

POLYTECH

INSULATION



POLYTECH INSULATION SDN. BHD.

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GENERAL PRODUCT INFORMATION

General

Polytech Insulation produce wide range of thermal insulation piping specifically used for most high rise building, industrial, institution and community central heating and cooling system, which called Polypipe. The process pipe suitable for temperature between -50°C to $+150^{\circ}\text{C}$ in any piping system environment.

Polypipe - A pre-insulated polyurethane pipe, it has an excellent thermal conductivity. Insulation of pipes with polyurethane can result in significant energy saving. Polypipe insulation is installed as a single layer which saves space, time and reduces labour cost. Which means it need be only half as thick as others alternative insulation products (thereby improving ease of installation in restricted spaces).

Polypipe, it is achieved by injecting polyurethane between the inner carrier pipe and outer shell pipe, casing. Conventional type of insulation used pipe manually covered with block polyurethane foam. Alternatively, pipes can simply be sprayed with polyurethane foam which is then covered within external coating.

We (Polytech) fabricated all types of pre-insulated piping system products and spiral round ducts and fittings. As following:

- Aboveground piping system
- Underground piping system
- Refrigeration piping system
- Boiler piping system
- Hot water piping system
- Spiral round duct piping system



PRODUCT SPECIFICATION

Manufacturing process

Polypipe is manufactured from three basic component. A pressure tight jacket, the required carrier pipe and rigid polyurethane foam. The carrier pipe is centralised within the outer jacket and the annular space between the jacket and carrier pipe is machine injected with polyurethane foam. The polyurethane foam expands and, upon setting forms a dense homogenous insulation around the pipe.

Description of the following carrier pipe :

- 1. BS 1387 Standard Pipe.
- 2. BS EN10255:2004
- 3. JIS G3452 Standard Pipe.
- 4. API 5L Grade B Seamless and ERW Pipe.
- 5. ASTM A53/A106 Grade B Seamless and ERW Pipe.
- 6. Copper-tube (ASTM B280 / AS1571 / AST B-88 / BSEN 1057 class X & Y)

Description of casing material : Aboveground System Casing

- Internal / External Spiral Lockseam, Galvanised Steel
- Internal / External Spiral Lockseam, Aluminium
- Internal / External Spiral Lockseam, Stainless Steel
- PVC Pipe

Aboveground Outer Casing

- Approx 0.4mm to 0.8mm Galvanised Steel
- Approx 0.4mm to 0.8mm Aluminium
- Approx 0.4mm to 0.8mm Stainless Steel

Underground System Casing

- High Density Polyethylene (HDPE)

Insulation of rigid polyurethane foam and physical properties:

- 1. Density : Minimum 45 kg/m³
- 2. Thermal conductivity : 0.021 W/m·K
- 3. Compressive strength : 320 kPa min
- 4. Closed cell content : 90% minimum
- 5. Insulation thickness shall be determined taking into consideration condensation forming on the outer jacket under the following climatic condition.

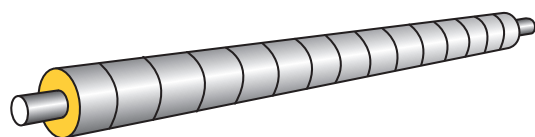
Ambient Temp	RH%	Fluid Temp.
35°C	90	5°C
30°C	95	5°C



ABOVE GROUND PIPING SYSTEM

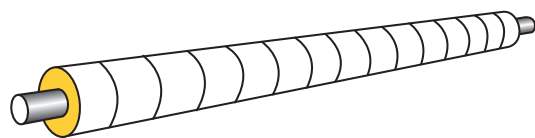
Polypipe is the thermal insulated piping system, factory manufactured stringent production and high quality condition. With our latest production machinery and quality control facilities, Polypipe is progressively developing new pre-insulated pipings range to serve the ever demanding industrial market. The following selection enables a casing to be chosen which will be functional, aesthetically pleasing and most suited to the environment.

A. Metal spiral internal/external lockseam casing. Material: Galvanised steel, Stainless steel, Aluminium or others.



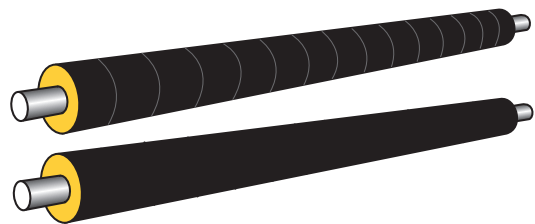
Casing Advantages:
Vapor barrier, Corrosion resistance

B. Metal casing with epoxy coated white, this casing provides a tough durable high gloss surface abrasions. This system incorporates a protective sleeving to guard againts damage during installation. It is recommended that this sleeving be left in place until completion and site insulation.



Casing Advantages:
Vapor barrier, Resistance to sunlight, Corrosion resistance

C. HDPE (High Density Polyethylene) pipe Spiral or One Piece Extruded Black in color. Customarily recognised as an underground casing, but HDPE is equally suitable for aboveground systems.



Casing Advantages:
Vapor barrier, Resistance to sunlight, Corrosion resistance, Resistance to mechanical damage.

*Alternative casing available upon request

Insulation Thickness

The following table shows insulation thickness is normally available for Polypipe. Others thickness are available for specific applications.

Pipe NB (mm)	Jacket Size (mm)														
	80	100	115	127	152	160	178	203	254	279	318	381	432	457	508
15	29	39													
20	26	36													
25		33	40												
32				42											
40				39											
50					46										
65					38	42									
80							44								
100								44							
125									56						
150										56					
200											50				
250												56			
300													56		
350														50	
400															50

Alternative Casing

Polypipe can be supplied in the following components : Straight lengths, L Bends, T Straights, T Crossovers, Anchors and Mini Bends. All are available prefabricated, or as kitsets to be assemble on site or in your own factory. This provides for three basic systems:

Site System

Supplied in pre-insulated straight lengths. Bend, tee and straight joint casing are supplied in kitset form and fitted as the pipeline is installed. The on-site insulation of these fittings being carried out after pressure testing.

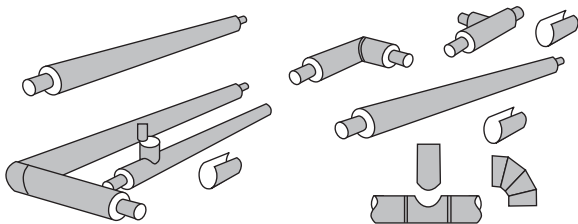
Unitised System

Supplied in pre-insulated straight lengths, bends and tees of standard dimensions. The only site insulation required is the straight joints between units.

Prefabricated System

Supplied in pre-insulated pipe lengths, branch offtakes and bends to specific dimensions and configurations, custom manufactured to individual requirements.

This system dramatically reduces on-site installation costs and reduces site installation to straight joints between prefabricated unit.



Access

Sufficient access is required to enable on-site insulation. To facilitate this function the minimum space required surrounding the item to be insulated is shown in insert alongside.

Expansion

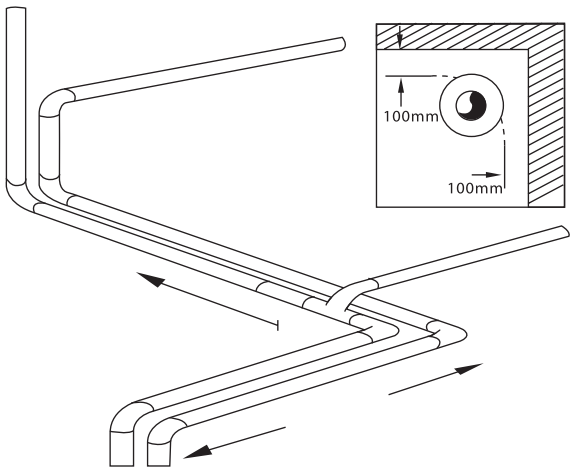
Where the expansion is to be taken into the bends, normal expansion criteria should be used to ensure that the service pipe is not overstressed at the bends

Where expansion bellows or loops are used to cater for expansion, no special allowances are required for using Polypipe. However, if long straight pipe runs are considered, we would highlight the fact that consideration should be given to the expansion stress imposed on the foam and outer casing. This stress criterion depends on many factors but generally expansion into any bends, loop or bellows should be limited to approximately 25 mm of expansion (i.e. 60 metres between bends, loops or bellows at an operating temperature of 80°C)

If movement calculated exceeds the 25mm allowed then provision must be made to accept this movement by providing a loop offset bellows or other mechanical expansion joint.

Change in length = $\frac{\text{Original Length}}{\text{Coefficient of Linear Expansion}} \times \text{Temperature Difference}$
 $m = m \times m/m^{\circ}C \times ^{\circ}C$

Material	Coefficient of Linear Expansion
Steel	12 x 10 -6
Copper	17 x 10 -6
PVC	8 x 10 -6



Process Pipe Selection and Supply

Polypipe can incorporate any specified type of process pipe of any length with due regard to handling and transport. We will be pleased to supply your speciated pipe or alternatively, clients may wish to supply their own pipe.

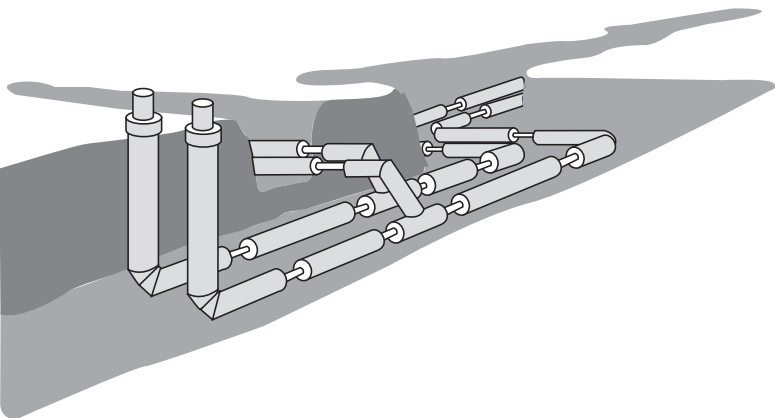
UNDERGROUND PIPING SYSTEM

DESCRIPTION

Polypipe is a factory fabricated and insulated Underground piping system designed for direct burial into an unlined trench. The product is manufactured generally to British Standard 4508 for 'Thermally Insulated Underground Piping System', to Parts 3 and 4, being 'cased systems without air gap'.

The system consists of any type of process pipe conveying hot or cold fluids, centralised within a high density polyethylene outer casing. The annular space between pipe and casing is machine filled with polyurethane foam which expands and, upon setting, forms a totally uniform insulation around the pipe.

Note particularly that all works installed to BS4508 Parts 3 and 4 must be fully prefabricated. Straight joints are the only site work permitted. As an option for chilled water and other non-cyclic applications, kitsets for bends and tees are available for fabrication on-site or in our factory.



Quality Control

The underground environment is particularly harsh by virtue of the abundance of ground water and corrosive conditions. Preventive or regular maintenance is almost impossible, therefore a product for use in this environment must be of the highest quality. Polypipe Underground has undergone much laboratory and experimental testing. Testing of raw materials as listed below together with typical water tightness data are available on request.





Nondestructive testing of steel pipe welds.

- Thermal aging of insulation.
- Pressure testing of process pipe.
- Mechanical properties of casing materials.
- Thermal conductivity of insulation.
- Mechanical properties of completed foam system.
- System test in which a representative pipe circuit subjected to cyclic thermal conditions under external water pressure head.
- A strict regimen of quality control procedures is maintained to ensure that every product made, conforms to our minimum standards, and will thus meet the requirements of British Standard.
- Biological properties of foam system.
- Physical properties of completed system. Tests on typical field joints under cyclic thermal conditions under external water pressure head.

Process Pipe

The pipe shall be suitable for the pressure service specified elsewhere.

All pipes shall have ends suitably prepared for field welding and shall be capped for transport and storage.

Outer Casing

High density polyurethane Grade 5010 Type II carbon black stabilised, extruded in one piece.

Insulation

Insulation shall be methylene di-isocyanate (MDI) based rigid polyurethane foam machine injected into the annular between the service pipe and outer casing by a one shot factory process and shall have the following properties:

Density	Nominal in situ 50kg/m ³
Thermal Conductivity	k value 0.023 W/m·K
Compressive Strength	260kPa at room temperature
Closed Cell Content	90% by volume minimum

Insulation Thickness Underground

PIPE	HDPE	THK	PIPE	HDPE	THK
50	140	37	150	280	52
65	140	30	200	315	44
80	160	32	250	400	58
100	200	39	300	450	57
125	225	38	350	500	66

* Alternative thickness available upon request.

REFRIGERATION PRE-INSULATED COPPER PIPE

Variable Refrigerant Flow (VRF) Air Conditioning System

POLYTECH pre-insulated pipe is a completely factory fabricated, insulated and jacketed copper piping system for distribution of domestic hot water and refrigerant gas lines. Copperline consists of one or two copper tubes insulated with rigid polyurethane foam, which is protected with outer jacket, usually spiral galvanized iron internal lockseam.

The benefits of pre-insulated pipe are:

- 1. To minimize damages and loss during transportation and / or delivery.
- 2. More efficient on works applying on 2 pipe system.

Benefits of Rigid Polyurethane (PU) foam vs. NBR foam

- 1. The k factor is lower than BR foam, which means having good insulation properties hence, condensation is inhibited.
- 2. PU foam will gives longer life span for insulation properties, and more durable physically.
- 3. The fowability of PU foam fill up all the space which could lead to any heat loss.

All POLYTECH's pre-insulated pipe system suction line is at the exact center including the two copper pipe system, this gives advantages as below:

- 1. **BEST INSULATION** properties because this copper suction line is insulated evenly from surround
- 2. **EASY INSTALLATION** where installer no need to adjust the pipe at variety position / angle just to get 2 pipes connected at the required position.

Material

1. Carrier Pipe

The carrier pipe shall be Refrigerant R410a / R32 with the following standard;

- a) ASTM B280
- b) AS1571-1985
- c) JIS H3300
- d) EN 12735-1

** Specifications cover copper UNS No. C1220 & C12200

Recommended CopperLine Copper pipe wall thickness for:

* **Liquid Line** (running pressure estimated at 2.8mpa/ 406psi and above)

1/4'x 0.71 mm thick @ 2045psi	3/8" × 0.71 mm thick @ 1315psi	5/8" × 0.81 mm thick @ 879psi
3/4 × 0.91 mm thick @ 821 psi	1/2" × 0.71 mm thick @ 968psi	7/8" × 1.14mm thick @ 624psi

* **Suction Line** (running pressure estimated at 0.9mpa/130psi)

5/8" × 0.71mm thick @ 766psi	3/4" × 0.71mm thick @ 634psi	7/8" x 0.81 mm thick @ 448psi
1 1/8"x0.97 mm thick @ 380psi	1 3/8" × 0.97 mm thick @ 310psi	1 5/8" x1.22mm thick @ 352psi

Note: Max. Working pressure stated above @psi50deg. C

2. Insulation - Polyurethane foam

The insulation polyurethane foam shall be rigid and machine injected, foamed in place completely filling the annual space between carrier pipe and jacket with the minimum ½” insulation thickness shall be apply.

3. Jacket - Spiral Internal / External Lockseam

The jacket material shall be sufficiently sized to allow for desired insulation thickness for optimum performance of system. Galvanized Iron metal jacket shall have an internal or external spiral lockseam.

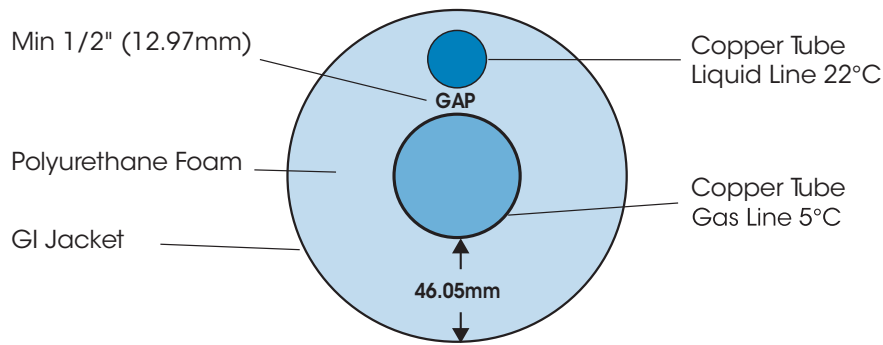
The common sizes of jacket for common gap of ½2 inch between liquid line & Suction Line are listed as the table shown below:

Copper Size	Jacket size					
	80 mm	100 mm	127 mm	152 mm	160 mm	178 mm
3/8" & 1/4"	✓					
1/2" & 1/4"	✓					
1/2" & 3/8"	✓					
5/8" & 3/8"		✓				
3/4" & 3/8"		✓				
3/4" & 1/2"		✓				
7/8" & 3/8"		✓	✓			
7/8" & 1/2"		✓	✓			
1 1/8" & 3/8"		✓	✓			
1 1/8" & 1/2"			✓			
1 1/8" & 5/8"			✓			
1 1/8" & 3/4"			✓			
1 3/8" & 1/2"			✓	✓		
1 3/8" & 5/8"			✓	✓		
1 3/8" & 3/4"			✓	✓		
1 3/8" & 7/8"				✓		
1 5/8" & 5/8"			✓	✓		
1 5/8" & 3/4"				✓	✓	
1 5/8" & 7/8"				✓	✓	
2 1/8" & 5/8"				✓	✓	
2 1/8" & 3/4"				✓	✓	
2 1/8" & 7/8"				✓	✓	
2 5/8" & 3/4"					✓	✓
2 5/8" & 7/8"					✓	✓
2 5/8" & 1 1/8"						✓

4. Insulation of Rigid Polyurethane Foam and Physical Properties:

- a) Density : Minimum 45 kg/m3
- b) Thermal Conductivity: 0.021 W/m·K
- c) Compressive Strength: 320kPa min.
- d) Closed Cell Content: 90% min.
- e) Water Vapor Permeability: 3.7 Perm-cm (2.2perm-in)
- f) Insulation thickness shall be determined taking into consideration condensation forming on the outer jacket under the climate condition eg.l. Ambient temperature 35deg.C, Rh: 90%, Fluid temperature 5deg.C or eg.2. Ambient temperature 30deg.C, Rh: 95%, Fluid temperature 5deg.C





The above example base on the following factor:

- Pipe size: 1 3/8" & 3/4", Jacket: 127mm (PU thickness is 46.05mm Suction in middle)
- Relative Humidity (RH) : 90%
- Ambient temperature: 35°C
- Dew point: 33.11°C
- Casing temperature for 23°C is 33.68°C, Heat Loss -1.52
- Casing temperature for 5°C is 34.11°C, Heat Loss -2.83

Note : Casing Temperature must above Dew Point is SAVE

Below Calculation table is to determine the GAP of 2 pipes ranges gives least heat gain.

Formula : $Q = k \times 2\pi L (\Delta T) / \ln(D2/D1)$

D1	R1= (D1)/2	Gap = variable (mm)	R2=R1+Gap	K	Ln(D2/D1)	Length of pipe=L (meter)	k x 2πL (Δ T)	Temperature of gas pipe = Ta (C°)	Temperature of liquid pipe = Ti (C°)
41.8	20.9	3	23.9	0.020	0.1341	5.8	12.3920	22	5
41.8	20.9	6	26.9	0.020	0.2524	5.8	12.3920	22	5
41.8	20.9	9	29.9	0.020	0.3581	5.8	12.3920	22	5
41.8	20.9	12	32.9	0.020	0.4537	5.8	12.3920	22	5
41.8	20.9	16	36.9	0.020	0.5685	5.8	12.3920	22	5
41.8	20.9	20	40.9	0.020	0.6714	5.8	12.3920	22	5
41.8	20.9	25	45.9	0.020	0.7867	5.8	12.3920	22	5

Temperature change Δ T = Ta-Ti (C°)	Heat Loss = Q	Heat Loss / m	d	Water Vol M³= (πd² / 4) x L	Density water = Kg/m³	C=4.187 Kg/Kg°C	tf (C°)
17	92.4133	15.9333	0.04128	0.00776	7.7634	4.1870	5.00284
17	49.0985	8.4653	0.04128	0.00776	7.7634	4.1870	5.00151
17	34.6056	5.9665	0.04128	0.00776	7.7634	4.1870	5.00106
17	27.3105	4.7087	0.04128	0.00776	7.7634	4.1870	5.00084
17	21.7982	3.7583	0.04128	0.00776	7.7634	4.1870	5.00067
17	18.4581	3.1824	0.04128	0.00776	7.7634	4.1870	5.00057
17	15.7514	2.7158	0.04128	0.00776	7.7634	4.1870	5.00048

For when set liquid line initial temperature (ti) as 5 °C, and the suction line at 22 °C. Base on the calculation of the Heat Gain formula $Q = K \times 2\pi L (\Delta T) / \ln (D2/D1)$, when the gap in between these 2 pipes ranges from 3mm to 25mm; the liquid line final temperature is always maintain at very close to 5°C and only very slightly over. Hence the heat gain is negligible.

ADVANTAGES & SYSTEM BENEFITS

Easy Installation

Specially designed and factory fabricated for easy and speedy installation to save time, labor and cost.

High Quality Control

Prefabrication procedure is well controlled to maintain consistently high quality of our products.

Installation Components

Fittings components such as elbows, tees, expansion loops and anchors are factory assembled for fast installation to all types of environment

Optional Choice of Jackets

There are many types of jacket such as spirally locked seam aluminum, galvanized steel, plastic-coated galvanized steel and stainless steel are available for specific requirement. PVC, polyethylene and UV inhibited plastic jackets are also available.

Application Environment

Polypipe are specially designed to suit indoor, outdoor, commercial and industrial applications.

Economy

Prefabricated and preinsulated, our products are easy to install and thus are very cost effective products.

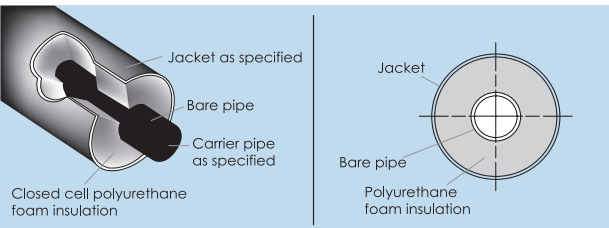
Advantages

- To achieve the maximum thermal efficiency, polyurethane is used for insulation.
- To achieve long lasting, the piping system is protected by metal or plastic material. Capability of supporting from the outside of the outer protective jacket.
- To achieve maximum saving in heat energy, calcium silicate and polyurethane are used as insulating materials.
- Most suitable for application in electric-traced environment.
- Decreased heat loss in the piping system avoiding the overloading and cooling problem of the generator.
- The calcium silicate layer provides high thermal insulation efficiency.
- The polyurethane layer provides the required thickness and density.
- The outer jacket provides the maximum protection to the piping system.
- To achieve maximum system economy, calcium silicate is used exclusively for insulation. Small thickness for desired temperature because of the high compression strength of calcium silicate.
- No temperature limit because calcium silicate is non-inflammable, high-strength inorganic locking insulating agent.

Wide Temperature Range

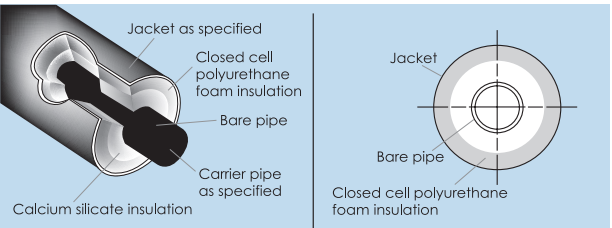
Type A:

Suitable for application of temperature lower and up to 130°C



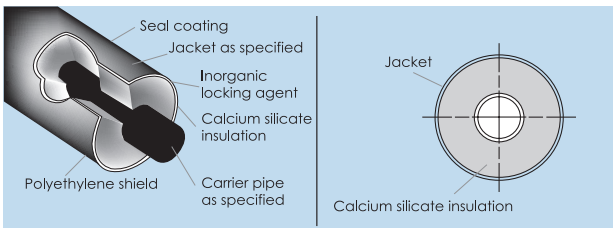
Type B:

Suitable for application of temperature between 130°C & 150°C



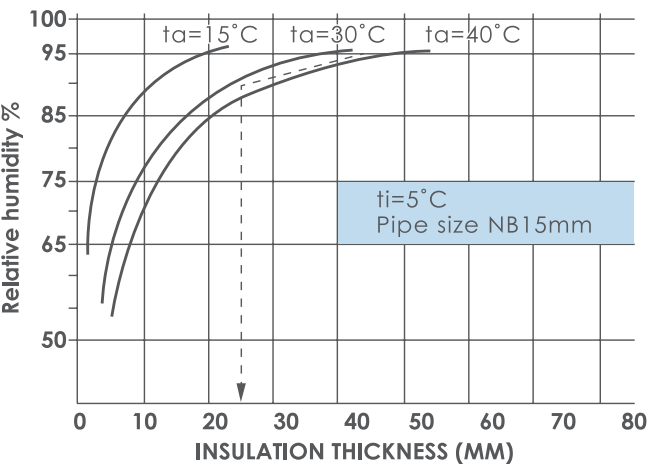
Type C:

Suitable for application of temperature above 150°C



CONDENSATION POINT

The following graphs are prepared as a guide to show the minimum insulation thickness required for prevention of condensation on

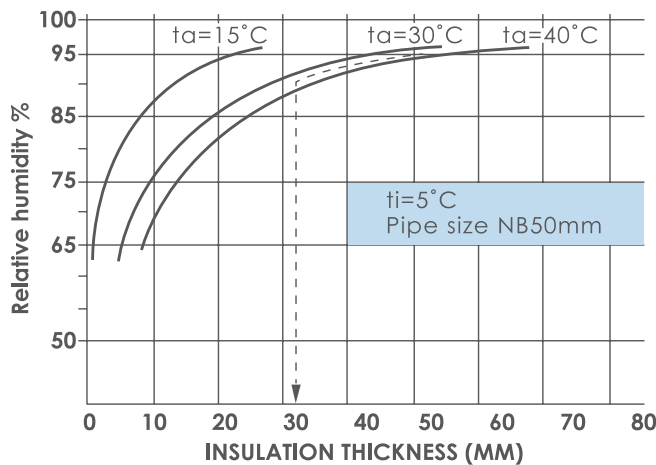


EXAMPLE

When

Pipe Size: **15 mm**
Fluid Temp: **5°C**
Ambient Temp: **35°C**
RH: **90%**

- Required insulation thickness is over 25mm.

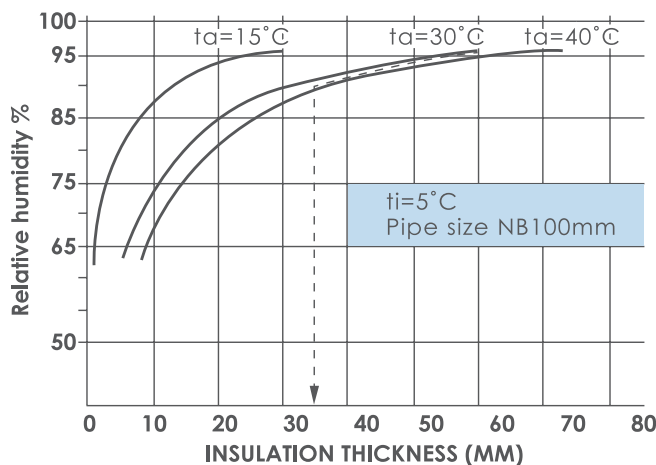


EXAMPLE

When

Pipe Size: **50 mm**
Fluid Temp: **5°C**
Ambient Temp: **35°C**
RH: **90%**

- Required insulation thickness is over 32mm.



EXAMPLE

When

Pipe Size: **100 mm**
Fluid Temp: **5°C**
Ambient Temp: **35°C**
RH: **90%**

- Required insulation thickness is over 35mm.

HEAT GAIN TABLE

Assumes Fluid Temperature 6°C

		Δ T		20 °C		Δ T		35 °C		Δ T		45 °C		Δ T		55 °C		Δ T		65 °C	
Pipe Size		Nom Casing	Insulation Thickness	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point	Heat Gain	Dew Point
NB mm		OD mm	mm	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%	Watts/Lin m	RH%
mm	in	80*	29	1.9	94	3.3	91	5.5	84	5.2	85	6.2	82								
		100	36	1.6	96	2.8	92	3.7	91	4.4	89	5.2	88								
		125	49	1.4	98	2.4	94	8.1	93	3.8	92	4.5	92								
		150	61	1.25	98	2.2	96	2.8	95	3.4	95	4.1	95								
25	1	100	32	2.4	92	3.4	90	4.3	88	5.3	84	6.3	83								
		125	45	2.0	96	2.8	94	3.7	93	4.5	92	5.3	90								
		150	57	1.8	97	2.5	96	3.2	95	3.9	94	4.7	92								
32	1¼	100	28	2.4	95	4.3	90	5.6	87	6.7	85	10.2	78								
		125	40	1.9	96	3.4	93	4.5	91	5.4	90	6.5	88								
		150	53	1.7	98	2.9	95	3.8	94	4.7	92	5.5	91								
40	1½	100	25	2.8	94	4.9	88	6.4	86	7.8	83	9.2	80								
		125	38	2.2	96	3.9	92	5.0	91	6.1	89	7.2	87								
		150	50	1.9	98	3.3	95	4.2	93	5.2	91	6.2	90								
50	2	125	32	2.8	94	5.0	90	6.4	86	7.9	86	9.3	84								
		150	44	2.3	96	4.1	94	5.2	92	6.4	90	7.6	89								
		175	56	2.0	98	3.5	96	4.5	94	5.5	92	6.5	92								
65	2½	125	25	3.8	94	6.7	87	9.3	83	10.5	80	12.4	80								
		150	37	2.9	95	5.1	92	7.0	89	8.1	88	9.5	86								
		175	49	2.4	96	4.3	95	5.5	92	6.7	91	7.9	90								
80	3	150	30	3.9	94	6.9	90	8.9	86	10.9	84	12.9	80								
		175	42	3.1	96	5.5	92	7.0	90	8.6	88	10.2	86								
		200	54	2.6	97	4.6	96	5.9	93	7.3	92	8.6	90								
100	4	175	30	4.8	94	8.5	89	11.0	89	13.4	84	16.0	80								
		200	43	3.8	96	6.6	92	8.5	90	10.4	88	12.3	86								
		225	55	3.2	96	5.5	95	7.1	92	8.1	92	10.2	90								
125	5	200	30	5.9	93	10.4	88	13.4	84	16.4	82	19.3	80								
		225	42	4.5	95	7.9	92	10.2	89	12.5	88	14.7	85								
		250	54	3.7	96	6.5	94	8.4	92	10.2	92	12.1	89								
150	6	250	41	5.3	95	9.3	91	11.9	88	14.6	86	17.3	84								
		275	54	4.3	96	7.6	93	9.7	92	11.9	90	14.1	88								
200	8	325	52	5.4	96	9.4	92	12.1	91	14.3	90	17.5	88								
		350	64	4.5	96	7.9	94	10.3	92	12.5	92	14.8	90								
250	10	350	38	8.4	95	14.7	90	18.9	88	23.2	85	27.4	82								
		375	51	6.7	95	11.7	92	15.0	91	18.4	88	21.7	86								
		380	53	6.4	96	11.2	93	14.4	92	17.7	88	20.8	89								
		400	63	5.6	96	9.8	95	12.6	92	15.4	92	18.2	90								
300	12	400	38	9.9	94	17.4	90	22.3	88	27.2	85	32.2	82								
		425	50	7.8	95	13.6	92	17.6	90	21.5	88	25.4	86								
		450	63	6.5	96	11.4	94	14.6	92	17.9	91	21.0	89								
		458	67	6.2	97	10.8	94	13.9	93	17.0	92	20.0	90								

Vapor Sealing

Where pipelines operate at less than ambient temperatures, it is essential that the outer surface of the insulation be totally vapor sealed. All Polypipe piping systems incorporate a ‘one piece’ pressure type tube as the outer casing ensuring the ultimate vapor barrier. Seams and joints in the casing are limited to bends, tees, straight joints, etc. and at these points the integrity of the vapour sealing is maintained using the best of modern technology available for the various materials used. Vapor sealing is critical for cryogenic and refrigeration applications.

Water Vapor Permeability

Test results are as follows:

- **ASTM - C355**

Spiral wound galvanised or polyester powder coated casing solidpipe - less than 1.8x 10-5metric perms.

- **ASTM - E398**

High density polyethylene casing solidpipe -less than 2.82 × 10-7 metric perms.

HEAT LOSS TABLE

Temperature Differential

Pipe Size NB		Nom Casing ID mm	Insulation Thickness mm	45°C	65°C	85°C	100°C	120°C	140°C
mm	IN			Approx. Heat Loss Watts Per Lin M					
25	1	80*	23	6.9	9.9	13.0	15.3	18.4	21.5
		100	32	5.6	8.2	10.7	12.5	15.1	17.6
		111*	42	5.2	7.5	9.8	11.6	13.9	16.2
32	1½	100	28	7.1	10.2	13.3	15.7	18.8	22.0
		111*	34	6.4	9.2	12.1	14.2	17	19.8
		125	42	5.7	8.3	10.8	12.8	15.3	17.9
40	1½	100	25	8.3	11.9	15.6	18.4	22.1	25.8
		111*	31	7.4	10.6	14	16.3	19.6	22.9
		125	39	6.5	9.4	12.3	14.5	17.4	20.3
50	2	111*	25	9.8	14.2	18.5	22.0	26.2	30.6
		125	32	8.4	12.1	15.8	18.6	22.4	26.1
		+150	44	6.8	9.9	12.9	15.2	18.3	21.3
65	2½	125	26	11.1	16.1	21.0	24.7	29.7	34.6
		145*	35	8.96	12.9	16.9	19.9	23.9	27.9
		+150	37	8.6	12.4	16.2	19.0	22.9	26.6
80	3	145*	28	12.3	17.8	23.2	27.3	32.8	38.3
		+150	30	11.5	16.7	21.8	25.7	30.9	36
		159*	35	10.5	15.2	19.9	23.4	28.1	32.8
100	4	+175	43	9.1	13.2	17.3	20.3	24.4	28.5
		185*	30	14.1	20.5	26.7	31.5	37.8	44.1
		+200	35	12.7	18.3	24	28.2	33.8	39.5
125	5	+200	42	11.0	15.9	20.9	24.5	29.5	34.4
		213*	30	17.3	24.9	32.6	38.4	46.1	53.8
		+225	36	14.9	21.5	28.1	33.0	39.6	46.3
150	6	+225	42	13.2	19.1	25.0	29.4	35.3	41.2
		250	30	20.6	29.7	38.8	45.7	54.9	64.0
		+275	41	15.5	22.4	29.3	34.5	41.4	48.3
200	8	+275	53	12.7	18.3	24.0	28.2	33.8	39.5
		300	28	26.2	37.8	49.5	58.2	69.9	81.5
		+325	40	19.5	28.1	36.8	43.3	52.0	60.7
250	10	+325	53	15.8	22.8	29.8	35.1	42.1	49.1
		380	39	24.5	35.5	46.4	54.6	65.5	76.4
			53	18.8	27.3	35.5	41.8	50.1	58.5
300	12	+400	38	28.9	41.7	54.6	64.2	7.7	90S
		425	50	22.8	32.9	43.1	50.7	60.9	71.0
		458	69	18.1	26.2	34.2	40.3	48.3	56.4

Items marked : * in High Density Polyethylene casings only ; + in metal casing only

For Aboveground systems an excellent approximation of heat gained or lost by an insulated pipeline and of insulation surface temperature can be obtained by using the IHVE formula:

$$Q = \frac{(\theta_w - \theta_\alpha) \pi}{\frac{1}{2k} \ln \left[\frac{D_2}{D_1} \right] + \frac{1}{h_{so} D_2}}$$

and $T_c = \theta_\alpha + \frac{Q}{D_2 h_{so}}$

Where

- θ_w = fluid temperature °C
- θ_α = ambient air temperature °C
- K = thermal conductivity of insulation W/m°K
- Q = heat gain
- D_1 = outside diameter pipe (m)
- D_2 = outside diameter insulation (m)
- T_c = insulation surface temperature °C
- h_{so} = a surface coefficient - normally 8

For Underground systems the B\$4508 quotes the following formula:

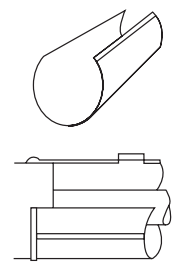
$$R_i = \frac{\ln(1+2t/d_1)}{2\pi k_i} \quad R_s = \frac{\ln(4h/d_2)}{2\pi k_s} \quad Q = \frac{\theta_w - \theta_\alpha}{R_i + R_s}$$

Where

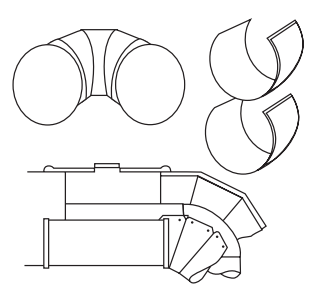
- θ_w = process temp °C
- θ_α = ambient temp °C
- d_1 = outside diameter of process pipe m
- t = thickness of insulation m
- d_2 = outside diameter of casing (m)
- h = depth of burial m
- k_i = thermal conductivity of insulation W/mk
- k_s = thermal conductivity of soil W/mk

SITE INSTALLATION DATA

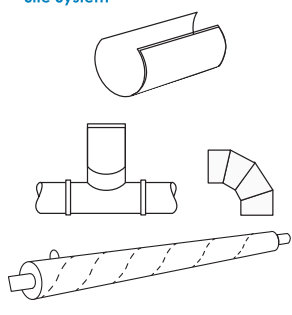
Straight Joints



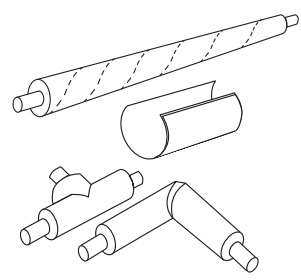
Bends



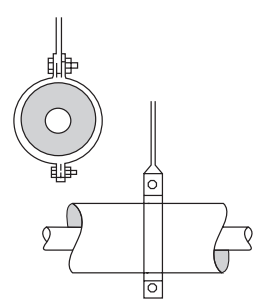
Site System



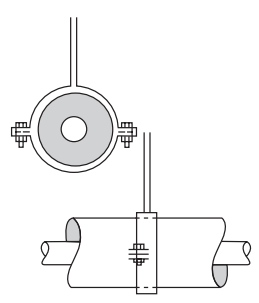
Unitised System



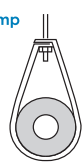
A. Pipe Hanger (ROD)



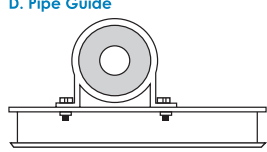
B. Pipe Hanger



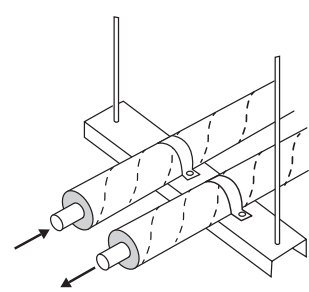
C. U Clamp



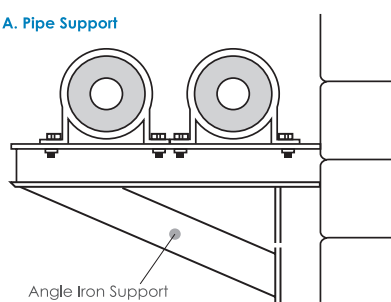
D. Pipe Guide



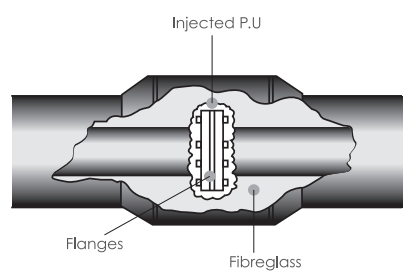
E. Typical Hanger



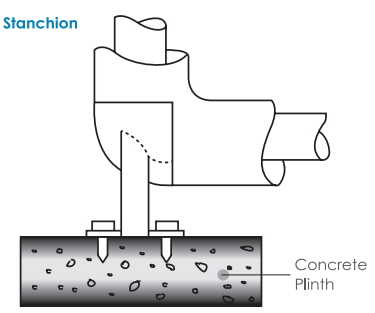
A. Pipe Support



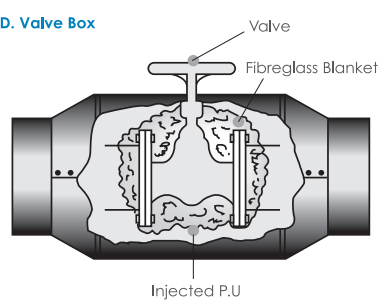
B. Flange Box



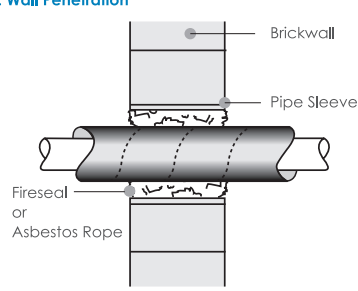
C. Stanchion



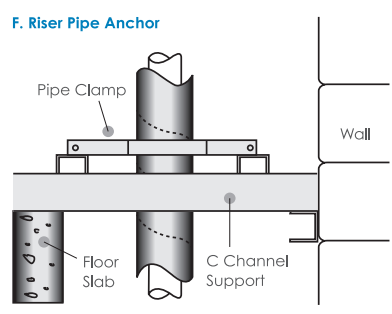
D. Valve Box



E. Wall Penetration



F. Riser Pipe Anchor

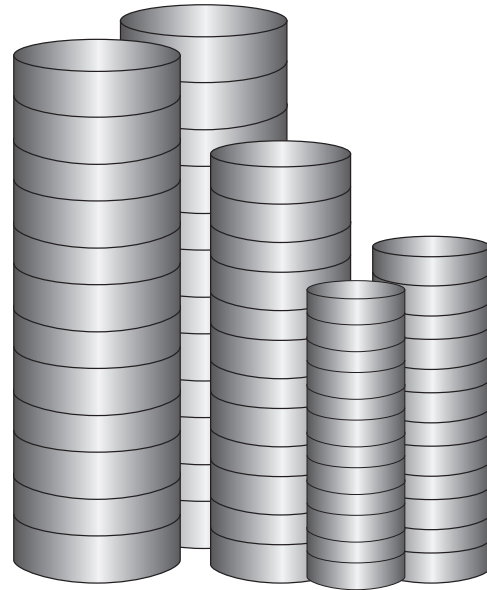




SPIRAL ROUND DUCT

Spiral Round Duct Systems Benefits

- Energy Efficient
- Cost less to install
- Often requires less spaces
- Needs less hangers
- Operation costs lower
- More noise free
- Installation simplified
- Cleaning less complicated
- Airflow measurements easier
- Lighter in weight



Duct

We offer you a flexible range of standard gauges, diameters, lengths and methods of assembly to meet your changing needs for strength, wearability and stability. Our duct is available in standard diameters 80 - 1500mm.

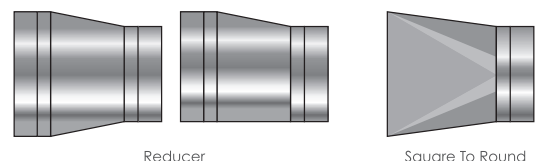
Socket / Connector

Socket or connector is joint connection for the duct.



Reducer and Square to Round

Reducer and square to round very often form an integrated part of any duct system - typically where machines have to be connected, where duct velocities need to be modified etc.

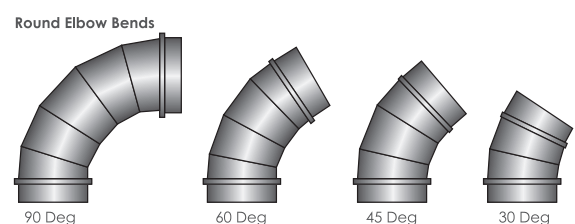


Reducer

Square To Round

Elbows

We offers you a flexible range of standard gauges, diameters, degrees and method of assembly to fill your changing needs for strength, wearability and space availability. Our elbows are segmented and available in standard diameters 100mm to 1500mm.



Round Elbow Bends

90 Deg

60 Deg

45 Deg

30 Deg

JOB REFERENCES

TSH Biotech Wakuba - Tawau, Sabah
Giant - Sepang, Selangor
Rapid KL - Kuala Lumpur
Mahkamah Shah Alam - Shah Alam, Selangor
MPOB Block PDAC - Bangi, Selangor
Rakan Muda Bera - Kuantan, Pahang
MLIP - Kuantan, Pahang
Bukit Tinggi - Klang, Selangor
Nilai International School - Nilai, NS
Sunway College - Sunway, Selangor
Double Tree Hotel - Ampang, KL
Hotel Pahlawan 1 - Melaka
Senai Airport (Extension) - Johor
Alson Klana Bukit Tinggi Hotel - Klang, Selangor
Casa Del Rio Melaka Hotel - Melaka
Akademi Seni Budaya & Warisan Kebangsaan - Kuala Lumpur
Pusat Islam Malaysia - Kuala Lumpur
Hartalega Factory Extension - Kuala Selangor, Selangor
Maybank Bukit Jelutong - Shah Alam, Selangor
TYT Industry Sdn Bhd - Sitiawan, Perak
City Square - Kuala Lumpur
Inspen Sepang - Sepang, Selangor
Sentosa Hospital - Kuala Lumpur
Akept - Nilai, NS
Alesco Paint Factory - Klang, Selangor
KSL City - Johor Bahru, Johor
University Malaya Asasi Sains - Petaling Jaya, Selangor
JPJ - Alor Setar, Kedah
University Malaya Fakulti Pergigian - Petaling Jaya, Selangor
Glomac - Kuala Lumpur
Management and Science University (MSU) - Shah Alam, Selangor
Delta Height Jalan Tun Razak - Kuala Lumpur
Freescale - Petaling Jaya, Selangor
Perdana Hospital Kelantan - Kota Bahru, Kelantan
Lab & Pharmacy Manufacturrer - Nigeria
Audit Negara - Seremban, NS
UTM - Jalan Semarak, KL
Institut Kemahiran Belia Negara - Banting, Selangor
UITM - Shah Alam, Selangor
Hotel Pudu Dalam - Kuala Lumpur
Mines2 - Balakong, Selangor
Mahkamah Syariah - Jalan Duta, KL
Nouvelle Hotel - Kuala Lumpur

Tesco (Refrigeration) - Melaka
RTM - Kota Kinabalu, Sabah
Giant (Refrigeration) - Ulu Tiram, Johor
Ibiden - Penang
Mardi, Serdang Makmal Lepas Tuai - Serdang, Selangor
UIAM - Kuantan, Pahang
UMK - Kota Bahru, Kelantan
Kid Zania Mutiara - Damansara, Selangor
Politeknik Nilai - Nilai, NS
Niosh - Bangi, Selangor
Carrefour Seksyen 23 - Shah Alam, Selangor
UTM BIO SAINS - Johor Bahru, Johor
Stride (VRV) - Kajang, Selangor
UOA Phase2 Blok 7-10 - Bangsar, KL
Marinara Building (Menara 238) - Kuala Lumpur
Multitape - Kulim, Kedah
Cinema Subang Parade - Subang, Selangor
Onsemi - Senawang, NS
IAB - Sepang, NS
KK2 Klinik Kesihatan - Kuala Lumpur
Station 1 Complex - Segamat, Johor
NSK Supermarket - Kuchai Lama, KL
Malaysia Milk - Klang, Selangor
Damansara Specialist Hospital - Damansara, Selangor
Plaza Sentosa - Johor Bahru, Johor
Kompleks Mini Khedn - Langkawi, Kedah
MSU Phase 2 - Shah Alam, Selangor
Tiong Nam (Refrigeration) - Shah Alam, Selangor
Pekan Bukit Kepayang - Seremban, NS
New Gaming - Genting Highland, Pahang
Pearl Regency - Penang
Sony - Bangi, Selangor
Wisma Persekutuan - Kuala Terengganu
Pearl Regency - Penang
Elken - Subang, Selangor
Island Hospital - Penang
Rawang Hospital - Rawang, Selangor
Panasonic - Penang
Mydin - Melaka
Cheras Central - Kuala Lumpur
Ibiden Phase2 - Penang
Weil Hotel - Ipoh, Perak
Waterfrant - KK, Sabah

Nilam Tekad - Port Klang, Selangor
Fibertex Personal Care - Nilai, Negeri Seremban
IPK - JB, Johor
Tune Hotel - Jln Sultan Ismail, KL
Dpulze Ventures - Cyberjaya
Manipal University - Nilai, Negeri Seremban
Infineon - Melaka
Daiman Landmark Hotel - Johor Centre, Johor
AEON Jusco - Bukit Mertajam, Penang
Le Apple Hotel - Kuala Lumpur
Tiga Man Square Shopping Hotel - Shah Alam, Selangor
Artia damansara - Damansara, Selangor
Gleneagle Medini Hospital - Johor Bahru, Johor
Giant - Kampar, Perak
NSK - Rawang, Selangor
Damai88 - Ampang, Kuala Lumpur
Ikea Cheras - Cheras, Kuala Lumpur
KPJ Hospital - Shah Alam, Selangor
Maxims Hotel Genting - Genting Highland, Pahang
IOI City Mall Office Block - Putrajaya
IOI City Mall Hotel - Putrajaya
Kencana Square - Shah Alam, Selangor
Menara Akal Megah - Kota Kinabalu, Sabah
UITM Dengkil - Sepang, Selangor
KPJ Kuantan Specialist Hospital - Kuantan, Pahang
Grand Merdeka Shopping Mall - Kota Kinabalu, Sabah
Electronics - Gelang Patah, Johor
Kuantan Airport - Kuantan, Pahang
KIP Hotel - Jalan Ipoh, Kuala Lumpur
NSK - Seremban, Negeri Sembilan
Asia Pacific University - Bukit Jalil, Kuala Lumpur
Double Tree Hilton - Batu Ferringgi, Penang
Signature Office - Dang Wangi, Kuala Lumpur
De Centrum - Bangi, Selangor
Murata Electronics - Ipoh, Perak
Taman Melawati Mixed Development - Setapak, Kuala Lumpur
Viva Home - Cheras, Kuala Lumpur
Jinko Solar - Seberang Perai, Penang
Vertical 38 - Bangsar, Kuala Lumpur
Q-Cells - Cyberjaya, Selangor
Giant Plentong - Skudai, Johor
Tasek Mall - Skudai, Johor
Hospital Tengku Ampuan Afzan - Kuantan, Pahang

Bangunan Mara - Jalan Raja Laut, KL
Ruma Hotel - Jalan Kia Peng, KL
Muara South Terengganu - Kuala Terengganu, Terengganu
Kuala Krai Hospital - Kuala Krai, Kelantan
Kuantan City Mall - Kuantan, Pahang
Serendah UMW - Serendah, Selangor
Sky Avenue - Genting, Pahang
Sky Plaza - Genting, Pahang
Crockfords Hotel Lobby - Genting, Pahang
Tower 3 Podium - Genting, Pahang
20th Century Fox - Genting, Pahang
AC Velodrome - Nilai, Negeri Sembilan
Zenith Hotel Putrajaya - Putrajaya, Malaysia
KPJ Batu Pahat - Batu Pahat, Johor
Melaka Impression City - Melaka City, Melaka
KDU Penang University College - Batu Kawan, Penang
Ikano, Mutiara Damansara - Damansara, selangor
Ikea Terbau - Terbau, Johor
Putra Indoor Stadium - Bukit Jalil, Kuala Lumpur
EkoCheras - Cheras, Kuala Lumpur
D'Pristine Medini - Nusajaya, Johor
KPJ Kluang Utama Specialist Hospital - Kluang, Johor
KL Eco City - Kuala Lumpur
Pantai Hospital - Bangsar, Kuala Lumpur
Quarza Mall - Taman Melati, Kuala Lumpur
Kensington Green Sepecialist - Skudai, Johor
Unigra Food Processing Asia Pacific - Tanjung Langsat, Johor
Persiaran Forest Height 1 - Senawang, Negeri Sembilan
South Point UOA - Bangsar, Kuala Lumpur
Dinding Poultry Processing - Setiawan, Perak
Gleneagle Medini Hospital - Nusajaya, Johor
Pantiasa Bintulu Boulevard - Bintulu, Sarawak
Alila Resort - Tuaran, Sabah
Majlis Bandaraya Johor Bahru - Johor Bahru, Johor
UOA Kepong 5 - Kepong, Kuala Lumpur
Murata Electronic - Batu Gajah, Perak
Towa-M - Batu Kawan, Penang
Cure & Care Rehabilitation Center - Kuching, Sarawak
Universiti Malaysia Perlis - Kangar, Perlis
Nippon Express Malaysia - Shah Alam, selangor

NOTES:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



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