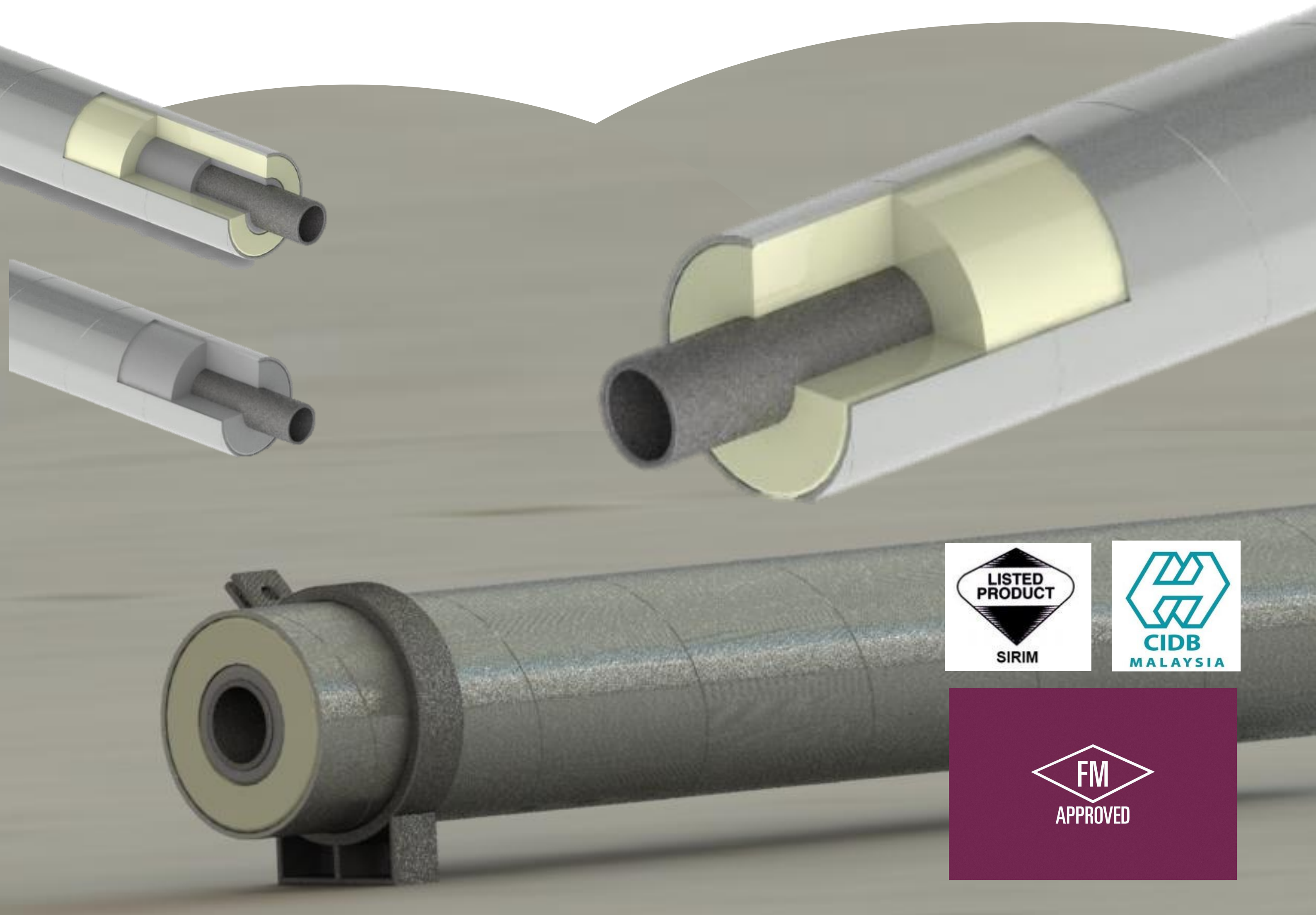
INSAFOAM

INSAPIPEFM

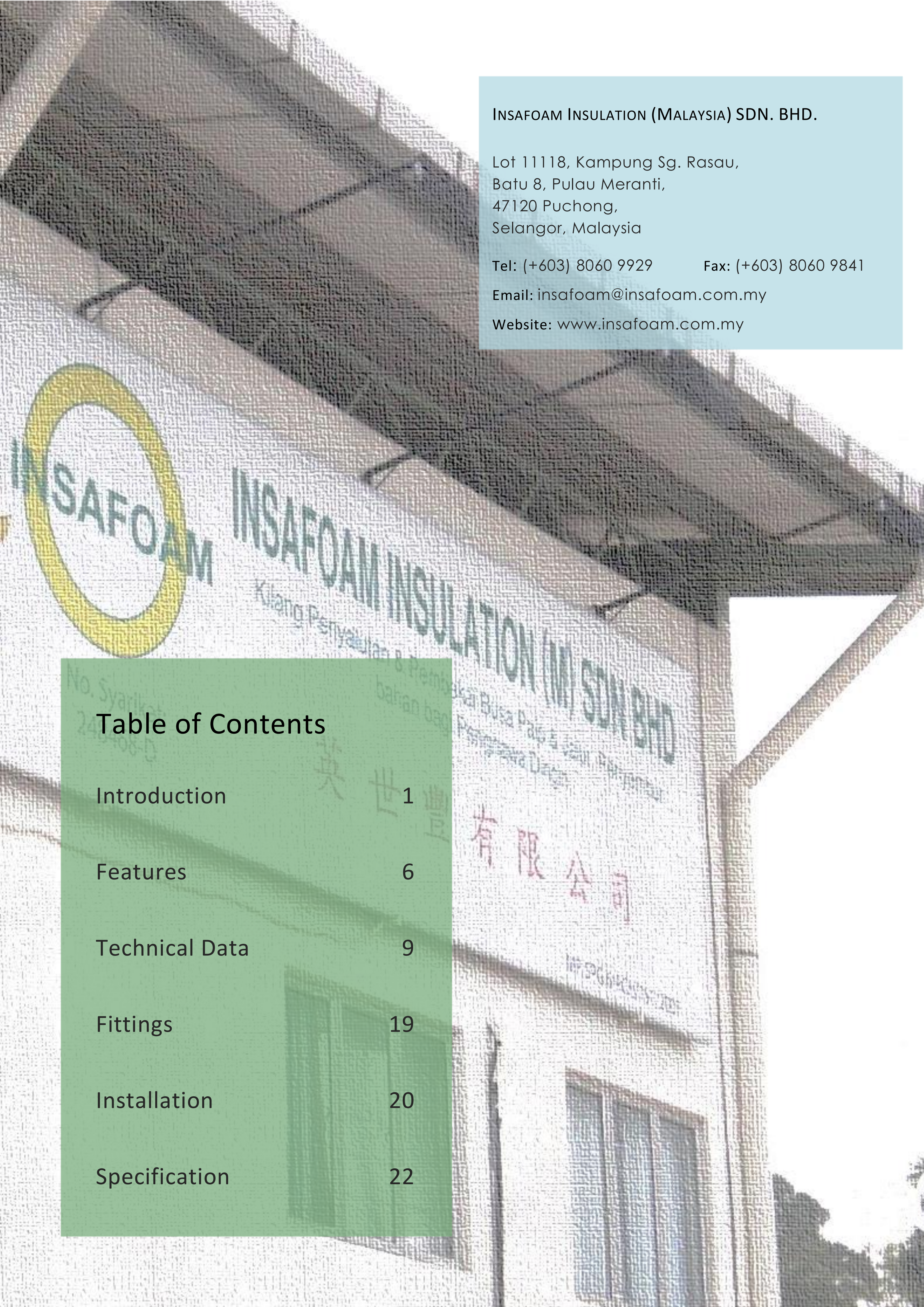
Catalogue



LISTED PRODUCT SIRIM

CIDB MALAYSIA

FM APPROVED



INSAFOAM INSULATION (MALAYSIA) SDN. BHD.

Lot 11118, Kampung Sg. Rasau,
Batu 8, Pulau Meranti,
47120 Puchong,
Selangor, Malaysia

Tel: (+603) 8060 9929 **Fax:** (+603) 8060 9841

Email: insafoam@insafoam.com.my

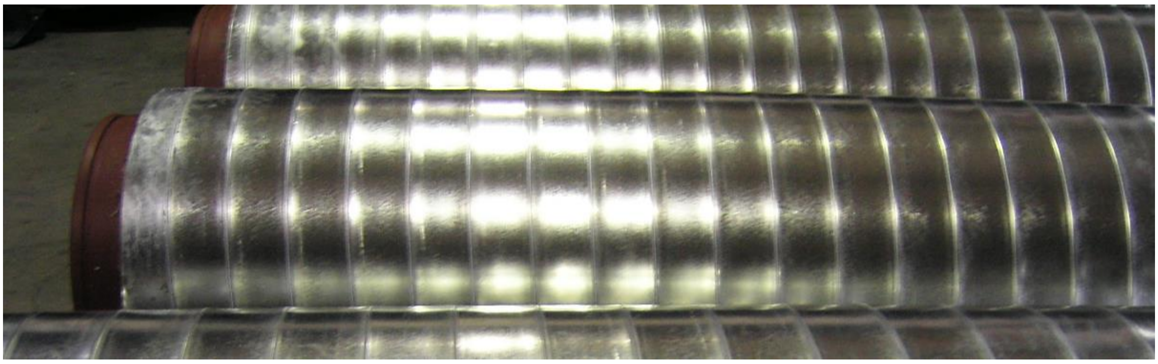
Website: www.insafoam.com.my

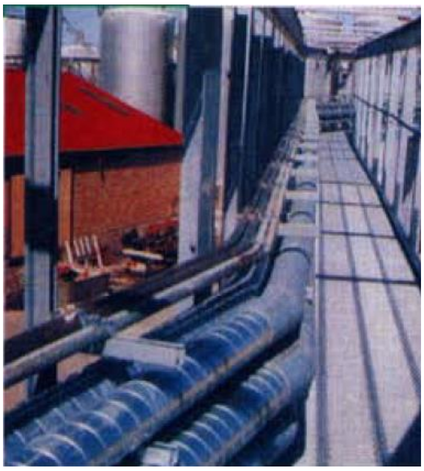
Table of Contents

INSAPIPEFM

INSAPIPEFM is a range of pre-insulated pipes specifically designed for transporting hot or cold fluids for applications above ground level. INSAPIPEFM Above Ground consist of 3 main components; an internal carrier pipe, the insulation layer and jacket. Carrier pipes are usually made from steel.

INSAPIPEFM is available in a range of thickness to suit the different performance requirements for the application. The jacket can be made from galvanised steel or other metal jacketing and the thickness of the material can be modified to suit the application.







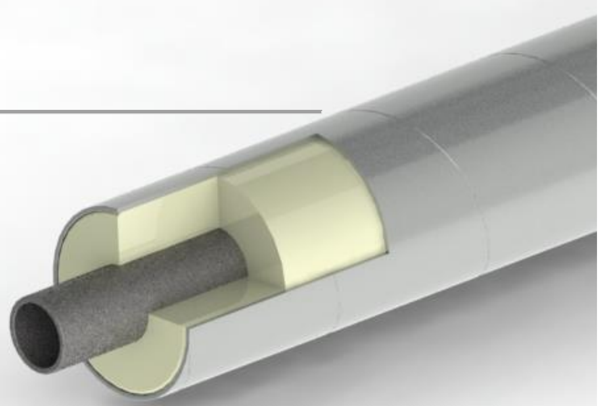

INSAPIPEFM

Polyurethane foam is the main insulator of choice for INSAFOAM. However, because the maximum operating temperature of polyurethane is 120°C, polyurethane should not come into direct contact with a surface of temperature higher than 110°C. Therefore, calcium silicate is included for higher fluid temperatures. The variation of the composition of the insulating layer with different fluid temperatures is shown below.

Low Temperatures

(Between 0°C and 110°C)

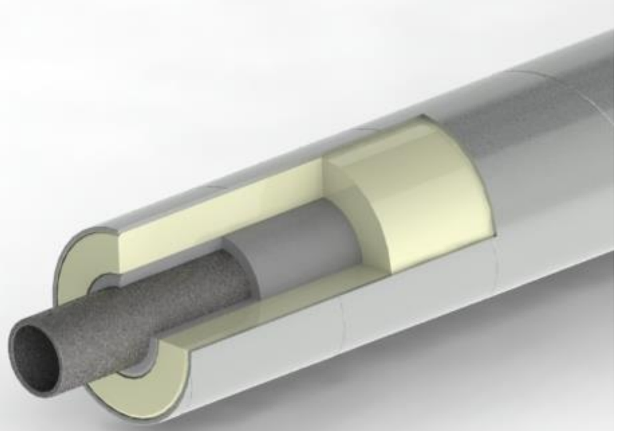
The insulation layer consists of only polyurethane.



Medium Temperatures

(Between 110°C and 500°C)

The insulation layer consists of a combination of polyurethane on the outer surface and calcium silicate on the inner.

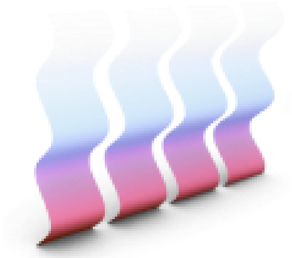


Features & Benefits

Zero Maintenance

The tight insulation provided by the polyurethane foam and the metal jacket ensures that the external face of the carrier pipe is not exposed to the environment. This makes certain that corrosion experienced by the external face of the carrier pipe is minimal.

Superior Thermal Performance



Polyurethane foam is the main insulator of choice for INSAPIPEFM. Polyurethane is one of the best insulating material commonly used and a thermal conductivity as low as 0.024 W/m K can be achieved. This means that the specified thermal performance can be provided with a thinner insulation.

Insulator thickness required to achieve the same thermal resistance of 4 m K/W.

Insulator	Thermal Conductivity (W/m K)	Thickness (mm)
Polyurethane Foam	<0.025	84
Expanded Polystyrene	0.032	128
Rock Wool	0.038	152
Glass Fibre	0.045	180
Calcium Silicate	0.060	240

Reduced Installation Time and Field Cost

INSAPIPEFM pre-insulated pipes come ready for installation. This means that the only insulation that needs to be done on site is at the joints. Therefore, installation time can be significantly reduced. In addition, the insulating process is done in a factory-controlled environment, i.e. no damp insulations, no reliance on site skill, no reduction in quality due to site condition or remoteness and no weather delays.

Moisture Resistant

The structure of the polyurethane foam consists of more than 92% closed cells. This makes it resistant to penetration of other fluids. The polyurethane foam also attaches very tightly to the carrier pipe, preventing water from seeping between the 2 materials.

Environmentally Friendly

The polyurethane foam used by INSAFOAM is CFC/HCFC-free and non-fibrous. In addition, the gassing agent used to produce the foam has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

Fire Resistant

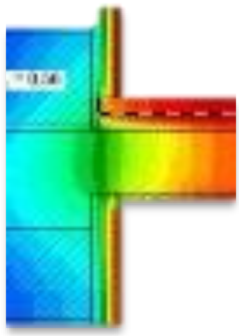
INSAPIPEFM has a 2 hour fire rating to enhance safety and is compliant to Class 'O' fire rating.

Fire test: FM approved class 4924

Sirim Product Certification: BS 476 Part 6 & 7

INSAPIPEFM

No Heat Bridges



Heat bridges occur when the insulating layer of the pipe is interrupted by another material of lower heat resistance. This increases the heat gained by the fluid in the pipe by decreasing the overall heat resistance of the insulation. Condensation is also more likely to occur at the position of heat bridges because of the higher amount of heat conducted, leading to lower surface temperatures at those positions.

INSAPIPEFM pre-insulated pipes avoid heat bridges by being supported outside the jacket. Therefore, there is no penetration through the insulator, avoiding the issues stated above.

High Mechanical Strength

The metal jacket is a spiral tube with a 4-ply lock seam. The spiralling process and 4-ply lock seam produces a tube with high strength and rigidity. In addition, the metal jacket used is impact resistant. Also, the combined mechanical strength of polyurethane and the metal jacket is fairly significant and this makes pre-insulated pipe systems resistant to physical effects.

Technical Data

Insulator Properties

The insulator used is polyurethane foam and is available in multiple densities. The density controls the strength of polyurethane foam, its thermal properties and the percentage of closed cells in the foam. Within the range of densities offered, there is an inverse relationship between the mechanical strength of the polyurethane foam and its thermal conductivity.

Polyurethane foam is made by combining polyol and isocyanate with a blowing agent. The foam generated is homogeneous. The process used to produce the insulator is CFC/HCFC-free.

Density (kg/m^3)	45	50	60
Compressive Strength (kPa)			
Parallel	230	290	370
Perpendicular	210	260	330
Shear Strength (kPa)	252	275	340
Thermal Conductivity (W/m K)	0.023	0.023	0.024
Closed Cell (%)	91%	93%	96%

Calculations

Maximum Heat Transfer

A conservative estimate for the heat transfer to the fluid in the pipe can be made by ignoring several negligible resistances to heat transfer. These include the thermal contact resistance between the layers, thermal resistance from convection in the pipe and thermal resistance from the pipe. This simplifies the calculation and the formula to calculate the maximum heat transfer is shown below.

$$Q' = \frac{(T_{atmosphere} - T_{fluid})}{R + R_{convection}}$$

where†,

Q'	=	Heat transfer per unit length
$T_{atmosphere}$	=	Atmospheric temperature
T_{fluid}	=	Temperature of the fluid in the pipe
R	=	Thermal resistance provided by the insulating layer
$R_{convection}$	=	Thermal resistance provided by convection away from surface

Thermal Resistance of Insulation

The heat transfer across the insulating layer is determined by the temperature difference across the layer and the thermal resistance provided by the insulating layer. The thermal resistance of an insulating layer acts as a measure independent of the operating conditions. This can be calculated using the equation below.

$$R = \frac{\ln\left(\frac{D_{Jacket}}{OD}\right)}{2\pi k}$$

where†,

R	=	Thermal resistance provided by the insulating layer
k	=	Thermal conductivity of insulator
D_{Jacket}	=	Diameter of the metal jacket
OD	=	Outer diameter of pipe

Thermal Resistance from convection

The jacket surface is not at atmospheric temperature. This is because of the thermal resistance due to the convection of air. This resistance can be calculated using the equation below.

$$R_{convection} = \frac{1}{\pi D_{Jacket} \times h}$$

where†,

$R_{convection}$ = Thermal resistance provided by convection away from surface
D_{Jacket} = Diameter of the metal jacket
h = Thermal convection coefficient of air

Maximum Temperature after L m

The maximum temperature can be estimated by assuming the temperature change of the fluid inside the pipe is small. This is given by the equation below.

$$T_{max} = \frac{Q' \times L}{\dot{m}C} + T_{fluid}$$

where†,

Q' = Heat transfer per unit area
L = Pipe length
T_{fluid} = Initial temperature of the fluid in the pipe
$\dot{m}$ = Mass flow rate
C = Specific Heat

Check for Condensation

To check that no condensation occurs at on the surface, we must first find out the temperature at which the condensation can happen (dew point) and compare with the surface temperature calculated from the heat flow across the insulation. The dew point can be found from the table or psychrometric chart shown in the appendix.

The surface temperature can be calculated using the equation below.

$$T_{surf} = \frac{R \times T_{atmosphere} + R_{convection} \times T_{fluid}}{R + R_{convection}}$$

where,

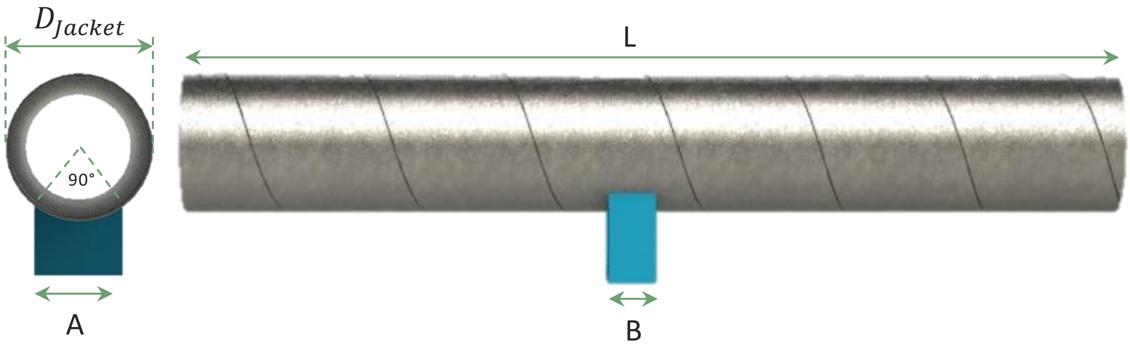
T_{surf}	=	Surface temperature of insulation
$T_{atmosphere}$	=	Atmospheric temperature
T_{fluid}	=	Temperature of the fluid in the pipe
k	=	Thermal conductivity of insulator
D_{Jacket}	=	Diameter of the metal jacket
OD	=	Outer diameter of pipe

If the surface temperature is above the dew point, condensation will not occur.

† All variables are in S.I. units unless stated otherwise

Support Length and Span

INSAPIPE Above Ground is supported outside the jacket. This avoids heat bridges through the insulation. However, polyurethane foam has limited compressive strength. Therefore, there is a limit to the span of pipe it is able to support without damaging the polyurethane foam given a certain support length.



D_{Jacket}	=	Jacket diameter
A	=	Support width
B	=	Support length
L	=	Span

The support width is determined by the jacket diameter as shown in equation below.

$$A = \frac{D_{Jacket}}{\sqrt{2}}$$

The support length and span are chosen based on the load on the column of polyurethane. The maximum allowable span and the support length are related by the equation below.

$$L = \frac{\sigma \times A \times B}{w}$$

where,

σ	=	Compressive strength of polyurethane
w	=	Weight per unit length

The weight per unit length is determined by the size, thickness and density of the pipe, polyurethane foam and jacket and the area the fluid the pipe is carrying is able to occupy.

$$w = \frac{\pi \rho_{fluid}\left(OD - 2t_{pipe}\right)^2}{4} + \frac{\pi \rho_{pipe}\left(OD^2 - \left(OD - 2t_{pipe}\right)^2\right)}{4} + \frac{\pi \rho_{PU}\left({D_{Jacket}}^2 - OD^2\right)}{4} + \pi \rho_{Jacket} D_{Jacket} t_{Jacket}$$

where†,

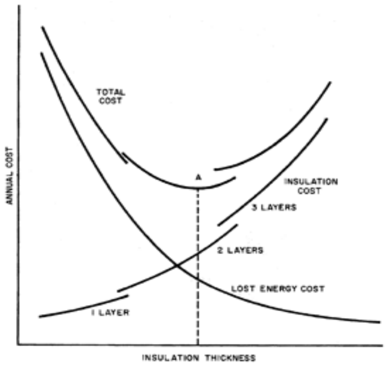
D_{Jacket}	=	Diameter of the metal jacket
OD	=	Outer diameter of pipe
t_{pipe}	=	Pipe thickness
t_{Jacket}	=	Jacket thickness
ρ_{pipe}	=	Density of pipe
ρ_{PU}	=	Density of polyurethane
ρ_{Jacket}	=	Density of metal jacket
ρ_{fluid}	=	Density of fluid

† All variables are in S.I. units unless stated otherwise

Product Classes

– Specifying Insulation Thickness

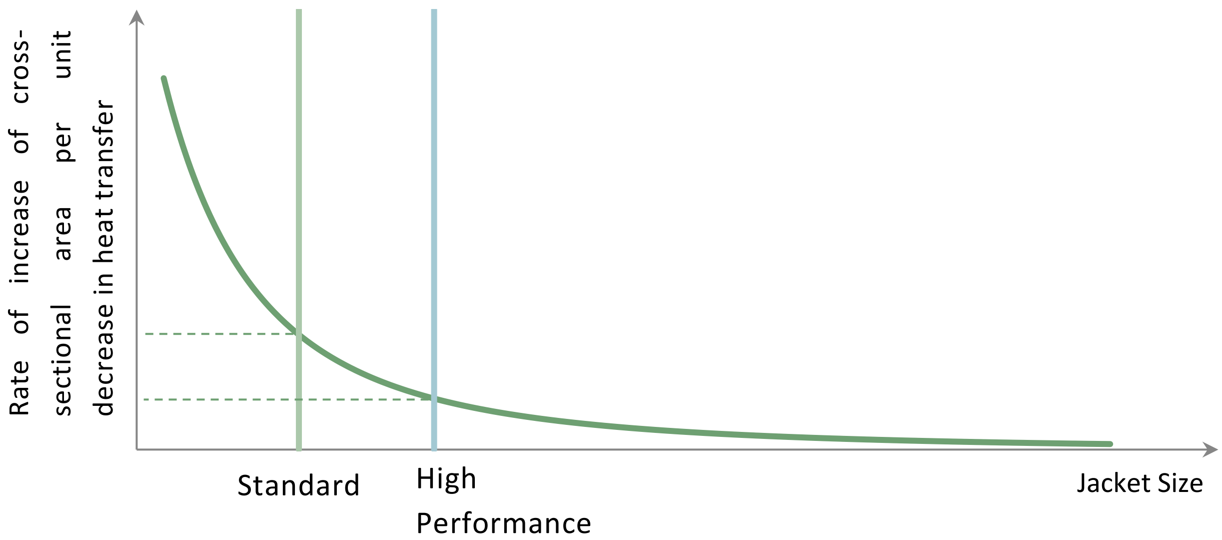
As the insulation thickness increase, the energy lost from heat gained from the surrounding decreases but at a decreasing rate. The insulation cost, however, increases with an increasing rate as the insulation thickness increases.



There is an optimum insulation thickness that minimises the total cost of the system. This optimal thickness differs for each application and pipe size.

INSAFOAM looks to cater to as many applications as possible and we do this through our product classes. 2 product classes are available (standard and high-performance) and the classes correspond to a selected jacket size for each pipe size.

The graph below acts as a guide to accommodate the trade-off between the increasing rate of the cost of insulation and decreasing effect of increasing the insulation when selecting the jacket sizes. As the jacket size increases for the same pipe size, the ratio of the rate of increase in cross-sectional area and the rate of decrease in heat transfer decreases. Selection of the appropriate ration depends on the budgetary and performance requirements.



Standard

Pipe Detail			Jacket Size	Thermal Resistance	Insulation Thickness	Weight	
Standard	NB	OD	Dia	R		w/o water	w water
	(mm)	(mm)	(mm)	(m K/W)	(mm)	(kg/m)	(kg/m)
BS 1387 C	15	21.3	80	10.029	29.35	2.62	2.80
BS 1387 C	20	26.7	100	10.008	36.65	3.42	3.73
BS 1387 C	25	33.4	115	8.311	40.4	4.47	4.96
BS 1387 C	32	42.2	125	7.598	42.05	5.62	6.42
BS 1387 C	40	48.3	135	7.207	43.1	6.38	7.64
BS 1387 C	50	60.3	142	6.491	40.6	8.54	10.51
BS 1387 C	65	73	160	5.458	41.7	10.40	13.72
BS 1387 C	80	88.9	200	5.262	55.25	13.37	18.40
BS 1387 C	90	100	200	4.25	50	14.01	20.37
BS 1387 C	100	114.3	228	4.24	56.55	18.01	25.87
BS 1387 C	125	141.3	250	3.626	54.7	21.98	34.26
BS 1387 C	150	168.3	279	2.999	56.45	25.78	43.46
JIS G3452 Std	200	219.1	320	2.871	51.85	36.26	67.68
JIS G3452 Std	250	273.1	381	2.523	56.8	50.06	99.15
JIS G3452 Std	300	323.9	431	2.165	56.25	63.02	133.72
JIS G3452 Std	350	355.6	458	1.918	51.2	77.80	174.02
API 5L 7.9mm	400	406.4	508	1.691	50.8	88.85	214.53
API 5L 7.9mm	450	457.2	560	1.524	51.4	99.96	259.02
API 5L 7.9mm	500	508	610	1.387	51	111.11	307.48
API 5L 7.9mm	550	558.8	660	1.261	50.6	122.19	359.81
API 5L 7.9mm	600	609.6	711	1.166	50.7	133.36	416.14
API 5L 9.5mm	650	660.4	762	1.085	50.8	169.69	501.56
API 5L 9.5mm	700	711.2	812	1.005	50.4	185.21	570.11
API 5L 9.5mm	750	762	863	0.943	50.5	198.56	640.40
API 5L 9.5mm	800	812.8	914	0.889	50.6	211.91	714.63
API 5L 9.5mm	850	863.6	965	0.841	50.7	225.27	792.79
API 5L 9.5mm	900	914.4	1016	0.799	50.8	244.52	880.78
API 5L 9.5mm	950	965.2	1066	0.753	50.4	258.00	966.91
API 5L 12.7mm	1000	1016	1117	0.718	50.5	350.11	1,135.61

CERTIFICATION

Registration Certificate

BM TRADA CERTIFICATION

ISO 9001:2000

UKAS QUALITY MANAGEMENT 012

Certificate Number 2174

20 March 2003	24 March 2006	4 June 2012
Date of Initial Registration	Date of Last Issue	Date of Expiry

This is to certify that the Quality System of

Insafoam Insulation (Malaysia) Sdn Bhd
(248468-D)
Lot 11118, Kampung Sungai Rasau
Batu 8, Pulau Meranti
47100 Puchong
Selangor
Malaysia

meets the requirements of ISO 9001: 2000
and is registered within the
BM TRADA Certification scheme for approved Quality Systems

Signed on behalf of BM TRADA Certification Ltd

ISO 9001:2000 CERTIFICATE

No Lesen : LI022603
Licence No :

SIRIM QAS INTERNATIONAL

SIJIL BARANGAN TERSENARAI
Product Listing Certificate

LISTED PRODUCT SIRIM

SIRIM QAS International Sdn. Bhd. dengan ini menganugerahkan kepada
SIRIM QAS International Sdn. Bhd. hereby grants to

INSAFOAM INSULATION (MALAYSIA) SDN. BHD.
LOT 11118, KAMPUNG SG. RASAU
BATU 8, PULAU MERANTI
47120 PUCHONG
SELANGOR, MALAYSIA

Sijil untuk menggunakan Tanda Barangan Tersenarai
a certificate to use the Listed Product Mark on

PRE-INSULATED PIPE (POLYURETHANE CORE)

Please refer to detail in the SCHEDULE

sebagai mematuhi keperluan
as complying with

BS 476 : PART 6 : 1989 + A1 : 2009
BS 476 : PART 7 : 1997

Nur Fadhilah binti Muhammad
Ketua Pegawai Eksekutif
Chief Executive Officer
SIRIM QAS International Sdn. Bhd.

Tarikh Mula Pensijilan *Certified Since* : 07 September 2010
Sah Sehingga *Valid Until* : 07 September 2023
Tarikh Dikeluarkan *Issue Date* : 09 September 2022
No Siri *Serial No* : 077723

SIRIM PRODUCT CERTIFICATE
COMPLY TO BS 476 PART 6 & 7

CIDB MALAYSIA

Perakuan Pendaftaran

CIDB G7 CERTIFICATE

FM APPROVED

Certificate of Compliance

This certificate is issued for the following:

INSAPIPEFM Pre-insulated Pipe

Prepared for:

Insafoam Insulation (M) Sdn Bhd
Lot 11118, Kg Sungai Rasau
Batu 8, Pulau Meranti
47120 Puchong, Selangor
Malaysia

FM Approvals Class: 4924

Approval Identification: PR459307 Approval Granted: 2/13/2023

To verify the availability of the Approved product, please refer to www.approvalguide.com

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the specifications as shown in the Approval Guide, an online resource of FM Approvals.

Phillip J. Smith
VP - Manager of Materials
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062

FM Approvals
Member of the FM Global Group

FM APPROVED CERTIFICATE

INSAFOAM

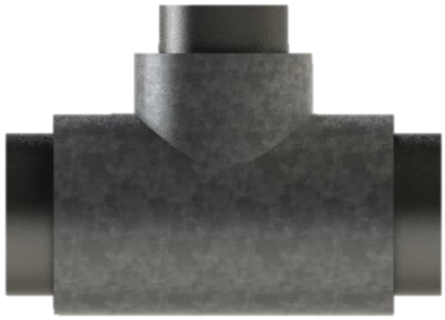
INSAPIPEFM

Fittings

In addition to straight length units, INSAPIPE Above Ground comes with the following fittings. They are all available pre-insulated and ready to be installed on site.

L Bends

Straight Tees



Reducers

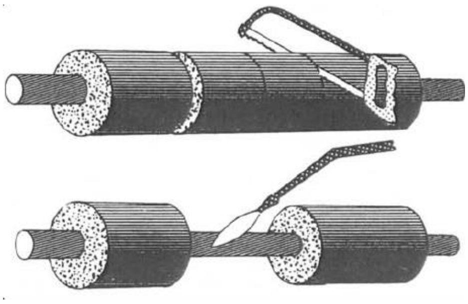
MiniBends

Installation

To install INSAPIPE Above Ground, pipes need to be cut to size and joined and finally, the joints need to be insulated. Some points regarding installation are shown here to provide an idea of how INSAPIPE Above Ground will be installed. A detailed manual for installing INSAPIPE Above Ground is available in the appendix.

Cutting

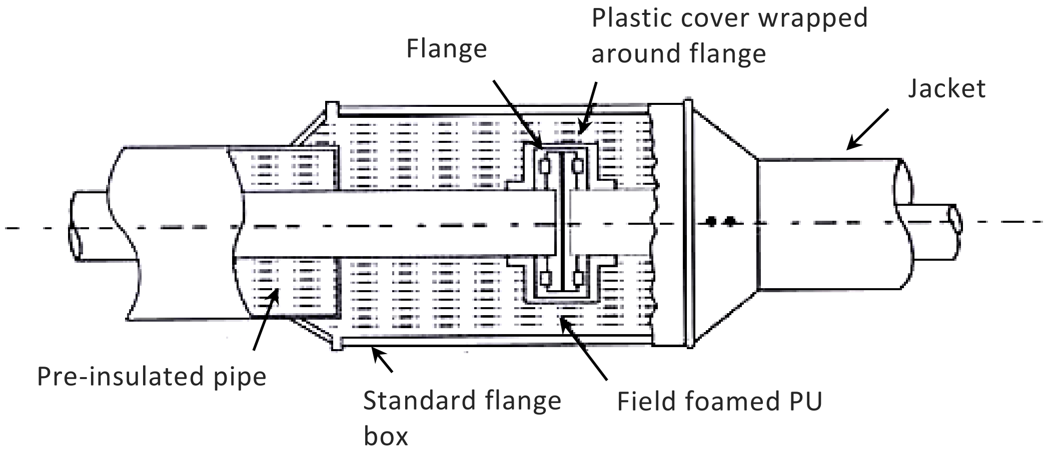
Piping units may need to be cut to field dimensions. A knife, hand saw, or power saw can be used to cut the insulation jacket and insulation. After the insulation has been removed, the service pipe can then be cut and the end preparation restored.



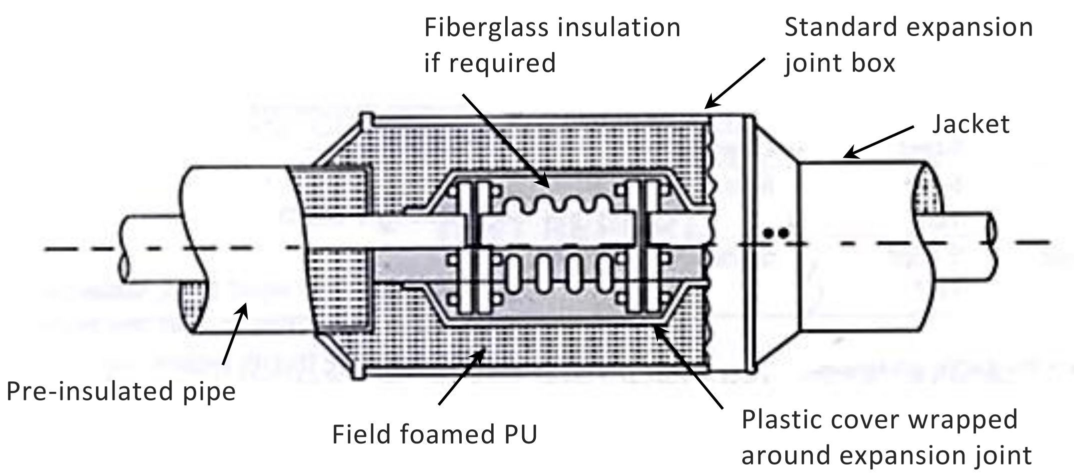
Joining

When joining two pipes together, mechanical couplings such as a flange, expansion joint or a valve joint are often used. These components need to be insulated in the field after installation. This can be done using standard joint boxes. The parts of standard joint boxes are shown on the next page.

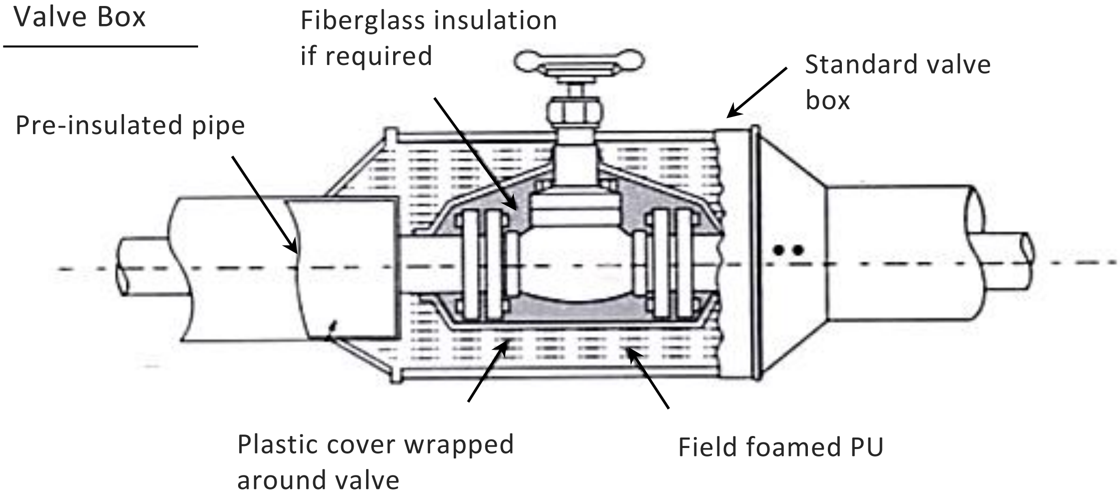
Flange Box



Expansion Joint Box



Valve Box



INSAPIPEFM

Specification – Recommended

GENERAL

All piping systems for service reaching a maximum temperature of 110°C installed aboveground as shown on plans shall be a Insapipe preinsulated and prefabricated piping system with all necessary fittings, expansion loops and accessories, etc., as specified.

The preinsulated pipe manufacturer shall be with ISO certification, FM Approved Certification and SIRIM product certification. The supplier shall have been manufacturing of preinsulated pipes for at least 10 years.

SERVICE PIPE

The service pipe shall be in either of the following standard:

1. Steel Pipe in BS 1387 / EN10255 in Medium or Heavy Grade.
2. Carbon Steel Pipe in JIS G3452.
3. Carbon Steel Pipe in API 5L Gr B / ASTM A53 Gr B (ERW / LSAW / SSAW).
4. Carbon Steel Pipe in ASTM A106 (Seamless).
5. HDPE (High Density Polyethylene) Pipe in MS 1058 / ISO 4427 / DIN8074
6. ABS (Acrylonitrile-Butadiene-Styrene) Pipe
7. PPR (Polypropylene) Pipe

JACKET

The jacket material shall be pre-fabricated with internal spiral lockseam in either of the following material:

1. Galvanised Steel

Pipe Size	Minimum Thickness
25 to 400mm	0.5 mm
401mm and above	0.6 mm

INSULATION

Polyurethane foam shall be environmental friendly with zero ODP. The applied blowing agent shall be either cyclo-pentene or HFC 245fa. The polyurethane foam shall be applied by moulding onto the pipe by injection of the polyurethane foam into the annulus between the service pipe and the jacket.

Physical properties of polyurethane foam shall be as follows:

- Density: Minimum : 60 kg/m3
- Thermal Conductivity : Max 0.024 W/mK
- Compressive Strength : Min 260 kPa
- Closed Cell Content : Min 90% by volume

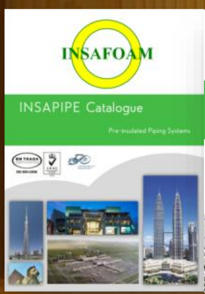
FITTINGS

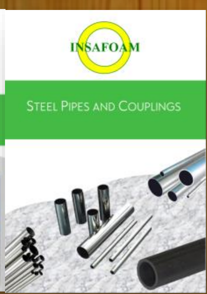
Prefabricated and preinsulated elbows, reducers and tees shall be furnished and installed where shown on plans and shall consist of pipe, insulation and jacket conforming to the same specifications as specified for straight runs.

FIELD JOINT INSULATION

Field Joints shall be insulated with a Two part liquid polyurethane foam, protected by an galvanized jacket. The manufacturer shall supply the field joint kit which inclusive of two part liquid polyurethane chemical and heat shrink sleeve.
The field foaming will be performed by the installing contractor under the instruction of a certified manufacturer's field service technician. To ensure proper and complete expansion of the two part polyurethane foam mix, the installer shall be trained by the manufacturer.

INSAFOAM





Insafoam Insulation (Malaysia) SDN. BHD.

Lot 11118, Kampung Sg. Rasau,
Batu 8, Pulau Meranti,
47120 Puchong,
Selangor, Malaysia

Tel: (+603) 8060 9929
Fax: (+603) 8060 9841
Email: insafoam@insafoam.com.my
Website: www.insafoam.com.my