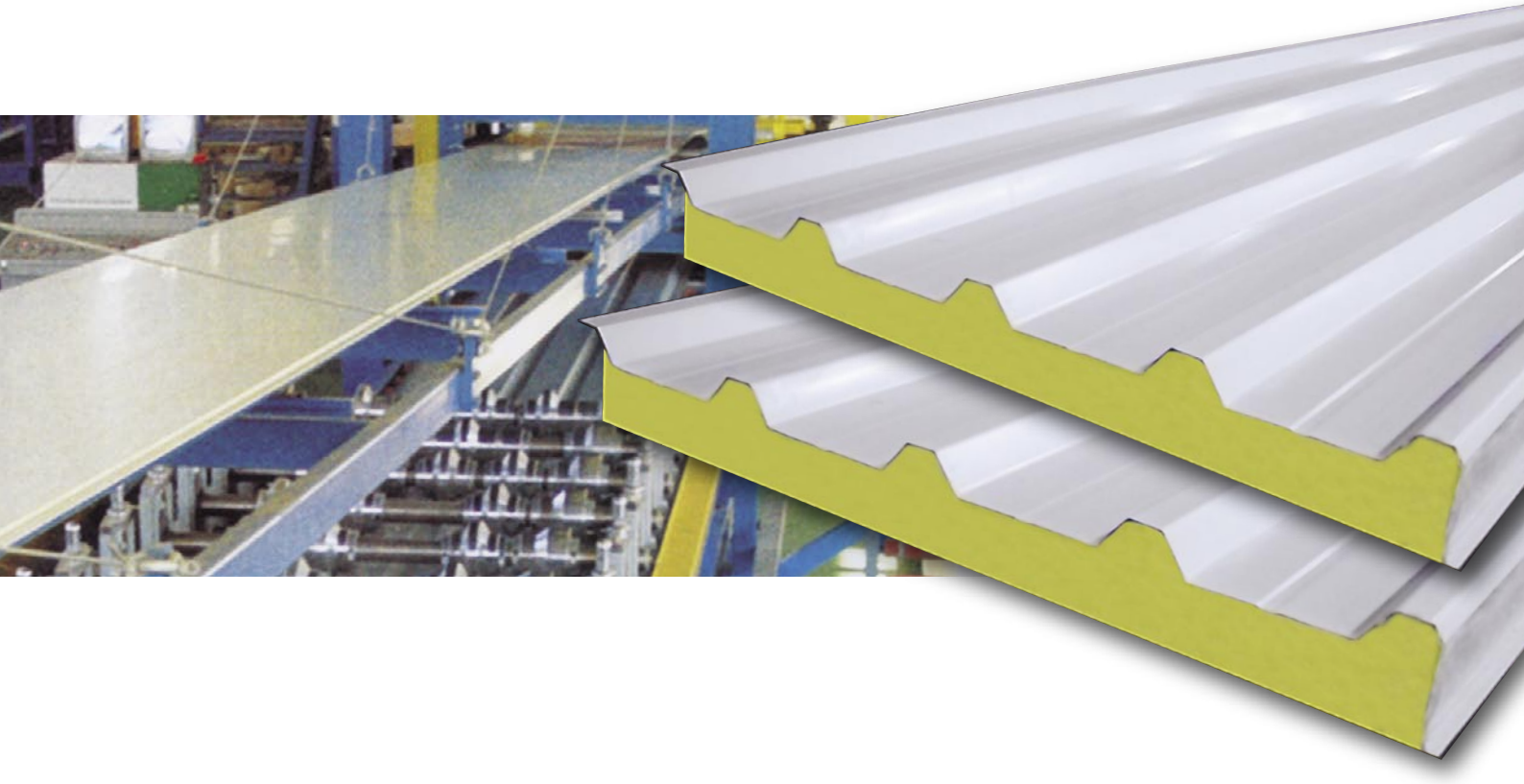
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Introduction:

CPS 40 is a two component polyurethane system developed for the manufacture of rigid polyurethane foam. It has been especially designed for manufacture of sandwich panels using the double band lamination process using flexible facers that serves as an excellent insulation material. The system is designed for use with *HCFC 141B* as blowing agent.It is a *CFC* free system and thus complies with the environment friendly regulations act having the same properties as that of *CFC* based foams.

Applications:

CPS 40 is mainly used for the production of sandwich panels by the continuous method. The system can be dispensed using a low or high- pressure machine with variable ratio.



Component A – is a polymeric Diphenyl Methane Discocyanate and has following properties:		
Appearance	:	Clear dark brown liquid
Viscosity @25°C	:	200 ± 20cps
Specific Gravity @25°C	:	1.21 ± 0.001
Free Isocynate Content,%	:	1.31 ± 0.5

Component B – is a blend of different polyols, additives and fire retardants. The typical properties of Component B are:		
Appearance	:	Clear Yellow liquid
Viscosity @25°C	:	3000 ± 100cps
Specific Gravity @25°C	:	1.01 ± 0.001

The reaction profile of CPS 40 is typically as follows:		
Polyol	:	100 Parts
HCFC 141 b	:	30.0 Parts
MDI	:	155.0 Parts

For a laboratory cup test in the above ratios, at 22°C, the reactivity is as follows –		
Cream Time	:	11 - 13 secs
Gel Time	:	40 - 42 secs
Tack Free Time	:	50 - 52 secs
Free rise density	:	30 - 32 kg/m3

Typical foam properties for panels manufactured by double band lamination method from CPS 40		
Molded density	Kg /m^3	38 – 42
Closed cell content	%	> 96
Initial Thermal Conductivity	W / m°K	0.022
Dimensional stability (Linear Change) 72 hrs at - 20°C 72 hrs at - 70°C	 % %	 Maximum 1 Maximum 1
Compressive Strength (perpendicular to the main panel)	Kpa	180

Packing:

Component A : 250 kg net
Component B : 220 Kg net

Storage Information:

We recommend the component containers to be kept in a dry and cool area at 20°C maximum. All the containers are to be kept well closed to avoid contamination with moisture or any other foreign matter that would result in a negative performance of the product.

The information given herein are true to the best of our knowledge and general industrial experience. However, the properties are subjected to change depending on the handling and processing conditions at the customer's end, which is not under our control.

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SS 40 - SPRAY

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Introduction:

SS 40 – CFC free is a two component polyurethane system developed for the manufacture of rigid polyurethane foam.

It has been designed for spray on roof applications that serves as an excellent insulation material. It is a *CFC* free system and thus complies with the environment friendly regulations act having the same properties of that of *CFC* based foams.

Applications:

SS 40 – CFC free is mainly used for spray applications.
The grade is suitable to be processed with low and high pressure dispensing machines.



Component A – is a polymeric Diphenyl Methane Discocyanate and has following properties:		
Appearance	:	Clear dark brown liquid
Viscosity @25°C	:	220 ± 20cps
Specific Gravity @25°C	:	1.25 ± 0.001
Free Isocynate Content,%	:	31 ± 0.5

Component B – is a blend of different polyols, additives and blowing agents. The blowing agent used is HCFC 141B that leads to the formation of polyurethane foam. The typical properties of Component B are:		
Appearance	:	Clear Pale Yellow liquid
Viscosity @25°C	:	400 ± 20cps
Specific Gravity @25°C	:	1.20 ± 0.001

The reaction profile of SS 40 CFC free is typically as follows:

For a Laboratory cup test, when both components maintained at 20°C,

And Mix Ratio Being		
Component A	:	100 pbw
Component B	:	100 pbw

Then Reacitvity is as follows:		
Cream Time	:	5 - 6 seconds
Gel Time	:	15 - 17 seconds
Tack Free Time	:	15 - 17 seconds
Free rise density	:	28 - 30 kg/m^3

Typical foam properties for sprayed foams manufactured from SS 40		
Spray density	Kg /m^3	38 – 42
Closed cell content	%	> 96
Initial Thermal Conductivity	W / m°K	0.020
Dimensional stability (Linear Change) 72 hrs at - 20°C 72 hrs at - 70°C	 % %	 Maximum 1 Maximum 1
Compressive Strength (perpendicular to the main panel)	Kpa	180

•Test methods are available on request

Packing:

Component A : 250 kg net
Component B : 220 Kg net

Storage Information:

We recommend the component containers to be kept in a dry and cool area at 20°C maximum. All the containers are to be kept well closed to avoid contamination with moisture or any other foreign matter that would result in a negative performance of the product.

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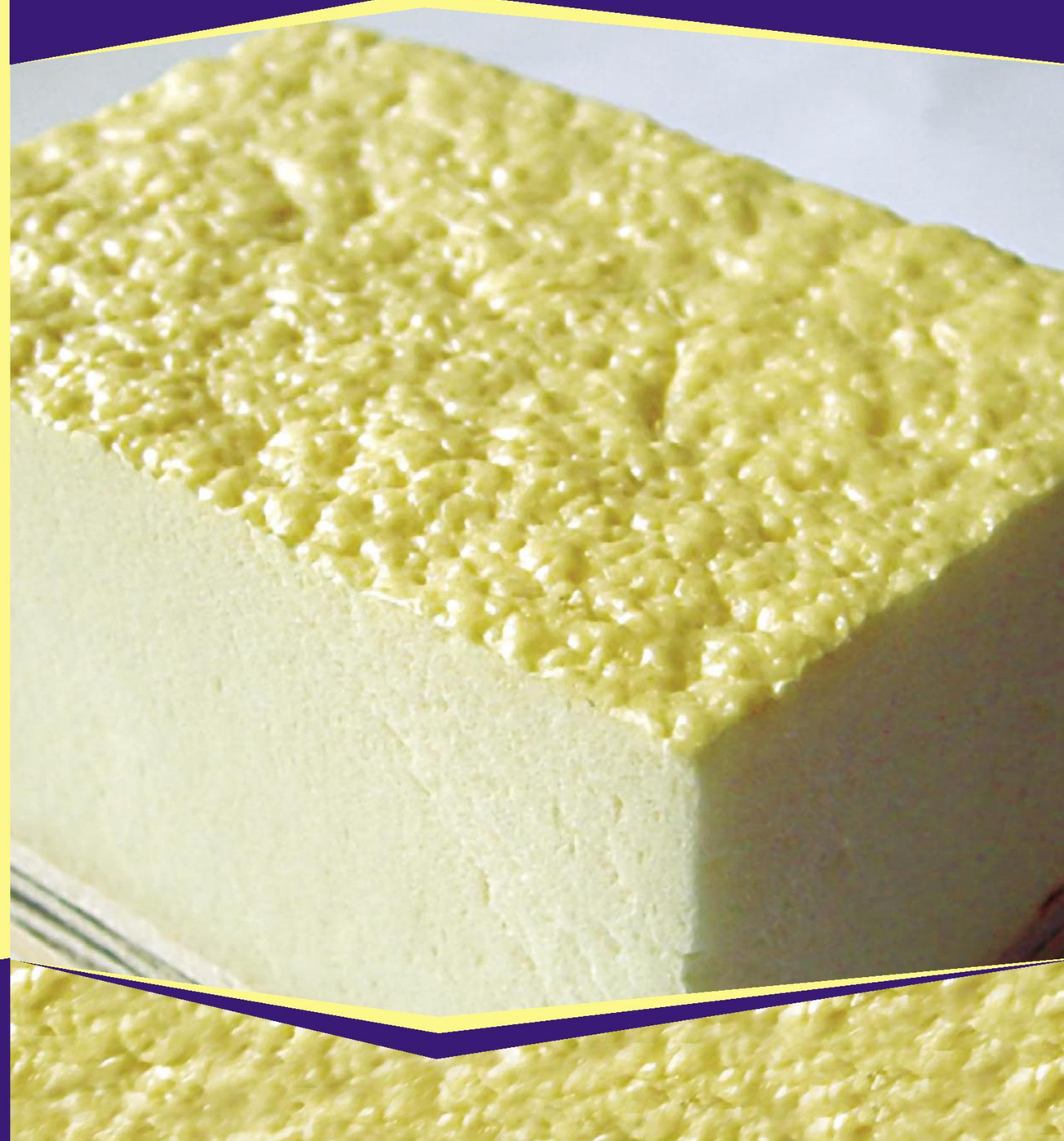
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System House.



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PS 40 / 02	Sandwich Panels for profiles and construction	Clear yellow liquid	500 ± 50	100 : 115	With 141B blowing agent and when combined in the given ration with MDI, it gives excellent flow ability, good demoulding characteristics and thermal insulation properties
CPS 40	Sandwich Panels for profiles and construction	Clear yellow liquid	500 ± 50	100 : 120	With 141B blowing agent and when has a faster reactivity to be used in for manufacture sandwish panel by the continues method.
PS 20 / LV	For Water Heaters	Clear yellow liquid	200 ± 30	100 : 100	With 141B blowing agent and has a good flow ability, excellent adhesion and good thermal insulation properties.
PS 20	For water heaters	Clear yellow liquid	400 ± 50	100 : 100	With 141B blowing agent and has a good flow ability, excellent adhesion and good thermal insulation properties.
SS 40	Spray on Roof	Clear yellow liquid	650 ± 50	100 : 100	Good surface, excellent adhesion and thermal insulation.
SS 40 / C	Spray on Roof	Clear yellow liquid	700 ± 50	100 : 100	Good surface, excellent adhesion, thermal insulation and non dripping on ceiling.
SS 60	Spray	Clear yellow liquid	700 ± 50	100 : 100	Good surface, excellent adhesion and good thermal insulation.
BS 40	PU Slabstock for cutting into boards and pipe sections	Clear yellow liquid	2500 ± 200	Available on request	Foams with very good cell structure, good thermal insulation and compressive strength.
BIR 40 BIR 50	PU Slabstock for cutting into boards and pipe sections	Clear yellow liquid	2200 ± 200	Available on request	PIR block foams with very good cell structure, theremal insulation and excellent fire performance.
FS 50	For preinsulated pipe	Clear yellow liquid	600 ± 50	100 : 110	With 141B, and has slower reactivity facilitating for manual mix with good cell structure, adhesion and thermal insulation properties.
HD 500	Wood imitation	Clear yellow liquid	2500 ± 200	100 : 105	With 141B blowing agent and has good flow ability, excellent surface finish and good compressive strength.

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A = SURFACE AREA OF THE CONSTRUCTION (M^2)

L = THICKNESS OF THE CONSTRUCTION (M)

Δ= DIFFERENCE IN THE TEMPERATURE ON THE TWO FACES OF THE CONSTRUCTON ($^{\circ}C$)

λ = THERMAL CONDUCTIVITY OF THE CONSTRUCTION ($W/M^{\circ}C$)

$$Q = \lambda \frac{A \Delta T}{L} \quad (W)$$

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THE THERMAL CONDUCTIVITY (λ) OF A MATERIAL IS THE AMOUNT OF HEAT IN WATTS PASSING THROUGH A MATERIAL HAVING A SURFACE OF 1 M^2 AND THICKNESS 1 M UNDER A TEMPERATURE DIFFERENTIAL OF 1$^{\circ}C$. HENCE A LOW LAMBDA VALUE INDICATES THAT THE MATERIAL IS A GOOD INSULATOR. λ IS EXPRESSED IN $W/M^{\circ}C$

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THE INSULATION VALUE (K) OF A MATERIAL IS THE THERMAL CONDUCTIVITY OF THE MATERIAL (λ) DIVIDED BY THE THICKNESS OF THE MATERIAL (L) EXPRESSED IN METERS (M)

$$K = \frac{\lambda}{L} \quad (W/M^{2\circ}C)$$

"U" VALUE:

THE TOTAL INSULATION VALUE (U) OF A COMPOSITE CONSTRUCTION IS DETERMINED BY THE INSULATION VALUES OF THE VARIOUS MATERIALS (K1 K2 ETC) FORMING THE CONSTRUCTION, ACCORDING TO THE FOLLOWING FORMULA:

$$U = \frac{1}{0.2 + \frac{1}{K_1} + \frac{1}{K_2} + ETC} \quad (W/M^{2\circ}C)$$

$$U = \Sigma \frac{1}{R_1} + \frac{1}{R_2}$$

THESE ARE BASIC INFORMATION ABOUT HEAT-TRANSFER AND INSULATION VALUES FOR CONSULTANT USE AND CALCULATIONS.



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