PT. RICWIL (INDONESIA)

HI-GARD™

Environment Friendly

CFC - FREE
Polyurethane System

PRE - DESIGNED
PRE - ENGINEERED
PRE - FABRICATED
PRE - INSULATED

ABOVEGROUND PIPING SYSTEM

QUALITY SYSTEM

SIRIM
CERTIFIED TO MS ISO 9001 : 2000
REGISTRATION NO. AR 1244

GENERAL INFORMATION

THIS TECHNICAL LITERATURE HAS BEEN ASSEMBLED FOR YOUR INFORMATION. THE HI-GARD™ SYSTEMS DESCRIBED ARE TYPICAL. AND ONLY DEPICT THOSE SYSTEMS THAT HAVE BEEN STANDARDIZED TO MEET REOCCURRING DESIGN PARAMETERS. RICWIL CAN ENGINEER, PRE-INSULATED AND PREFABRICATE A PIPING SYSTEM TO SATISFY MOST DESIGN REQUIREMENTS AND INVITES INQUIRIES FOR SPECIALLY DESIGNED PRE-INSULATED HI-GARD™ PIPING SYSTEM.

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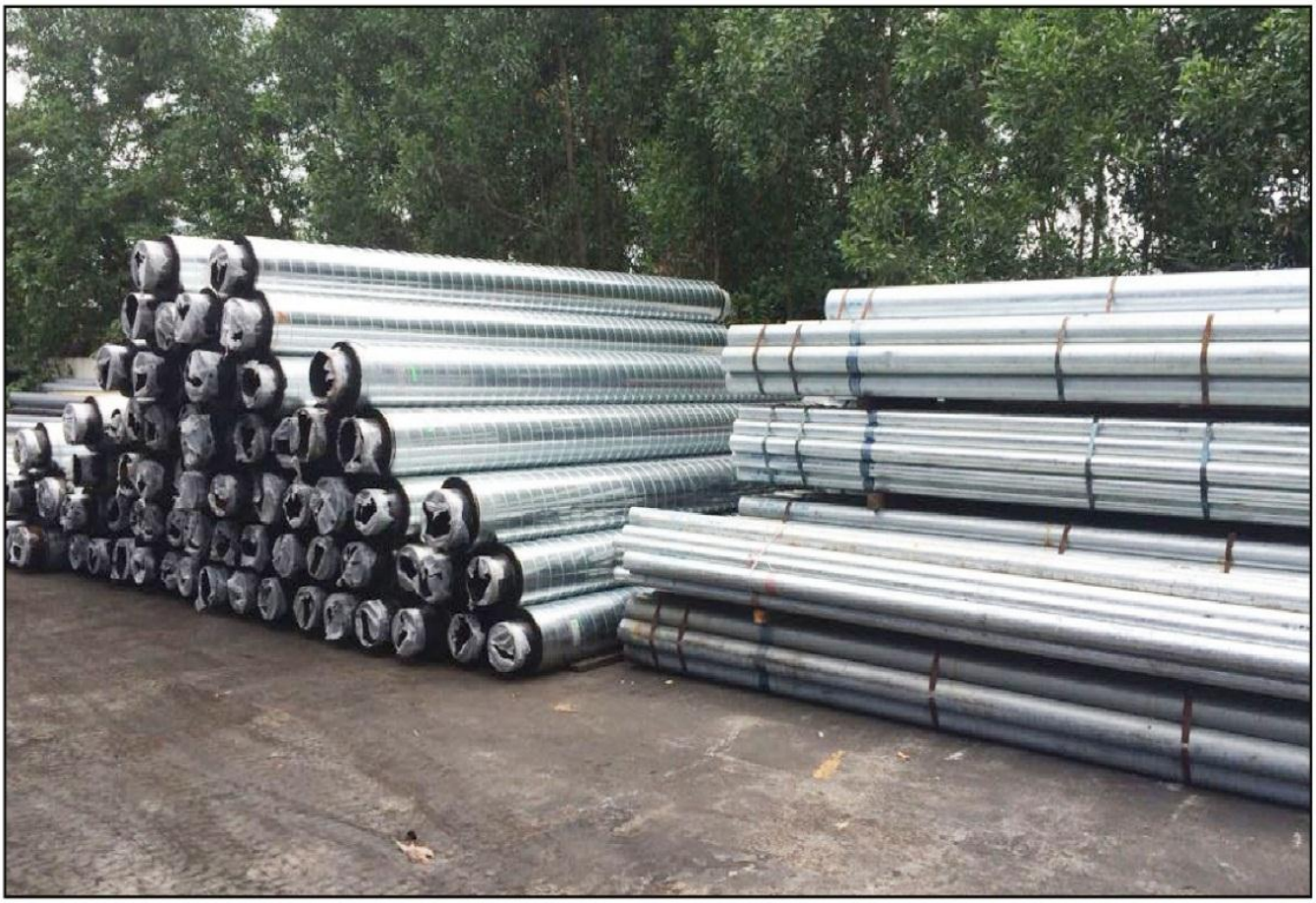
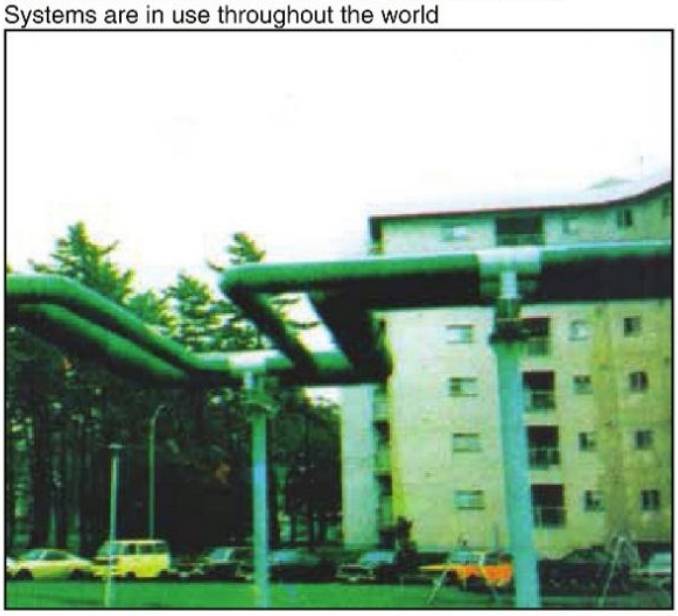


WHERE

RICWIL pre-insulated HI-GARD™ System Is Used.

- **COMMUNITY CENTRAL HEATING AND COOLING**
  and air conditioning systems for public utilities, municipalities, housing projects and commercial developments.
- **INSTITUTIONS OF ALL TYPES**
  including universities and colleges, school systems, hospitals, military establishments.
- **INDUSTRIAL PLANTS**
  for pipe line electric heating, industrial processing, air conditioning, generating electricity, oil storage and handling.
- **HIGH RISE BUILDINGS**
  non-condensation pre-insulated piping system for high rise building in a tropical region.

Thousands of miles of RICWIL pre-insulated Piping Systems are in use throughout the world



Colour jacket HI-GARD

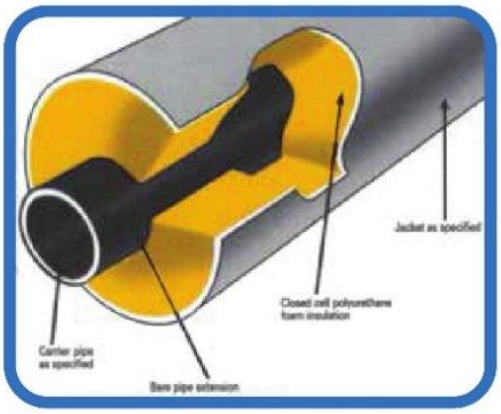
Metal jacket (Alumunium Steel) HI-GARD

Metal jacket (Galvanized Steel) HI-GARD

Metal jacket (Stainless Steel) HI-GARD

PRODUCT DATA

HI-GARD™

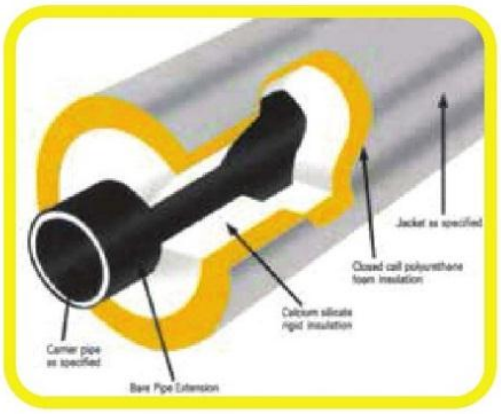


LO-TEMP HI-GARD

RICWIL'S Lo-Temp Hi-Gard piping system is the highest quality, most efficient and dependable method of providing for above-ground distribution of fluids at temperatures up to 130°C.

Lo-Temp Hi-Gard is prefabricated to improve quality and save labor, the Lo-Temp Hi-Gard piping system is completely preinsulated to satisfy insulation and jacketing needs for all above-ground applications, indoors and outside.

Lo-Temp Hi-Gard provides the unparalleled thermal efficiency of factory-applied polyurethane insulation. protected by any one of a multitude of jacket materials. Metal jackets of aluminium, galvanized steel, plasticcoated galvanized steel, stainless steel, and U.V. inhibited plastic jacket of PVC and polyethylene are all available. Lo-Temp Hi-Gard components are factory assembled including all necessary fabricated fittings, such as ells, tees, expansion loops and anchors, so a complete system ready for fast installation is delivered to the jobsite. Supporting of the Lo-Temp Hi-Gard system is simplified by the capability of supporting from the outside of the protective jacket.

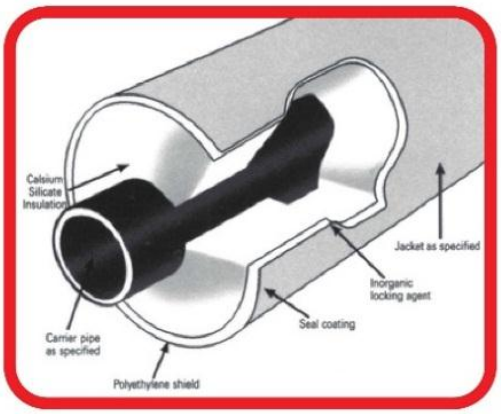


MID-TEMP HI-GARD

RICWIL'S Mid-Temp Hi-Gard piping system provides superior BTU savings in addition to an efficient, high quality, labor-saving method of providing for the distribution of fluids above ground at temperatures of 130° C and above.

A combination of calcium silicate and polyurethane insulation makes BTU savings possible. These savings are extremely desirable in electric-traced applications where every BTU saved lowers electrical equipment material cost and adds to lifelong savings in power usage. These savings also justify Mid-Temp Hi-Gard purchase for many district cooling and heating applications, where every BTU delivered to a customer brings added income to the system owner. supporting of pipe system is simplified by capability of supporting from the outside of the protective capability of supporting from the outside of the protective jacket.

Completely prefabricated and preinsulated. the Mid-Temp Hi-Gard piping system meets the design requirements of all above-ground installations for services of and above where maximum BTU savings are desired. Mid-Temp Hi-Gard maintains thermal efficiency indoors and outside. it consists of a highly thermal-efficient inner layer of calcium silicate, an outer layer of polyurethane factory-applied to the required thickness and density, and a protective jacket of a material best suited to the application. Metal jackets of aluminium, galvanized steel, plastic coated galvanized steel, stainless steel, and U.V. inhibited plastic jackets of PVC and polyethylene are all available. these components are efficiently factory assembled, including all necessary fabricated items such as ells, tees, expansion loops, anchors, etc., to deliver a complete system to the jobsite.



HI-TEMP HI-GARD

RICWIL'S Hi-Temp Hi-Gard piping system provides maximum durability in addition to an efficient, high quality, labor saving method of providing for the distribution of fluids above ground at temperatures above 150° C.

The combination of RICWILs exclusive nonflammable insulation locking agent with calcium silicate makes maximum system economy possible.

Hi-Temp Hi-Gard is a specially formulated, high-strength inorganic locking agent that exhibits virtually no temperature limitations when used in a RICWIL piping system.

The inorganic locking agent's high-compression strength, plus the combination of insulation materials that allows RICWIL to apply the minimum thickness of insulation required to maintain desired temperatures, results in a rugged, durable system. A system that allows maximum bearing loads with maximum support spans. These design savings are added to the economy of Hi-Temp Hi-Gard minimum insulation thickness.

Completely preinsulated to handle all temperatures, the prefabricated piping system is particularly suited for indoor and outside apllications. supporting the Hi-Temp Hi-Gard system is simplified by capability of supporting from the outside of the protective jacket.

Hi-Temp Hi-Gard consists of an inner layer of calcium silicate insulation, factory applied to the required thickness, sealed with a polyethylene shield, covered by an outer layer of RICWILS exclusive inorganic locking agent for strength, and protected by any one of a multitude of metal jacket materials..

Hi-Temp Hi-Gard's nonflammable barrier permits its use in all commercial and industrial environments.

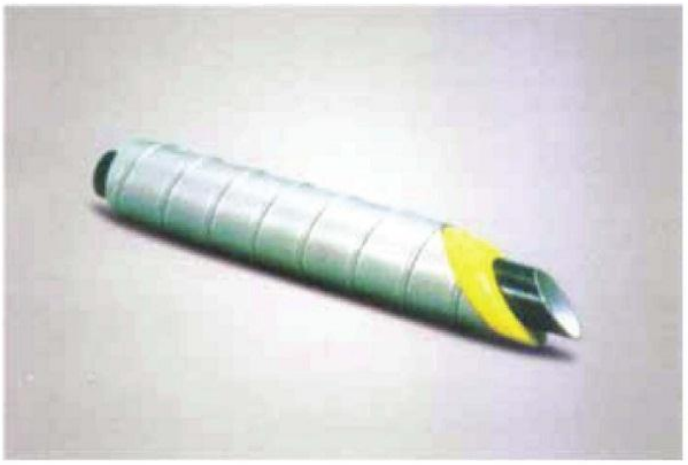
Metal jackets of spirally locked seam aluminium, galvanized steel, plasticcoated galvanized steel and stainless steel are available. these components are factory-assembled including all necessary fittings, such as eils, tees, expansion loops, and anchors, so a complete system ready for fast installation is delivered to your job site.

PRODUCT DATA

HI-GARD™ JACKET ALTERNATIVES

RICWIL®
Preinsulated Piping Systems

The jacket materials shall be as specified shall be sufficiently sized to allow for desired insulatin thickness for optimum performance of system. The Hi-Gard jacket materials are available in either of the following three types



METAL JACKET

- Hot dipped galvanized steel inside or outside lockseam spiral tube, standard thickness:
  0.4 for jacket size 15mm - 100mm
  0.5 for jacket size 125mm - 250mm
  0.6 for jacket size 300mm - 1000mm
- Aluminium
  0.6 for jacket size 15mm - 100mm
  0.7 for jacket size 125mm - 250mm
  0.8 for jacket size 300mm - 1000mm
- Stainless steel

  standard thickness : 0.4mm & 0.5mm

  (Heavier jackets available upon request)

COLOUR JACKET

- Precoated aluminium outside lockseam spiral tube
- Precoated or spray coated galvanized steel outside lockseam spiral tube.

  (various colours and finishes available)

PLASTIC JACKET

- High density polyethylene conforming to:

  DIN 8074
  DIN 8075
  MS 1058
- Extruded PVC conforming to:

  BS 4514 : 1983
  BS 5255 : 1989
  BS 3505 : 1986
  BS 3506 : 1987

The insulation shall be a rigid polyurethane foam and completely fill the annular space between carrier pipe and outer jacket.

• PHYSICAL PROPERTIES OF RIGID POLYURETHANE FOAM

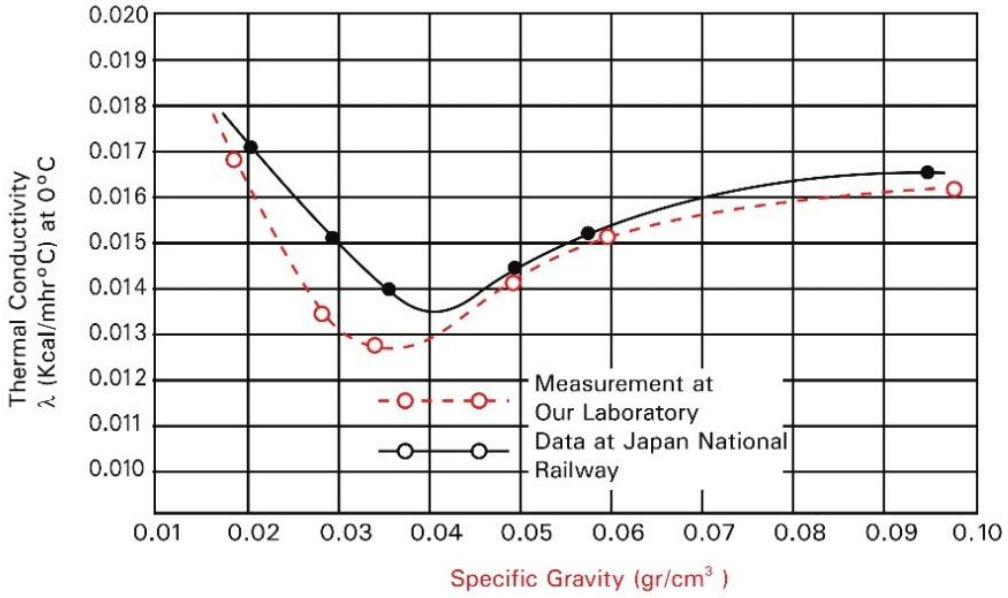
PHYSICAL PROPERTIES	METRIC	METRIC	ASTM TEST
DENSITY	±45 kg/rn^3	±50 kg/rn^3	D1622
THERMAL CONDUCTIVITY	0.017 Kcal/m.h. °C (0.02 W/m.°K)	0.018 Kcal/m.h. °C (0.021 W/m.°K)	C518
COMPRESSIVE STRENGTH	2.0 kgf/cm^2	2.8 kgf/cm^2	D1621
CLOSED CELL CONTENT	90%	91%	D2856
WATER VAPOUR PERMEABILITY	3.7 PERM-CM (2.2 PERM-IN)	3.5 PERM-CM (2.1 PERM-IN)	C355

Above density is RICWIL's standard, and varies as fluid temperature increases.
Higher density polyurethane foam is available upon request.

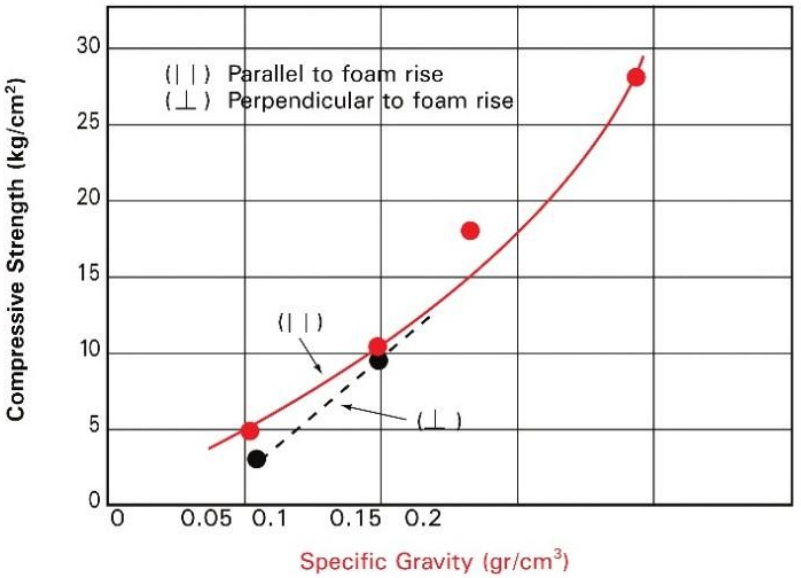
• K-Factor (comparative) @ 20°C mean temperature

RIGID POLYURETHANE FOAM	RUBER FOAM	ROCKWOOL	FIBERGLASS	CALCIUM SILICATE
0.017Kcal/m.h.°C	0.037Kcal/m.h.°C	0.034Kcal/m.h.°C	0.030Kcal/m.h.°C	0.048Kcal/m.h.°C

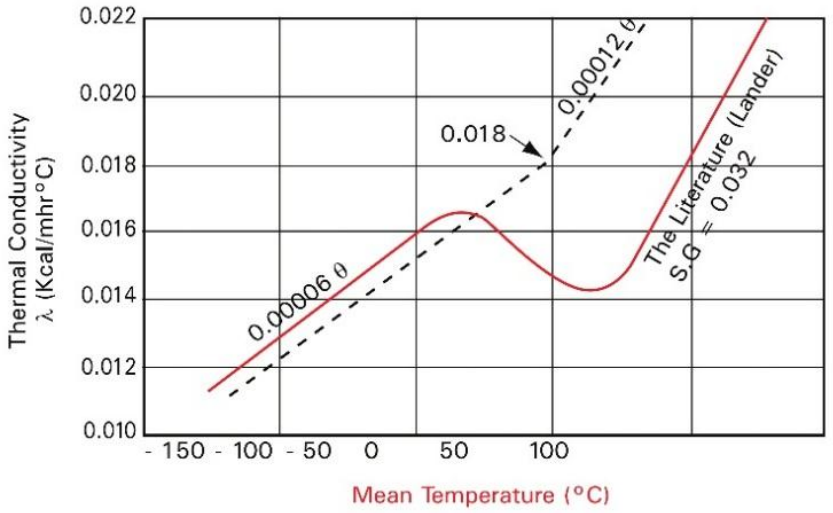
• Relation between K-factor and specific grafity



- **Relation between compressive strength and spesific grafity.**



- **Relation between thermal conductivity and temperature.**



The temperature coefficient so far confirmed is 0.00012 θ
(θ : Average temperature) in near of room temperature

- **The following is the insulation thickness required to limit heat loss to 36 Kcal/m-hr for 100 mm steel pipe in outdoor at 30 deg.C ambient temperature.**

Polyurethane Foam	30 mm
Fiberglass	46 mm
Rockwool	52 mm
Calcium Silicate	77 mm
Cellular Glass Foam	79 mm

ENGINEERING DATA

HEAT LOSS AND HEAT GAIN

Pipe size (NB)	Jacket O.D (mm)	Insulation THK (mm)	Heat loss Kcal/m hr	Heat gain Kcal/m hr
15	75	26.4	12.44	2.27
	101.6	39.7	10.19	1.88
	127	52.4	8.99	1.66
20	75	23.7	15.01	2.73
	101.6	37.0	11.85	2.18
	127	49.7	10.26	1.90
25	75	20.3	18.89	3.41
	101.6	33.6	14.14	2.59
	152.4	59.0	10.57	1.96
32	101.6	29.2	17.72	3.23
	127	41.9	14.37	2.64
	152.4	54.6	12.45	2.30
40	101.6	26.2	20.76	3.77
	127	38.9	16.30	2.99
	152.4	51.6	13.87	2.56
50	101.6	20.2	28.89	5.19
	127	32.9	20.93	3.82
	160	49.4	16.27	2.99
65	127	26.5	27.69	5.01
	152.4	39.2	21.31	3.90
	175	50.5	18.14	3.34
80	127	18.6	41.54	7.42
	152.4	31.3	28.66	5.21
	203.2	56.7	19.22	3.54
100	160	22.4	19.56	8.00
	175	29.9	36.00	6.52
	216	50.4	24.79	4.55
125	225	41.2	33.63	6.14
	254	55.7	27.03	4.97
	304.8	81.1	20.86	3.86
150	225	42.2	37.98	6.93
	275	52.7	32.15	5.90
	318	74.2	25.11	4.64
200	304.8	52.2	47.19	8.60
	318	48.8	42.12	7.71
	406.4	93.0	25.97	4.81
250	355.6	40.7	58.53	10.65
	406.4	66.1	39.80	7.32
	431.8	78.8	34.75	6.41
300	406.4	40.7	67.95	12.36
	431.8	53.4	54.43	9.97
	508	91.5	35.50	6.56

The calculations are performed on the basis of following conditions.

(1) Heat loss

Carrier pipe : ASTM A53 Gr. B

Insulation : Rigid polyurethane foam

- Density 35 kg/rn³
- Thermal conductivity 0.027 Kcal/m.hr.°C @75°C

Jacket : Galvanized spiral steel

Fluid temperature : 130°C

Ambient temperature : 30°C

(2) Heat gain

Carrier pipe : ASTM A53 Gr. B

Insulation : Rigid polyurethane foam

- Density 35 kg/rn³
- Thermal conductivity 0.027 Kcal/m.hr.°C @20°C

Jacket : Galvanized spiral steel

Fluid temperature : 5°C

Ambient temperature : 30°C

(3) Calculation formula (by I.H.V.E)

Heat gain

$$Q = \frac{(Tw - Ta)\,\pi}{\frac{1}{2K}\,LN\,\frac{D2}{D1} + \frac{1}{\alpha D2}}$$

where K = 0.020 Kcal/m hr °C

Heat loss

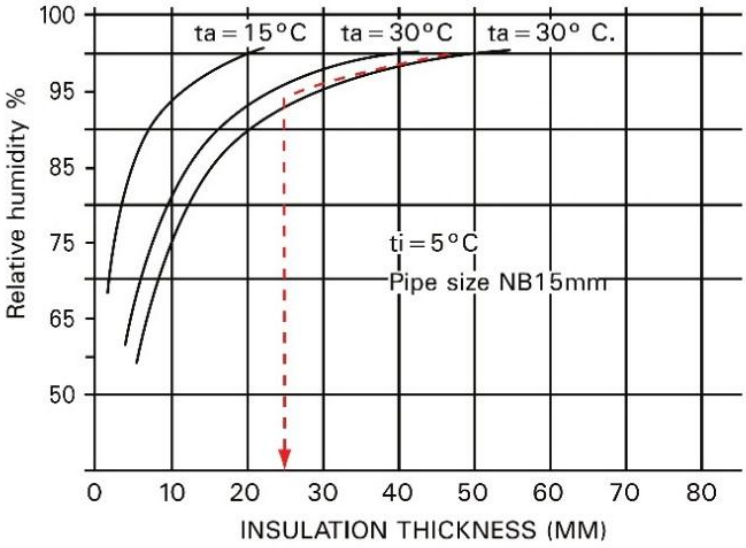
$$Q = \frac{(Tw - Ta)\,\pi}{\frac{1}{2K}\,LN\,\frac{D2}{D1} + \frac{1}{\alpha D2}}$$

where K = 0.027 Kcal/m hr °C

Tw = Working temperature
Ta = Ambient temperature
D2 = Jacket diameter
D1 = Carrier pipe outside diameter
α = 8 (Dull metallic surface still air)

Note : Kindly contact Ricwil or their respective agent for information if pipe diameter is larger than 300mm. The above information seives as a guide only.

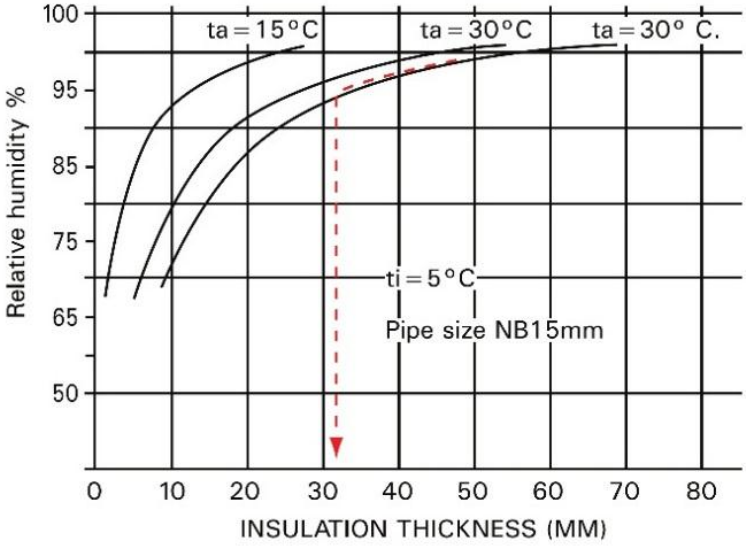
The following graphs are prepared as a guide to show the minimum insulation thickness required for prevention of condensation on the surface of outer jacket at ambient temperature of ta =15°C, 30°C and 40° C.



EXAMPLE

WHEN
PIPE SIZE : 15 mm
FLUID TEMP : 5°C
AMBIENT TEMP : 35°C
RH : 90%

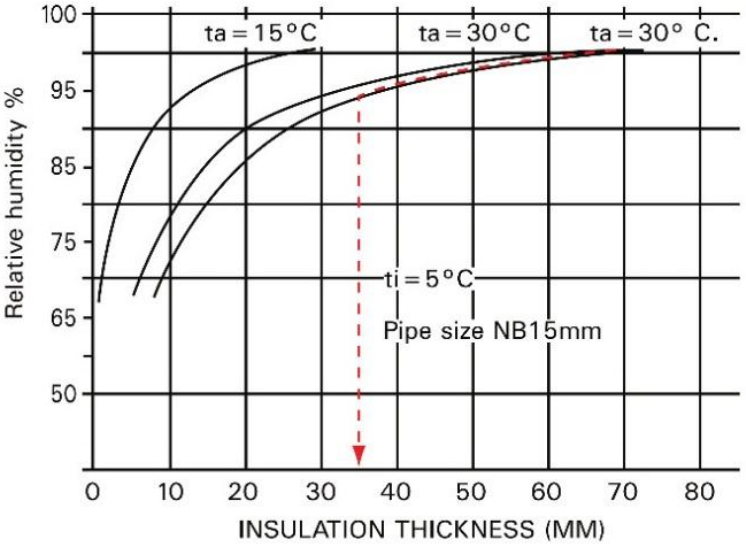
Required insulation thickness is over 25 mm



EXAMPLE

WHEN
PIPE SIZE : 50 mm
FLUID TEMP : 5°C
AMBIENT TEMP : 35°C
RH : 90%

Required insulation thickness is over 32 mm



EXAMPLE

WHEN
PIPE SIZE : 100 mm
FLUID TEMP : 5°C
AMBIENT TEMP : 35°C
RH : 90%

Required insulation thickness is over 35 mm

If further information is required for other pipe sizes, please contact RICWIL engineering department.

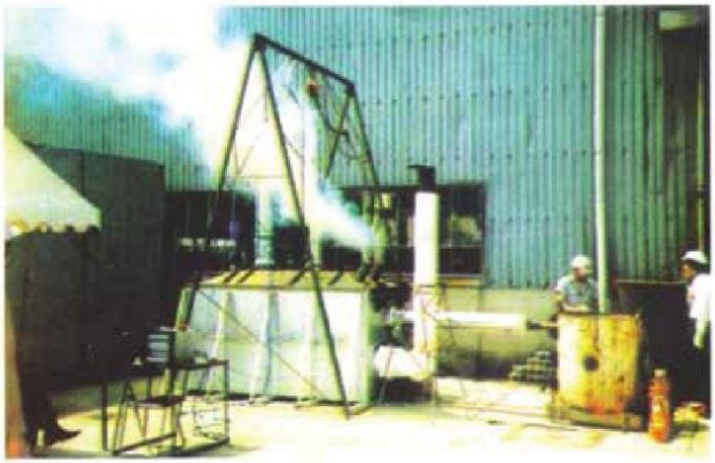
ENGINEERING DATA

FIRE TEST OF HI-GARD™

2-hour fire test of RICWIL HI-GARD™ system was conducted in a furnace with a temperature in excess of 1,000° C in order to examine the integrity of the jacket and joints and fire development along the polyurethane insulation encased in outer jacket when exposed to fire.

Picture shows the HI-GARD™ jacket is still intact, the insulation system not generating the flame spread, and smoke emission.

Hi-Gard™ test specimen was installed in the furnace.



The test specimen was exposed to fire for 2 hours with the temperature in excess of 1,000°C.
The test was conducted in accordance with ISO 834
"Fire resistance test - Elements of building construction".

The Hi-Gard™ system tested was still intact through- out the 120 minutes exposure to fire and no flames or smoke escaped from unexposed sections of pipe.
(The above test report No. 6979 issued by WAKA-YAMA Prefectual Industrial research institute is available upon request.)

ENGINEERING DATA

HI-GARD™ STANDARD COMBINATION

RICWIL®
Preinsulated Piping Systems

Pipe size NB x W.T (mm) ❶	Jacket O.D x W.T (mm) ❷	Insulation thickness (mm) ❸	Weight in kg per	
			Meter	Std. Length (6m)
15 x 2.77	75 x 0.5	26.4	2.5	15
	101.6 x 0.5	39.7	3.0	18
	127 x 0.5	52.4	3.5	21
20 x 2.87	75 x 0.5	23.7	2.8	17
	101.6 x 0.5	37.0	3.3	20
	127 x 0.5	49.7	3.8	23
25 x 3.38	75 x 0.5	20.3	3.7	22
	101.6 x 0.5	33.6	4.2	25
	152.4 x 0.5	59.0	5.2	31
32 x 3.56	101.6 x 0.5	29.2	5.0	30
	127 x 0.5	41.9	5.5	33
	152.4 x 0.5	54.6	6.2	37
40 x 3.68	101.6 x 0.5	26.2	5.7	34
	127 x 0.5	38.9	6.2	37
	152.4 x 0.5	51.6	6.7	40
50 x 3.91	101.6 x 0.5	20.2	7.0	42
	127 x 0.5	32.9	7.5	45
	160 x 0.5	49.4	8.3	50
65 x 5.16	127 x 0.5	26.5	10.7	64
	152.4 x 0.5	39.2	11.2	67
	175 x 0.5	50.5	11.7	70
80 x 5.49	127 x 0.5	18.6	13.3	80
	152.4 x 0.5	31.3	13.8	83
	203.2 x 0.5	56.7	15.0	90
100 x 6.02	160 x 0.5	22.4	18.7	112
	175 x 0.5	29.9	19.0	114
	216 x 0.5	50.4	20.0	120
125 x 6.55	225 x 0.6	41.2	27.0	162
	254 x 0.6	55.7	27.8	167
	304.8 x 0.6	81.1	29.7	178
150 x 7.11	254 x 0.6	42.2	34.2	205
	275 x 0.6	52.7	34.8	209
	318 x 0.6	74.2	36.5	219
200 x 8.18	304.8 x 0.6	42.2	49.7	298
	318 x 0.6	48.8	50.2	301
	406.4 x 0.6	93.0	53.7	322
250 x 9.30	355.6 x 0.6	40.7	68.4	410
	406.4 x 0.6	66.1	70.8	425
	431.8 x 0.6	78.8	72.1	433
300 x 9.52	406.4 x 0.6	40.7	82.9	497
	431.8 x 0.6	53.4	84.2	505
	508.0 x 0.6	91.5	88.3	530

❶ Wall thickness is based on ASTM A53 GR.B standard weight. JIS, DIN or BS standard can be supplied upon request.

❷ Jacket wall thickness is based on galvanized lock seamed spiral tube. Heavier wall is available upon request.

❸ Insulation thickness shown on above table indicates calculated thickness only. Actual thickness varies due to carrier pipe O.D tolerance and manufacturing dimensional tolerance.

Note : Kindly contact Ricwil or their respective agent for information if pipe diameter is larger than 300mm and density more than 35kg/rn³.

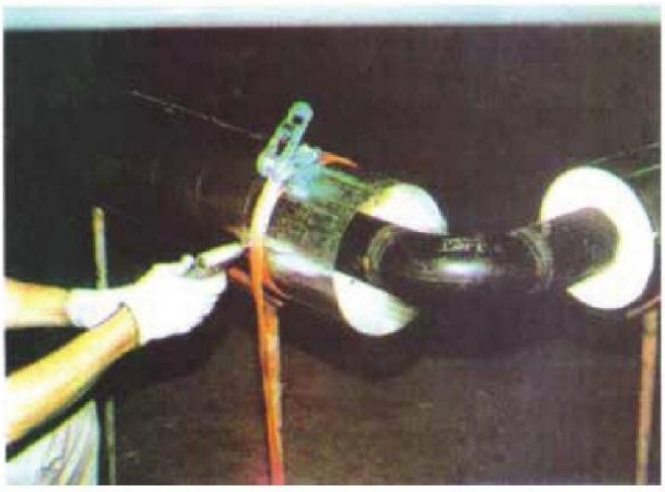
Ricwil furnishes components for complete piping systems

Straight sections of pipe, in standard lengths and in a selection of materials, are factory insulated and jacketed for delivery to the jobsite. Each shipment includes appropriate fittings; premolded covers for tees, bends, flanges, and couplings; and a polyurethane foam pack.

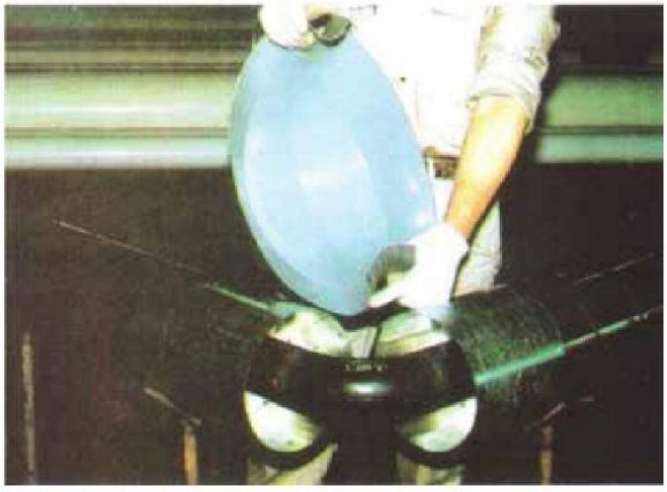
HOW TO FIELD INSULATE JOINTS BETWEEN PIPE AND FITTINGS

1. Cut pipe section to length as required, removing approximately 100mm of insulation and jacketing.
   Join pipes or install fitting, and test as specified.
   Apply sleeve on pipe jacket adjust to joint.

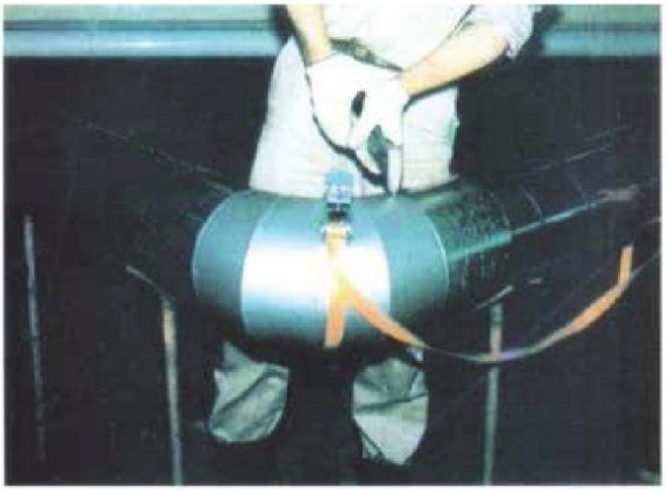
2. Place the jacket overlaping with other pre-insulated jacketing



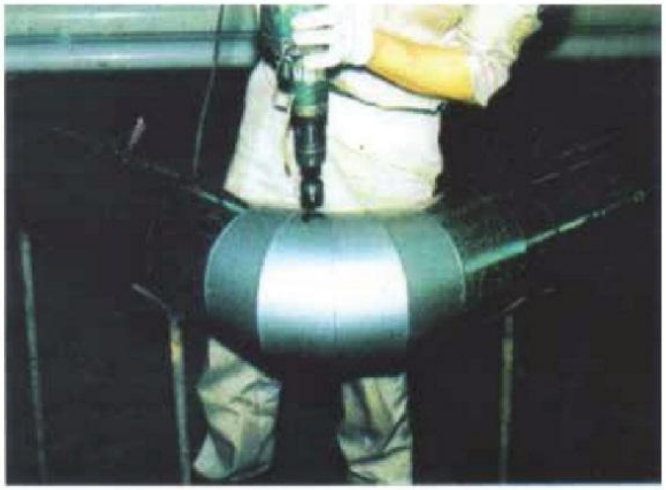
3. Pop-Rivet sleeve



4. Apply elbow cover



5. Secure fitting cover with steel and pop rivet.



6. Open pour hole on fitting cover or sleeve in case of straight joints.

7. Pour required amount of part A into measuring beaker. Pour required amount of part B into measuring cup.

8. Pour Part B into mixing container first, then add part A. Stir and mix thoroughly for 25 to 30 Seconds, preferably with electric drill.

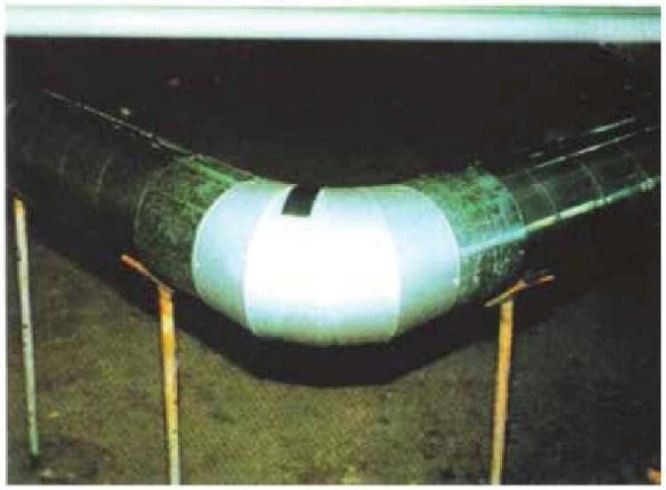
INSTALLATION DATA

JOINING METHOD

9. Pour chemicals quickly through opening and into fitting cover or connector sleeve. Allow four to five minutes reaction time.

10. Trim excess foam.

11. Patch up with aluminium tape.



12. Completed

IMPORTANT

RICWIL will furnish the following field joint material:

- Two part liquid polyurethane foam chemicals
- Sealing with Aluminium tape

The contractor must prepare the following tools and equipments prior to installation.

- Pop-rivetor
- Rivets
- Measuring beaker
- Weight scale
- Electric drill
- Other tools to assemble joint

RICWIL will not furnish bare steel fittings unless otherwise separately ordered by contractor.

QUANTITY OF FOAM REQUIRED PER JOINT

kg/joint

Hi-Gard Designation No.	Straight joint	Elbow joint	Tee joint	Reducer joint
H G 15 / 75	0.06	0.08	0.11	0.07
H G 15 / 100	0.12	0.15	0.21	0.13
H G 15 / 125	0.19	0.24	0.33	0.22
H G 20 / 75	0.06	0.07	0.11	0.07
H G 20 / 100	0.12	0.15	0.21	0.13
H G 20 / 125	0.19	0.24	0.33	0.21
H G 25 / 75	0.05	0.07	0.10	0.06
H G 25 / 100	0.11	0.14	0.21	0.13
H G 25 / 150	0.27	0.34	0.51	0.32
H G 32 / 100	0.10	0.14	0.20	0.12
H G 32 / 125	0.17	0.23	0.34	0.20
H G 32 / 150	0.26	0.34	0.52	0.31
H G 40 / 100	0.10	0.13	0.20	0.12
H G 40 / 125	0.17	0.23	0.35	0.20
H G 40 / 150	0.25	0.35	0.53	0.31
H G 50 / 100	0.08	0.12	0.17	0.10
H G 50 / 125	0.15	0.23	0.32	0.19
H G 50 / 160	0.27	0.40	0.57	0.34
H G 65 / 125	0.13	0.21	0.30	0.17
H G 65 / 150	0.22	0.36	0.49	0.28
H G 65 / 175	0.31	0.50	0.70	0.40
H G 80 / 125	0.10	0.17	0.23	0.13
H G 80 / 150	0.19	0.33	0.44	0.24
H G 80 / 200	0.41	0.72	0.96	0.53
H G 100 / 160	0.15	0.30	0.39	0.20
H G 100 / 175	0.21	0.43	0.54	0.29
H G 100 / 215	0.41	0.83	1.05	0.55
H G 125 / 225	0.37	0.84	1.02	0.53
H G 125 / 250	0.54	1.23	1.48	0.77
H G 125 / 300	0.89	2.02	2.44	1.27
H G 150 / 250	0.44	1.11	1.29	0.64
H G 150 / 275	0.58	1.45	1.69	0.84
H G 150 / 315	0.89	2.25	2.61	1.30
H G 200 / 300	0.54	1.65	1.79	0.82
H G 200 / 315	0.65	1.96	2.12	0.97
H G 200 / 400	1.44	4.35	4.70	2.16
H G 250 / 350	0.63	2.23	2.31	1.00
H G 250 / 400	1.11	3.93	4.06	1.77
H G 250 / 425	1.37	4.85	5.01	2.18
H G 300 / 400	0.73	2.96	2.95	1.22
H G 300 / 425	1.00	4.05	4.04	1.68
H G 300 / 500	1.88	7.61	7.60	3.15

Note : Kindly contact Ricwil or their respective agent for information if pipe diameter is larger than 300mm and density more than 35kg/m³

GUIDE SPECIFICATION

LOW-TEMP HI-GARD™

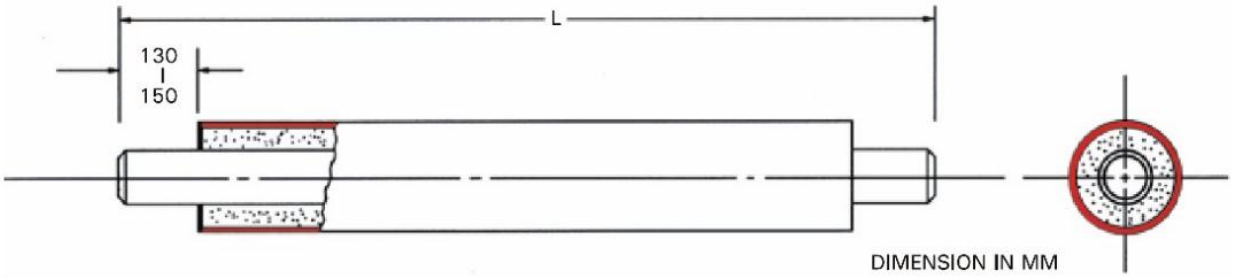
Proposed specification for RICWIL Low-Temp Hi-Gard™

PRE-INSULATED ABOVEGROUND PIPING SYSTEM

CLAUSE	REMARKS
1. GENERAL	
Aboveground piping system shall be factory pre-insulated and prefabricated RICWIL Hi-Gard and shall consist of steel carrier pipe insulated with rigid polyurethane foam which is protected with outer jacket. The pre-insulated pipes shall be of a product of manufacturer with ISO certification and who has been engaged in manufacturing pre-insulated pipes at least for the last 10 years. The system components shall conform to the following specifications.	
2. MATERIAL DESCRIPTION	Specify carrier pipe.
2.1. Carrier Pipe:	
The carrier pipe shall be in either of the following. (a) JIS G 3454 STPG 38 SCH 40 Seamless black (b) ASTM A53 GR.B Standard weight Seamless black (c) JIS G 3452 Std (d) BS 1387 standard	
All pipe ends shall be protected by plastic caps or plastic sheet cover.	Specify if higher density is required.
2.2. Insulation:	
Insulation shall be rigid polyurethane machine injected and foamed in place completely filling the annular space between carrier pipe and jacket. Physical properties of polyurethane foam shall be as follows. (a) Density : ±45 kg/m3 (2.8cb/CFT) (b) Thermal Conductivity : English. 14 BTU/(HR) (SQ.FT) (°F/IN) @ 73°F Metric .0.017 Kcal/m. h.°C @ 23° C (c) Compressive Strength : 2.0 kg/cm2 (29 psi) (d) Closed Cell content : 90% (e) Insulation thickness shall be determined considering condensation foaming on the outer jacket under following climatic condition.	
AMSIENTTEMP. RH% FLUIDTEMP. 35°C 90 6°C 30°C 95 6°C	Insulation thickness may vary depending on geographical area.
Min. insulation thickness shall be as follows. Pipe size up to NB100 mm (4") : 37mm (1 ½") NB125 mm (5") and larger : 50 mm (2")	

CLAUSE	REMARKS
2.3. Jacket: The jacket material shall be sufficiently sized to allow for desired insulation thickness for optimum performance of system. All metal jacket shall have an external spiral lockseam. Jacket shall be of the following materials.	Specify kind of jacket.
(a) External spiral lockseamed galvanized steel with following thickness. 0.4 for jacket size 15mm - 100mm 0.5 for jacket size 125mm - 250mm 0.6 for jacket size 300mm - 1000mm	Specify if particular finish is required. i.e colour jacket or plastic jacket.
(b) External spiral lockseamed aluminium with following thickness 0.6 for jacket size 15mm - 100mm 0.7 for jacket size 125mm - 250mm 0.8 for jacket size 300mm - 1000mm	
(c) External spiral lockseamed stainless steel : 0.4mm & 0.5mm	
(d) Polyvinyle chloride (PVC) conforming to ASTM D1784 Type 1 Class 1 or JISK6741 : Min. 3mm	
(e) High density extruded polyethylene conforming to ASTM D1248 Type 4 Class 3 or JIS K6761 or BS 3284/1967 TYPE 50 : Min. 3mm	
2.4. Fire Rating of Pre-insulated Pipe Unit: The pre-insulated HI-GARD system shall be of a product which has conducted 2 hour fire test with a temperature in excess of 1,000°C.	
3. INSTALLATION (a) The site installation shall be performed in strictly accordance with manufacturer's instructions and recommendations. The straight joints, valves and fittings (incase of not pre-insulated fittings), flanges, expansion joints etc. shall be site insulated and jacketed unless otherwise specified.	
(b) A manufacturer's field service instructor is to be present during critical periods of installation. He should be factory trained and technically qualified to determine whether or not the installation is being made in accordance with the manufacturer's recommendation.	Where pipe expansion and/or contraction provision is very critical, refer to manufacturer's recommendations and engineering instruction.

STANDARD STRAIGHT SECTIONS



Standard Straight Units - Low Temp Hi-Gard

❶ Carrier pipe (NB)		Hi-Gard designation No.	❷ Carrier pipe dimensions		❸ Outer jacket	Insulation	❹ Weight in kg per		Heat loss	Heat gain	❺ Standard length
			O.D x W.T	ASTM	O.D x W.T (mm)	(mm)	Meter	Std length	Kcal/m-hr	Kcal/m-hr	meter L
(mm)	(in)										
15	½	H G 15/ 75	21.3 x 2.8	A53. Gr. B.	75.9 x 0.5	26.4	2.5	15	12.44	2.27	6
		H G 15/ 100			101.6 x 0.5	39.7	3.0	18	10.19	1.68	
		H G 15/ 125			127.0 x 0.5	52.4	3.5	21	8.99	1.66	
20	¾	H G 20/ 75	26.7 x 2.9	A53. Gr. B.	75 x 0.5	23.7	2.8	17	15.01	2.73	6
		H G 20/ 100			101.6 x 0.5	37.0	3.3	20	11.85	2.18	
		H G 20/ 125			127.0 x 0.5	49.7	3.8	23	10.26	1.90	
25	1	H G 25/ 75	33.4 x 3.4	A53. Gr. B.	75.0 x 0.5	20.3	3.7	22	18.89	3.41	6
		H G 25/ 100			101.6 x 0.5	33.6	4.2	25	14.14	2.59	
		H G 25/ 150			152.4 x 0.5	59.0	5.2	31	10.57	1.96	
32	1¼	H G 32/ 100	42.2 x 3.6	A53. Gr. B.	101.6 x 0.5	29.2	5.0	30	17.72	3.23	6
		H G 32/ 125			127.0 x 0.5	41.9	5.5	33	14.37	2.64	
		H G 32/ 150			152.4 x 0.5	54.6	6.2	37	12.45	2.30	
40	1½	H G 40/ 100	48.3 x 3.7	A53. Gr. B.	101.6 x 0.5	26.2	5.7	34	20.76	3.77	6
		H G 40/ 125			127.0 x 0.5	38.9	6.2	37	16.30	2.99	
		H G 40/ 150			152.4 x 0.5	51.6	6.7	40	13.87	2.56	
50	2	H G 50/ 100	60.3 x 3.9	A53. Gr. B.	101.6 x 0.5	20.2	7.0	42	18.89	5.19	6
		H G 50/ 125			127.0 x 0.5	32.9	7.5	45	20.93	3.82	
		H G 50/ 160			160.0 x 0.5	49.4	8.3	50	16.27	2.99	
65	2½	H G 65/ 125	73.0 x 5.2	A53. Gr. B.	127.0 x 0.5	26.6	10.7	64	27.69	5.01	6
		H G 65/ 150			152.4 x 0.5	39.2	11.2	67	21.31	3.90	
		H G 65/ 175			175.9 x 0.5	50.5	11.7	70	18.14	3.34	
80	3	H G 80/ 125	88.9 x 5.5	A53. Gr. B.	127.0 x 0.5	18.6	13.3	80	41.54	7.42	6
		H G 80/ 150			152.4 x 0.5	31.3	13.8	83	28.66	5.21	
		H G 80/ 200			203.2 x 0.5	56.7	15.0	90	19.22	3.54	
100	4	H G 100/ 160	114.3 x 6.0	A53. Gr. B.	160.0 x 0.5	22.4	18.7	112	44.56	8.09	6
		H G 100/ 175			175.0 x 0.5	29.9	19.0	114	36.00	6.52	
		H G 100/ 215			216.0 x 0.5	50.4	20.0	120	24.79	4.55	
125	5	H G 125/ 225	141.3 x 6.6	A53. Gr. B.	225.0 x 0.6	41.2	27.0	162	33.63	6.14	6
		H G 125/ 250			254.0 x 0.6	55.7	27.8	167	27.03	4.97	
		H G 125/ 300			304.8 x 0.6	81.1	29.7	178	20.86	3.86	
150	6	H G 150/ 250	168.3 x 7.1	A53. Gr. B.	254.0 x 0.6	42.2	34.2	205	37.98	6.93	6
		H G 150/ 275			275.0 x 0.6	52.7	34.8	209	32.15	5.90	
		H G 150/ 315			318.0 x 0.6	74.2	36.5	219	25.11	4.64	
200	8	H G 200/ 300	219.1 x 8.2	A53. Gr. B.	304.8 x 0.6	42.2	49.7	298	47.19	8.60	6
		H G 200/ 315			318.0 x 0.6	48.8	50.2	301	42.12	7.71	
		H G 200/ 400			406.4 x 0.6	93.0	53.7	322	25.97	4.81	
250	10	H G 250/ 350	273.0 x 9.3	A53. Gr. B.	355.6 x 0.6	40.7	68.4	410	58.53	10.65	6
		H G 250/ 400			406.4 x 0.6	66.1	70.8	425	39.80	7.32	
		H G 250/ 425			431.8 x 0.6	78.8	72.1	433	34.75	6.41	
300	12	H G 300/ 400	323.8 x 9.5	A53. Gr. B.	406.4 x 0.6	40.7	82.9	497	67.95	12.36	6
		H G 300/ 425			431.8 x 0.6	53.4	84.2	505	54.43	9.97	
		H G 300/ 500			508.0 x 0.6	91.5	88.3	530	35.50	6.56	

❶ NB = Abribiation for nominal bore

❷ O.D and wall thickness are based on ASTM A53 Gr. B standard weight. JIS, DIN or BS standard are also available upon request.

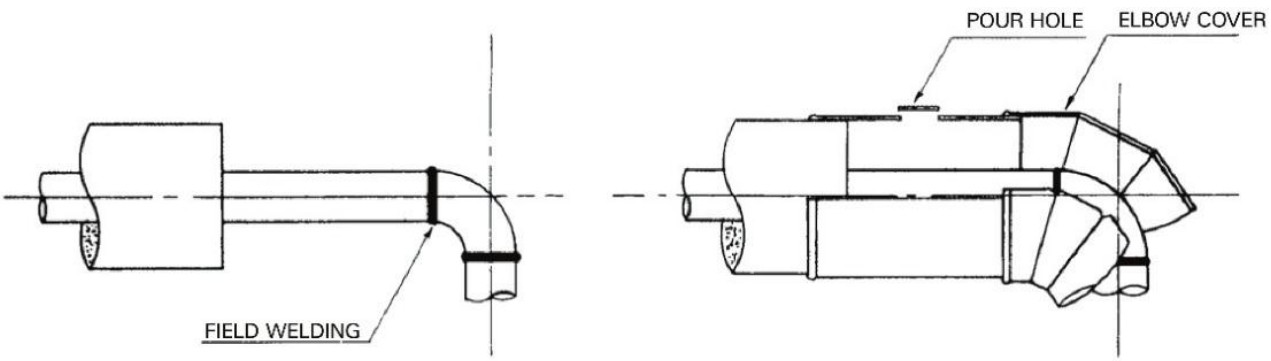
❸ Jacket is based on inside lock seamed galvanized steel. Other type of jacket is available upon request.

❹ Weight is based on ASTM A53 Gr. B standard weight.

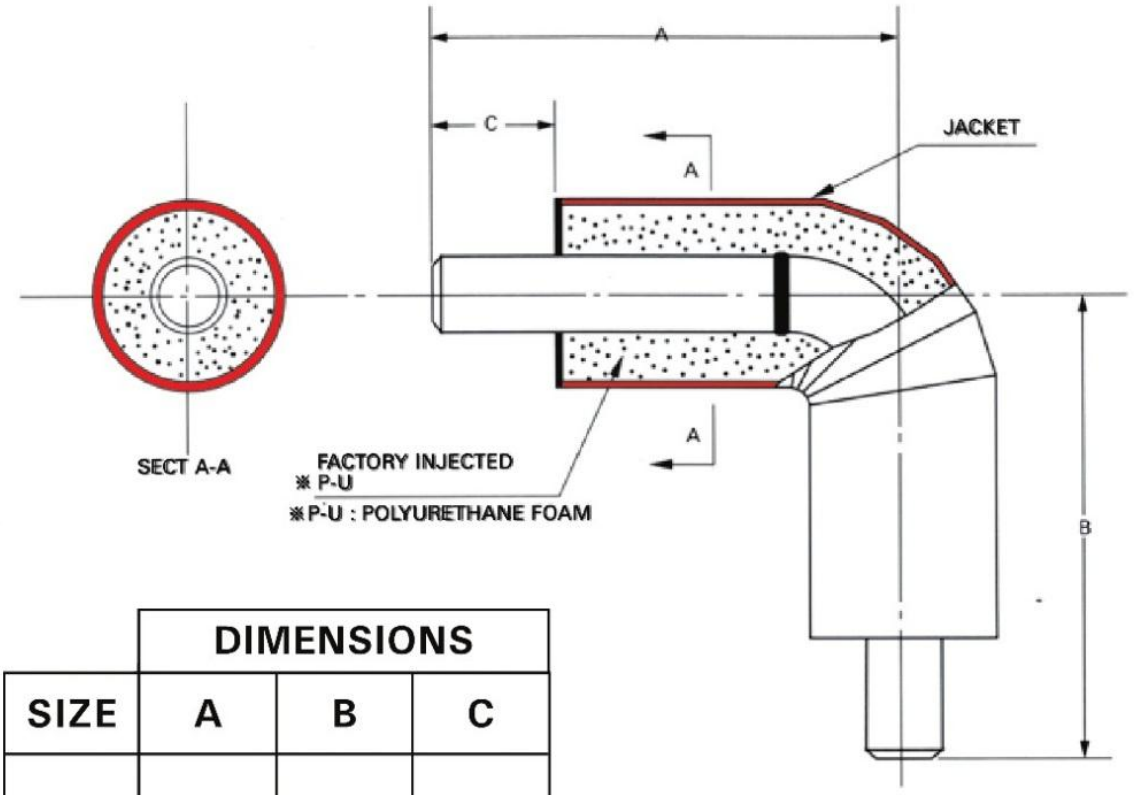
❺ Longer length (12 meter) unit is available upon request.

NOTE : Insulation thickness shown on table indicates calculated thickness only.
Actual thickness varies due to carrier pipe O.D tolerance and manufacturing dimensional tolerance.

Note : Kindly contact Ricwil or their respective agent for information if pipe diameter is larger than 300mm.The above information serves as a guide only.



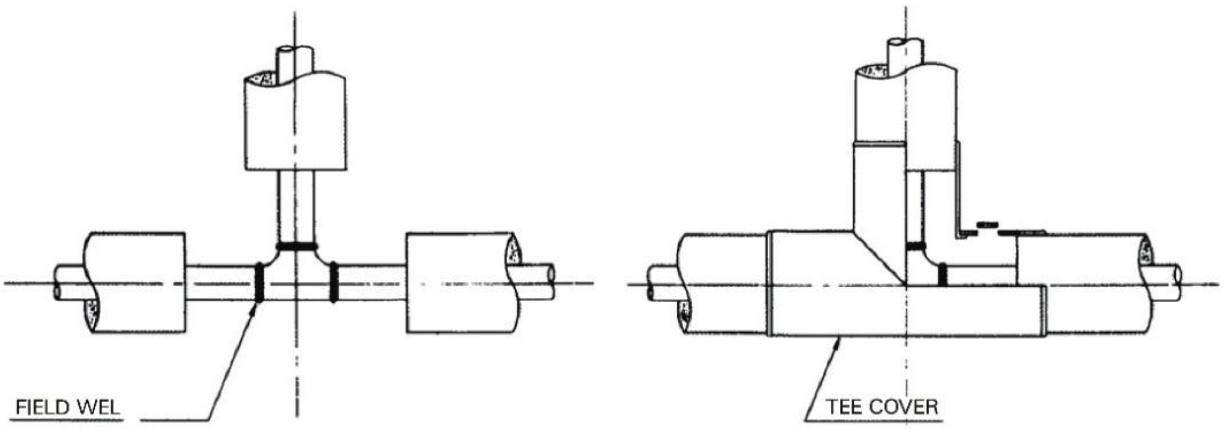
SITE INSULATED ELBOW



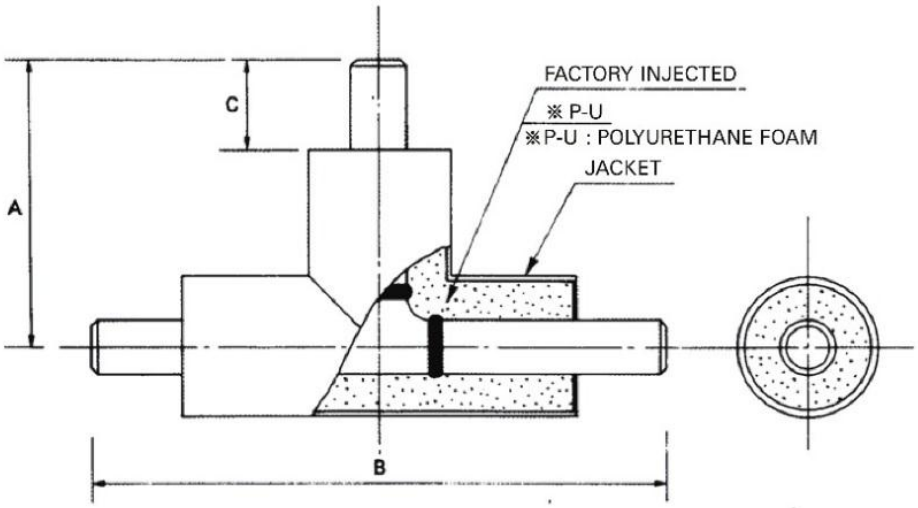
	DIMENSIONS		
SIZE	A	B	C

STANDARD PRE-INSULATED PREFABRICATED ELBOW

STANDARD INSULATION
FOR FITTING & VALVE

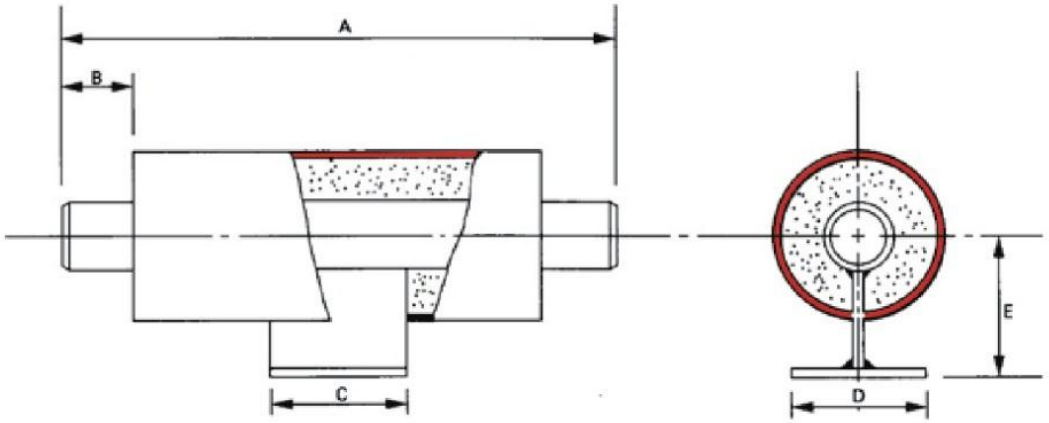


SITE INSULATED TEE



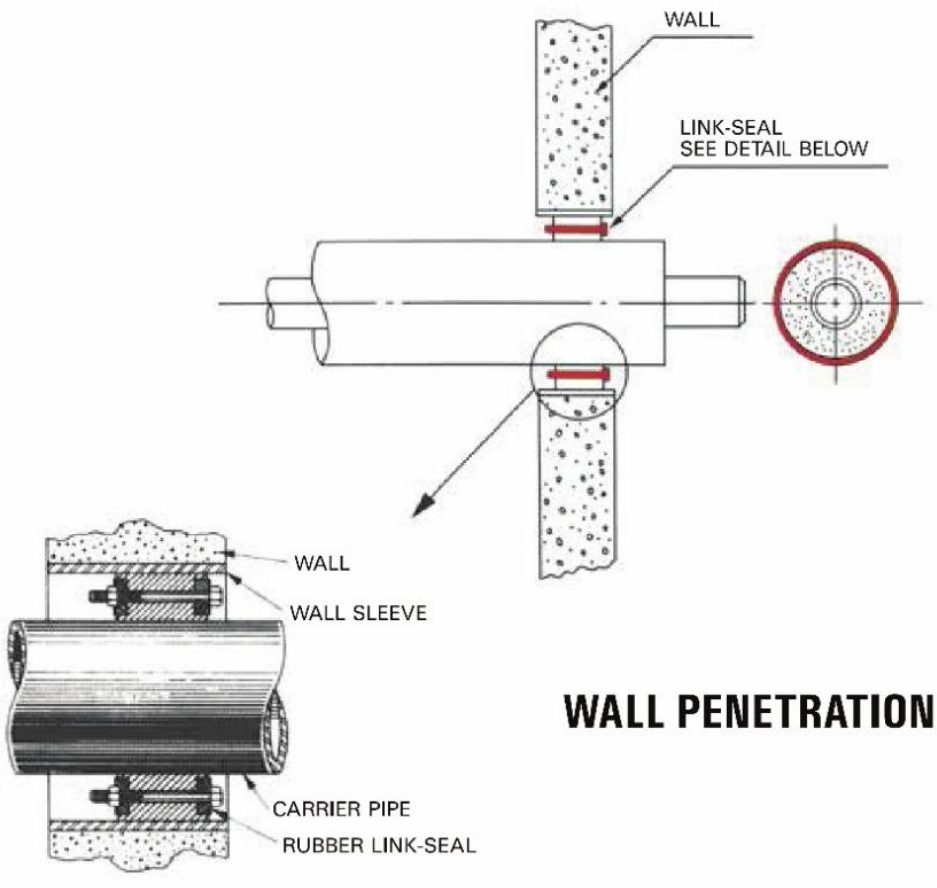
	DIMENSIONS		
SIZE	A	B	C

STANDARD PRE-INSULATED PREFABRICATED TEE



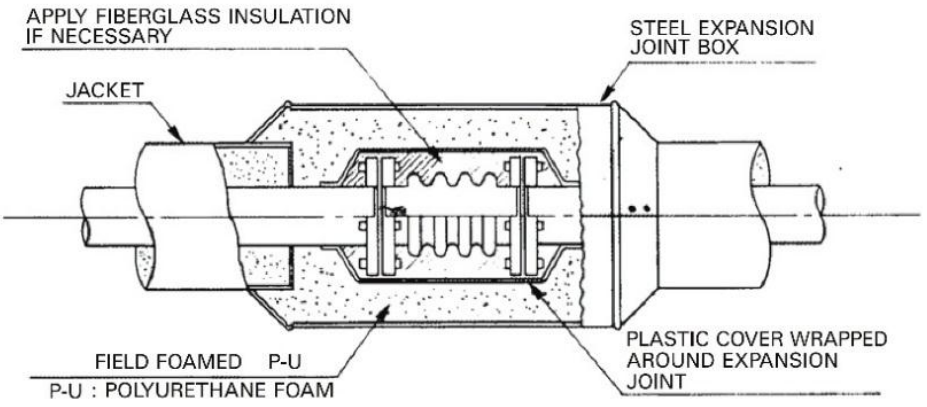
SIZE	DIMENSIONS				
	A	B	C	D	E

PREFABRICATED ANCHOR

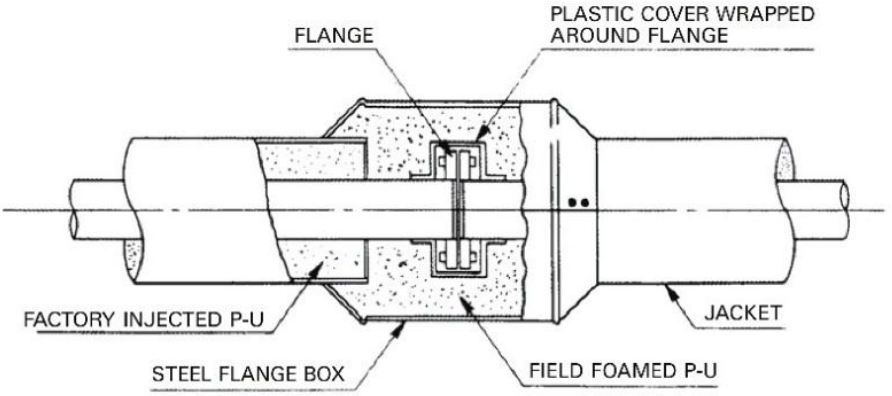


WALL PENETRATION DETAIL

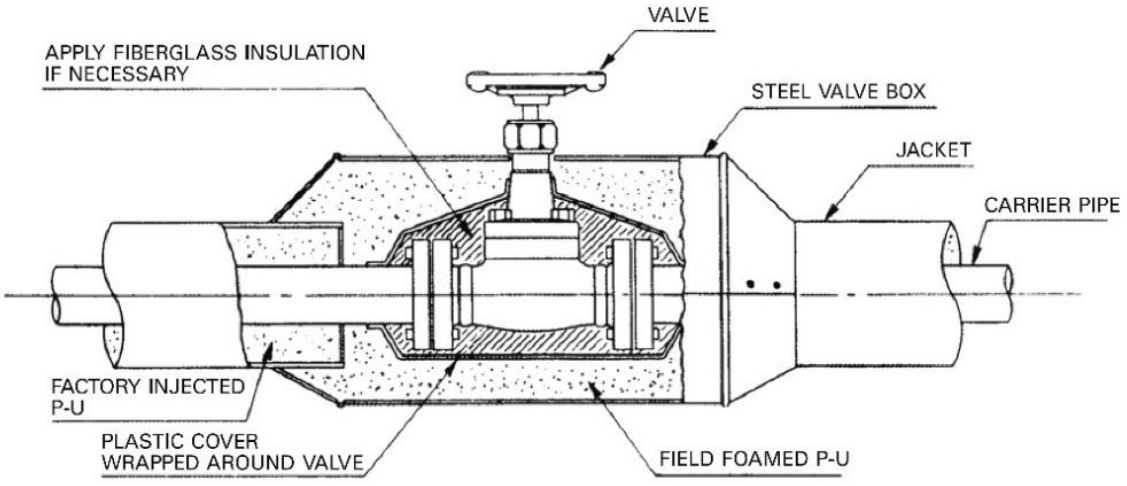
STANDARD INSULATION
FOR FITTING & VALVE



EXPANSION JOINT BOX



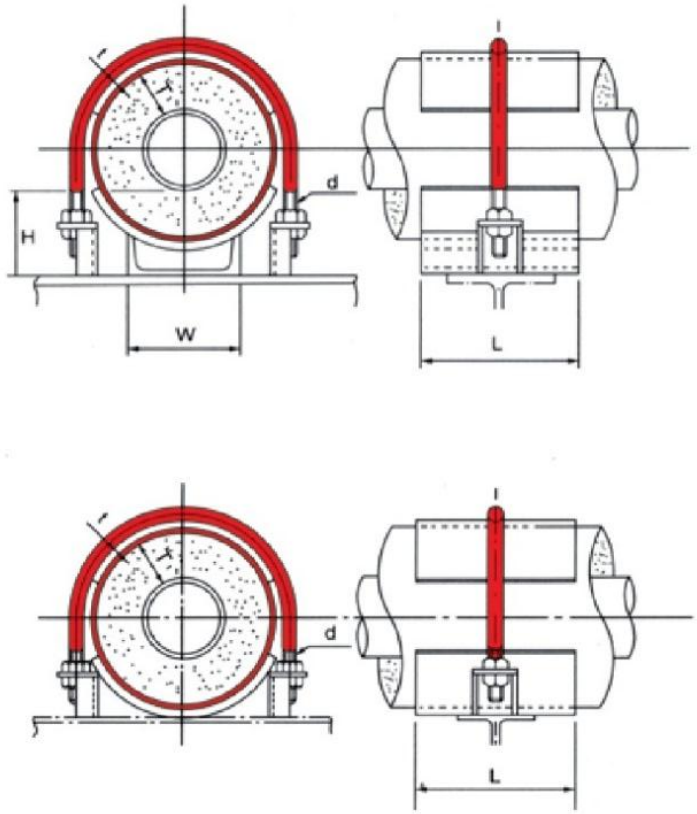
FLANGE BOX



VALVE BOX

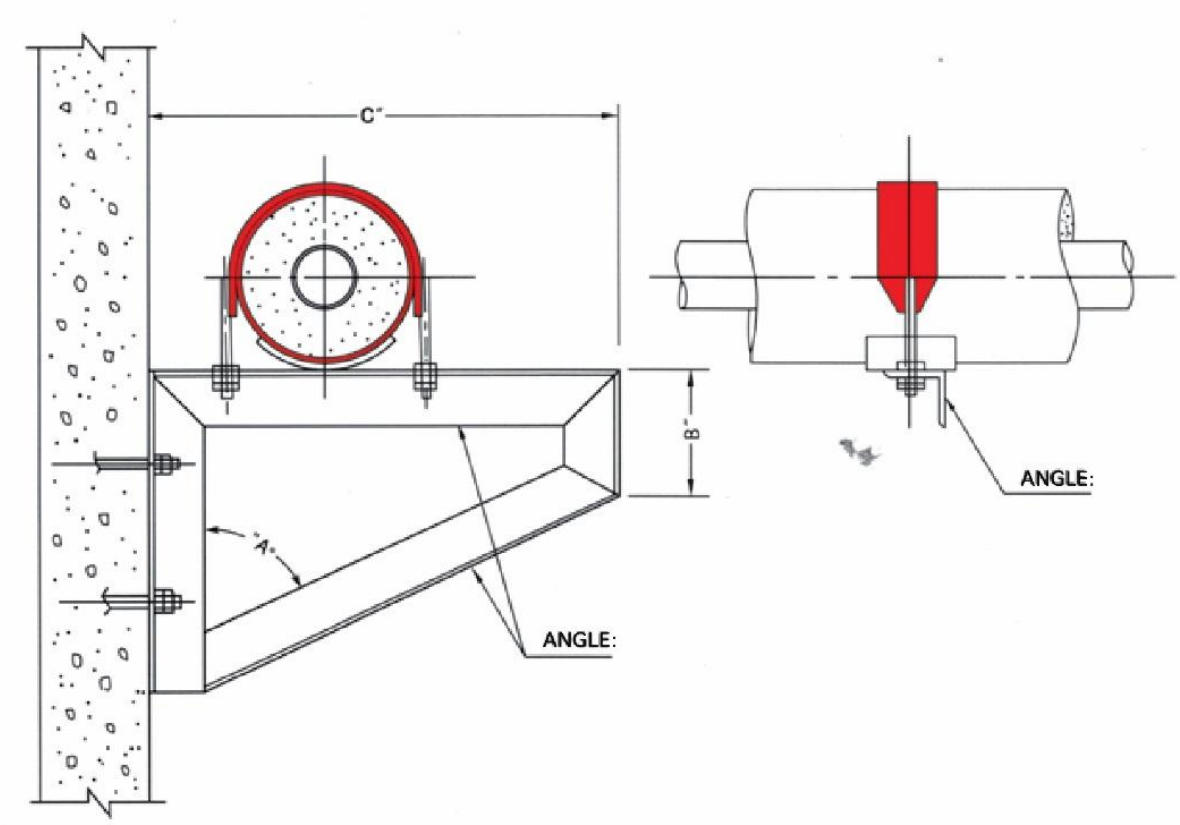
PIPE SUPPORT

PIPE GUIDE



CARRIER PIPE (NB)	HI-GARD DESIGNATION No.	W (mm)	t (mm)	BOLT SIZE d	L (mm)	H (mm)
(mm) (In)						
15 1/2	H G G15/ 75	100	3.2	1/2"	155	80
	H G 15/100	100	3.2	1/2"	155	80
	H G 15/125	100	3.2	1/2"	155	100
20 3/4	H G 15/ 75	100	3.2	1/2"	155	80
	H G 15/100	100	3.2	1/2"	155	80
	H G 15/125	100	3.2	1/2"	155	100
25 1	H G 15/ 75	100	3.2	1/2"	155	80
	H G 15/100	100	3.2	1/2"	155	80
	H G 15/125	100	3.2	1/2"	155	100
32 1 1/4	H G 15/ 75	100	3.2	1/2"	155	80
	H G 15/100	100	3.2	1/2"	155	80
	H G 15/125	100	3.2	1/2"	155	100
40 1 1/2	H G 15/ 75	100	3.2	1/2"	155	80
	H G 15/100	100	3.2	1/2"	155	80
	H G 15/125	100	3.2	1/2"	155	100
50 2	H G 15/ 75	100	4.5	5/8"	155	80
	H G 15/100	100	4.5	5/8"	155	80
	H G 15/125	100	4.5	5/8"	155	100
65 2 1/2	H G 15/ 75	100	4.5	5/8"	155	80
	H G 15/100	100	4.5	5/8"	155	80
	H G 15/125	100	4.5	5/8"	155	100
80 3	H G 15/ 75	100	4.5	5/8"	155	80
	H G 15/100	100	4.5	5/8"	155	80
	H G 15/125	100	4.5	5/8"	155	100
100 4	H G 15/ 75	100	6.0	3/4"	155	80
	H G 15/100	100	6.0	3/4"	155	80
	H G 15/125	100	6.0	3/4"	155	100
125 5	H G 15/ 75	125	6.0	3/4"	180	100
	H G 15/100	125	6.0	3/4"	180	100
	H G 15/125	150	6.0	3/4"	180	125
150 6	H G 15/ 75	125	6.0	3/4"	180	100
	H G 15/100	125	6.0	3/4"	180	100
	H G 15/125	150	6.0	3/4"	180	125
200 8	H G 15/ 75	150	6.0	3/4"	300	100
	H G 15/100	150	6.0	3/4"	300	100
	H G 15/125	150	6.0	3/4"	300	125
250 10	H G 15/ 75	150	6.0	3/4"	400	100
	H G 15/100	150	6.0	3/4"	400	125
	H G 15/125	150	6.0	3/4"	400	125
300 12	H G 15/ 75	150	6.0	3/4"	400	100
	H G 15/100	150	6.0	3/4"	400	100
	H G 15/125	150	6.0	3/4"	400	125

Note : Kindly contact Ricwil or their respective agent for information if pipe diameter is larger than 300mm.The above information serves as a guide only.

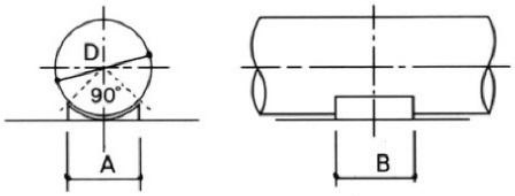


DEGREE OF BRACKET "A°"	ANGLE (MM)	DIM."C" / DIM."B"	MAXIMUM SAFETY LOAD			"KG"
			<400	<600	<800	<1.000
45°	50X50X6	100	3.350	2.950	2.700	——
	65X65X6	130	4.850	4.200	3.750	——
	75X75X6	150	5.850	5.000	4.450	——
60°	50X50X6	100	2.250	1.850	1.700	——
	65X65X6	130	3.300	2.750	2.400	2.150
	75X75X6	150	4.100	3.300	2.850	2.550
	75X75X9	150	6.000	4.850	4.200	3.750

NOTE :

1. MATERIAL ALLOWABLE STRESS : 800 KG/CM^2

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



W : WEIGHT AT UNIT LENGTH kg/m
L : SPAN
A : SUPPORT WIDTH $D/\sqrt{2}$cm
σ : COMPRESSIVE STRENGTH OF P-U 1kg/cm²
B : SUPPORT LENGTH cm

SUPPORT LENGTH AND SPAN

Carrier Pipe (NB)		Hi-gard Designation No.	Carrier Pipe Dimentions		Outer Jacket	Weight			Support Width A (cm)	Support Length B MIN. (cm)	Max span Length (M)
			O.D X W.T (mm)	ASTM	O.D X W.T (mm)	Hi-gard (kg/m)	Water (kg/m)	Total (kg/m)			
(mm)	(in)	H G 15/ 75	$21.^{3} \times 2.^{8}$	A53. Gr. B	$75.^{0} \times 0.^{5}$	$2.^{5}$	$0.^{2}$	$2.^{7}$	$5.^{3}$	$0.^{8}$	$1.^{6}$
15	½	H G 15/100			$101.^{6} \times 0.^{5}$	$3.^{0}$	$0.^{2}$	$3.^{2}$	$7.^{2}$	$0.^{7}$	$1.^{6}$
		H G 15/125			$127.^{0} \times 0.^{5}$	$3.^{5}$	$0.^{2}$	$3.^{7}$	$9.^{0}$	$0.^{7}$	$1.^{6}$
20	¾	H G 20/ 75	$26.^{7} \times 2.^{9}$	A53. Gr. B	$75.^{0} \times 0.^{5}$	$2.^{8}$	$0.^{3}$	$3.^{1}$	$5.^{3}$	$1.^{1}$	$1.^{8}$
		H G 20/100			$101.^{6} \times 0.^{5}$	$3.^{3}$	$0.^{3}$	$3.^{6}$	$7.^{2}$	$0.^{9}$	$1.^{8}$
		H G 20/125			$127.^{0} \times 0.^{5}$	$3.^{8}$	$0.^{3}$	$4.^{1}$	$9.^{0}$	$0.^{8}$	$1.^{8}$
25	1	H G 25/ 75	$33.^{4} \times 3.^{4}$	A53. Gr. B	$75.^{0} \times 0.^{5}$	$3.^{7}$	$0.^{6}$	$4.^{3}$	$5.^{3}$	$1.^{6}$	$2.^{0}$
		H G 25/100			$101.^{6} \times 0.^{5}$	$4.^{2}$	$0.^{6}$	$4.^{8}$	$7.^{2}$	$1.^{3}$	$2.^{0}$
		H G 25/150			$152.^{4} \times 0.^{5}$	$5.^{2}$	$0.^{6}$	$5.^{8}$	$10.^{8}$	$1.^{1}$	$2.^{0}$
32	1-¼	H G 32/100	$42.^{2} \times 3.^{6}$	A53. Gr. B	$101.^{6} \times 0.^{5}$	$5.^{0}$	$1.^{0}$	$6.^{0}$	$7.^{4}$	$1.^{6}$	$2.^{1}$
		H G 32/125			$127.^{0} \times 0.^{5}$	$5.^{5}$	$1.^{0}$	$6.^{5}$	$9.^{0}$	$1.^{5}$	$2.^{1}$
		H G 32/150			$152.^{4} \times 0.^{5}$	$6.^{2}$	$1.^{0}$	$7.^{2}$	$10.^{8}$	$1.^{4}$	$2.^{1}$
40	1-½	H G 40/100	$48.^{3} \times 3.^{7}$	A53. Gr. B	$101.^{6} \times 0.^{5}$	$5.^{7}$	$1.^{3}$	$7.^{0}$	$7.^{4}$	$2.^{0}$	$2.^{7}$
		H G 40/125			$127.^{0} \times 0.^{5}$	$6.^{2}$	$1.^{3}$	$7.^{5}$	$9.^{0}$	$2.^{3}$	$2.^{7}$
		H G 40/150			$152.^{4} \times 0.^{5}$	$6.^{7}$	$1.^{3}$	$8.^{0}$	$10.^{8}$	$2.^{0}$	$2.^{7}$
50	2	H G 50/100	$60.^{3} \times 3.^{9}$	A53. Gr. B	$101.^{6} \times 0.^{5}$	$7.^{0}$	$2.^{2}$	$9.^{2}$	$7.^{4}$	$3.^{8}$	$3.^{0}$
		H G 50/125			$127.^{0} \times 0.^{5}$	$7.^{5}$	$2.^{2}$	$9.^{7}$	$9.^{0}$	$3.^{2}$	$3.^{0}$
		H G 50/160			$160.^{0} \times 0.^{5}$	$8.^{3}$	$2.^{2}$	$10.^{5}$	$11.^{3}$	$2.^{8}$	$3.^{0}$
65	2-½	H G 65/125	$73.^{0} \times 5.^{2}$	A53. Gr. B	$127.^{0} \times 0.^{5}$	$10.^{7}$	$3.^{1}$	$13.^{8}$	$9.^{0}$	$5.^{1}$	$3.^{3}$
		H G 65/150			$152.^{4} \times 0.^{5}$	$11.^{2}$	$3.^{1}$	$14.^{3}$	$10.^{8}$	$4.^{4}$	$3.^{3}$
		H G 65/175			$175.^{0} \times 0.^{5}$	$11.^{7}$	$3.^{1}$	$14.^{8}$	$12.^{4}$	$3.^{9}$	$3.^{3}$
80	3	H G 80/125	$88.^{9} \times 5.^{5}$	A53. Gr. B	$127.^{0} \times 0.^{5}$	$13.^{2}$	$4.^{6}$	$18.^{1}$	$9.^{0}$	$7.^{2}$	$3.^{6}$
		H G 80/150			$152.^{4} \times 0.^{5}$	$13.^{8}$	$4.^{8}$	$18.^{6}$	$10.^{8}$	$6.^{2}$	$3.^{6}$
		H G 80/200			$203.^{2} \times 0.^{5}$	$15.^{0}$	$4.^{8}$	$19.^{8}$	$14.^{4}$	$5.^{0}$	$3.^{6}$
100	4	H G100/160	$114.^{3} \times 6.^{0}$	A53. Gr. B	$160.^{0} \times 0.^{5}$	$18.^{7}$	$8.^{2}$	$26.^{9}$	$11.^{3}$	$10.^{2}$	$4.^{3}$
		H G100/175			$175.^{6} \times 0.^{5}$	$19.^{0}$	$8.^{2}$	$27.^{2}$	$12.^{4}$	$9.^{6}$	$4.^{3}$
		H G100/215			$216.^{0} \times 0.^{5}$	$20.^{0}$	$8.^{2}$	$28.^{2}$	$15.^{3}$	$7.^{9}$	$4.^{3}$
125	5	H G125/225	$141.^{3} \times 6.^{6}$	A53. Gr. B	$225.^{0} \times 0.^{5}$	$27.^{0}$	$12.^{9}$	$39.^{9}$	$15.^{9}$	$12.^{2}$	$4.^{9}$
		H G125/250			$254.^{0} \times 0.^{6}$	$27.^{8}$	$12.^{9}$	$40.^{7}$	$18.^{0}$	$11.^{1}$	$4.^{9}$
		H G125/300			$304.^{8} \times 0.^{6}$	$29.^{7}$	$12.^{9}$	$42.^{6}$	$21.^{6}$	$9.^{7}$	$4.^{9}$
150	6	H G150/250	$168.^{3} \times 7.^{1}$	A53. Gr. B	$254.^{0} \times 0.^{5}$	$34.^{4}$	$18.^{7}$	$52.^{9}$	$18.^{0}$	$15.^{4}$	$5.^{2}$
		H G150/275			$275.^{0} \times 0.^{6}$	$34.^{8}$	$18.^{7}$	$53.^{5}$	$19.^{4}$	$14.^{3}$	$5.^{2}$
		H G150/315			$318.^{0} \times 0.^{6}$	$36.^{5}$	$18.^{7}$	$55.^{2}$	$22.^{5}$	$12.^{8}$	$5.^{2}$
200	8	H G200/300	$219.^{1} \times 8.^{2}$	A53. Gr. B	$304.^{8} \times 0.^{6}$	$49.^{7}$	$32.^{3}$	$82.^{0}$	$21.^{6}$	$22.^{0}$	$5.^{8}$
		H G200/315			$318.^{0} \times 0.^{6}$	$50.^{2}$	$32.^{3}$	$82.^{5}$	$22.^{5}$	$21.^{3}$	$5.^{8}$
		H G200/400			$406.^{4} \times 0.^{6}$	$53.^{7}$	$32.^{3}$	$86.^{0}$	$28.^{7}$	$17.^{4}$	$5.^{8}$
250	10	H G250/350	$273.^{0} \times 9.^{3}$	A53. Gr. B	$355.^{6} \times 0.^{6}$	$68.^{4}$	$50.^{8}$	$119.^{2}$	$25.^{1}$	$31.^{8}$	$6.^{7}$
		H G250/400			$406.^{4} \times 0.^{6}$	$70.^{8}$	$50.^{8}$	$121.^{6}$	$28.^{7}$	$28.^{4}$	$6.^{7}$
		H G250/425			$431.^{8} \times 0.^{6}$	$72.^{1}$	$50.^{8}$	$122.^{9}$	$30.^{5}$	$27.^{0}$	$6.^{7}$
300	12	H G300/400	$323.^{8} \times 9.^{5}$	A53. Gr. B	$406.^{4} \times 0.^{6}$	$82.^{8}$	$72.^{4}$	$155.^{1}$	$28.^{7}$	$37.^{8}$	$7.^{0}$
		H G300/425			$431.^{8} \times 0.^{6}$	$84.^{2}$	$72.^{2}$	$156.^{4}$	$30.^{5}$	$35.^{9}$	$7.^{0}$
		H G300/500			$508.^{0} \times 0.^{6}$	$88.^{3}$	$72.^{2}$	$160.^{5}$	$35.^{9}$	$31.^{3}$	$7.^{0}$

The compressive strength of foam varies as temperature increases.
The above calculation is based on the compressive strength of 1 kg/cm² assuming temperature exceeds 100°C.
For temperature below 100°C, the compressive strength can be considered to be 1.5 kg/cm²

Exportation Of RICWIL Products

The history of RICWIL Group extends more than 70 years and the technology developed and accumulated in this time stands at the highest level, ranking the company among the Big Three pre-insulated pipe manufacturers of the world.
The company has exported a wide range of products bearing the company's trade mark, plants and technology to more than 10 countries, and enjoys a most favorable reputation worldwide.

■ Products have been exported to:

- Korea
- U.S.A.
- China
- Pakistan
- Egypt
- Malaysia
- Algeria
- Brunei
- Saudi Arabia
- Jordan
- Cameroon
- Singapore
- Nepal
- Indonesia

FM APPROVED

Certificate of Compliance

This certificate is issued for the following:

Hi-Gard Pre-Insulated Pipe

Prepared for:

Ricwil (Malaysia) Sdn Bhd
No. 122, Jalan 4D, Kampung Baru Subang
Seksyen U6, Shah Alam
40150 Selangor
Malaysia

FM Approvals Class: 4924

Approval Identification: 0003056742 Approval Granted: 10/2/2017

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

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

Cynthia E Frank

Cynthia Frank
VP - Manager of Materials
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062

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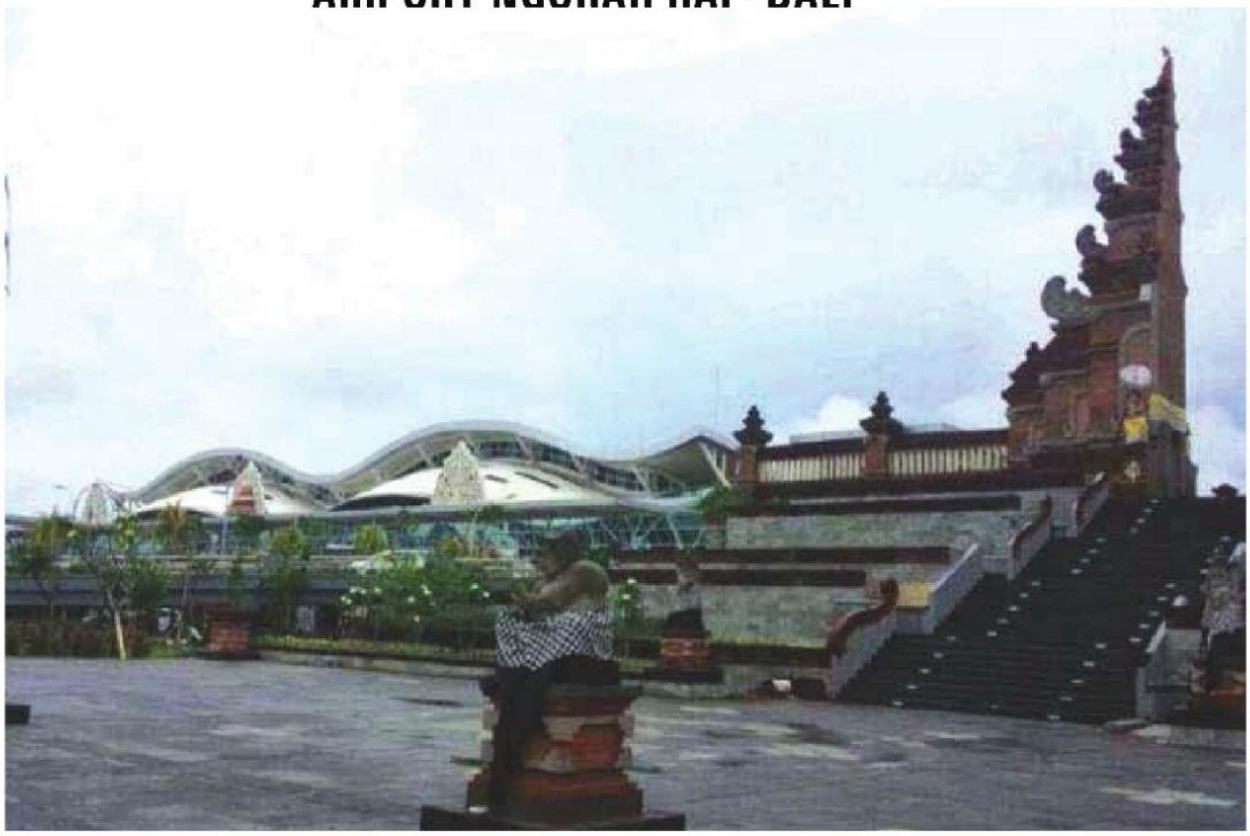
AIRPORT NGURAH RAI - BALI



BANK INDONESIA

MRT - BENHIL

MAHKAMAH KONSTITUSI INDONESIA - JAKARTA

YOGYA TOSERBA - BANDUNG

MALL ALAM SUTERA - SERPONG

GRAND GALAXY MALL - BEKASI

AIRPORT SEPINGGAN - BALIK PAPAN

HOTEL LE MEREDIEN (RENOVATION)

WTC I OFFICE TOWER (RENOVATION)

COMPANY WORKS EXPERIENCE

No.	DESCRIPTION OF WORKS	LOCATION	YEAR
A	**LOCATION : INDONESIA**		
1	Hotel JW Marriot Medan	Medan	On Progress
2	Terminal 2F Soekarno Hatta	Jakarta	On Progress
3	Terminal 1C Soekarno Hatta	Jakarta	On Progress
4	Thamrin Nine Tower 1	Jakarta	On Progress
5	Thamrin Nine Tower 2	Jakarta	On Progress
6	Bank Indonesia Palangkaraya	Palangkaraya	On Progress
7	Nico Coconut Tobelo	Halmahera	On Progress
8	Renovasi Hotel Manhattan Jakarta	Jakarta	On Progress
9	RS Budha Tzu Chi	Jakarta	On Progress
10	IKDC Dubnium Phase 3	Citeurep	On Progress
11	Data Centre CGK 064	Karawang	On Progress
12	Data Centre CGK 065	Cikarang	On Progress
13	HDC Telkom	Cikarang	On Progress
14	OCBC BSD	BSD	On Progress
15	JIS	Jakarta	On Progress
16	Airport Makassar	Makassar	2022
17	Data Centre - Amazon Kerawang	Karawang	2022
18	Telkom Smart Office	Jakarta	2021
19	Renovasi Hotel Sheraton Kuta	Bali	2021
20	Pabrik Mayora	Cikupa - Tangerang	2021
21	RSUD Tapin	Tapin	2021
22	Princeton Digital Group	Cikarang	2021
23	RS Omni Pulomas	Jakarta	2021
24	RSCM Covid	Jakarta	2021
25	Kiat Ananda Cold Storage	Jakarta	2021
26	Pabrik Nivea	Malang	2021
27	PIM 3 & Office	Jakarta	2021
28	GLK Pabrik Keju	Cikarang	2021
29	Airport Manado	Manado	2021
30	Tower Indomaret PIK	Jakarta	2021
31	RSCM Kiara	Jakarta	2021
32	Graha Pertamina	Jakarta	2021
33	Renovasi Hotel Aryaduta Bandung	Bandung	2021
34	Renovasi Hotel Aryaduta Ketapang Jakarta	Jakarta	2021
35	JKT 3 Data Centre	Cikarang	2021
36	Bank Indonesia Kediri	Kediri	2021
37	Airport Juanda Surabaya	Surabaya	2020
38	Graha Pertamina	Jakarta	2020
39	Pakubuwono Menteng	Jakarta	2020
40	Bank Indonesia Siantar	Medan	2020
41	Telkom Smart Office	Jakarta	2020
42	Utilities Tank	Kalimantan Barat	2020
43	UHT Kalimantan	Kalimantan Barat	2020
44	Waldrof Astoria Bali	Bali	2020
45	Pabrik You C 1000 Sukabumi	Sukabumi	2020
46	The Park Mall Sawangan	Depok	2020
47	Airport Kulon Progo	Yogyakarta	2020
48	Airport Manado	Manado	2020
49	Aeon Mall Sentul City	Jakarta	2020
50	Novotel Manado	Manado	2020
51	Hotel Royal Asia Palembang	Palembang	2019
52	Airport Syamsudin Noor	Banjarmasin	2019
53	Airport Minangkabau	Padang	2019
54	Bank Indonesia - Riau	Pekan Baru	2019

No.	DESCRIPTION OF WORKS	LOCATION	YEAR
A	**LOCATION : INDONESIA**		
55	Jumeirah Pecatu Bali	Bali	2019
56	Intercontinental Resort & Holiday Inn Express Canggu Bali	Bali	2019
57	Toserba Yogya Karawang	Karawang	2019
58	Airport Solo	Solo	2019
59	Transpark Cibubur	Cibubur	2019
60	Gedung IFC	Jakarta	2019
61	Sakata Inx Indonesia	Tangerang	2019
62	Indonesia Toray Synthetics (ITS)	Tangerang	2019
63	Panasonic Gobel Energy Indoensia	Cikarang	2019
64	MRT - Indonesia One	Jakarta	2019
65	Menara Astra Sudirman	Jakarta	2019
66	Food Court Mall Alam Sutra	Tangerang	2019
67	Toserba Yogya Sumbersari Bandung	Bandung	2018
68	UOB - Tenancy Lt L	Jakarta	2018
69	WTC 2 - Gedung Mandala	Jakarta	2018
70	Grand Classic Cikarang	Cikarang	2018
71	Menara Astra 2000	Jakarta	2018
72	Data Centre Kuningan	Jakarta	2018
73	Branz BSD Apartement	Tangerang	2018
74	Airport Semarang	Semarang	2018
75	RS Omni Pekayon	Jakarta	2018
76	Jakarta Box	Jakarta	2018
77	PIK Office	Jakarta	2018
78	World Trade Centre 3	Jakarta	2018
79	Airport Makassar	Makassar	2018
80	MRT Jakarta	Jakarta	2018
81	Hotel Pondok Indah	Jakarta	2018
82	Bank Indonesia	Jakarta	2018
83	Kedutaan Belanda	Jakarta	2018
84	Pabrik TPI	Cikarang	2017
85	Velodrome Rawamangun	Jakarta	2017
86	RS Ukrida	Jakarta	2017
87	Perpustakaan RI	Jakarta	2017
88	Kereta Bandara Soeta	Jakarta	2017
89	Hotel 1001 Jakarta Kota	Jakarta	2017
90	Pabrik Indofood	Purwakarta	2017
91	Pabrik Mattel	Cikarang	2017
92	Toyota Motor Manufacturing Indonesia	Karawang	2017
93	Hotel Samasta Movenpick Bali	Bali	2017
94	AEON MALL Jakarta Garden City	Jakarta	2017
95	Terminal 3 Bandara Soeta	Jakarta	2016
96	RCTI TV	Jakarta	2016
97	Qbig Mall Serpong	Serpong	2016
98	PIK MALL	Jakarta	2016
99	MNC TV	Jakarta	2016
100	Menara Parkson	Jakarta	2016
101	GTN, Lippo Cikarang	Cikarang	2016
102	Graha Irahama	Jakarta	2016
103	Apartement GTU Simatupang	Jakarta	2016
104	Plaza Thamrine	Jakarta	2016
105	Swissbel Hotel Mangga Besar	Jakarta	2016
106	Diamond Cold Storage - Ancol	Jakarta	2015
107	Gama Hotel	Jakarta	2015
108	Cyber 3	Jakarta	2015

COMPANY WORKS EXPERIENCE

RICWIL®
Preinsulated Piping Systems

No.	DESCRIPTION OF WORKS	LOCATION	YEAR
A	**LOCATION : INDONESIA**		
109	Yogya Toserba Bogor	Bogor	2015
110	Global TV	Jakarta	2015
111	Pasar Turi	Surabaya	2015
112	PIK HOTEL	Jakarta	2015
113	Swissbel Hotel Mangga Besar	Jakarta	2015
114	Hotel Mercure Karawang	Karawang	2015
115	Hotel Le Meredien	Jakarta	2015
116	UOB Buana	Jakarta	2015
117	AEON Mall	Tangerang	2015
118	Salon & Club Olympus (Grand Hyatt)	Jakarta	2015
119	WTC 2 - Lantai 20	Jakarta	2015
120	Airport Sepinggan Balik Papan	Balik papan	2014
121	WTC 2 - Lantai 19	Jakarta	2014
122	Spring Sport Club	Serpong	2014
123	Soho Ethica	Cikarang	2014
124	Senayan Hotel	Jakarta	2014
125	Renovasi UOB Buana - Thamrin	Jakarta	2014
126	Renovasi Hotel Le Meredien	Jakarta	2014
127	Pabrik PT Polari	Jakarta	2014
128	Pabrik Coca Cola	Bali	2014
129	Hotel Santika Bintaro	Serpong	2014
130	Hotel Novotel Tangcity	Tangerang	2014
131	Hotel Ibis Makassar	Makassar	2014
132	Grand Mall Palu	Palu	2014
133	Gereja Katedral Jakarta	Jakarta	2014
134	Cityloft Gajah Mada	Jakarta	2014
135	Chase Tower	Jakarta	2014
136	Bandara Ngurahrai - Bali (Interdom)	Bali	2014
137	Airport Sepinggan Balik Papan	Balik papan	2014
138	Wisma Metropolitan I	Jakarta	2013
139	Wisma BNI 46 Kota - Lt. 5	Jakarta	2013
140	Shangrila Bali	Bali	2013
141	Scientia Office	Serpong	2013
142	Pullman Hotel	Jakarta	2013
143	PT. Intan Kenkomayo - Cakung	Cakung	2013
144	Permata Bank - WTC II	Jakarta	2013
145	Pabrik Biskuit Mayora	Balaraja	2013
146	N5 - Resort Bali	Bali	2013
147	Multivision Tower	Jakarta	2013
148	JIS - Stage 2 Phase 2	Jakarta	2013
149	JAATS	Tangerang	2013
150	Hotel Ibis Surabaya	Surabaya	2013
151	Grand Galaxy Mall	Bekasi	2013
152	Diamond Cold Storage	Cibitung	2013
153	Brain Centre Hospital	Jakarta	2013
154	Airport Juanda Surabaya	Surabaya	2013
155	Airport Bali Tahap 5	Bali	2013
156	Airport Bali Tahap 3	Bali	2013
157	WTC II, Jl Jend Sudirman	Jakarta	2012
158	Toserba Yogya Kepatihan	Bandung	2012
159	Tangerang City Mall	Jakarta	2012
160	Standart Chareted - WTC II	Jakarta	2012
161	Renov Wisma BNI 46	Jakarta	2012

No.	DESCRIPTION OF WORKS	LOCATION	YEAR
A	**LOCATION : INDONESIA**		
162	Renov Giant Margo City Depok	Depok	2012
163	Renov Gedung Graha Angkasa Pura 1	Jakarta	2012
164	Proyek Pekerjaan Umum (PU) Patimura	Jakarta	2012
165	Plaza Indonesia	Jakarta	2012
166	Pabrik Unilever Cikarang	Cikarang	2012
167	Pabrik P & G	Karawang	2012
168	Pabrik Nippro	Karawang	2012
169	Morgan - WTC II	Jakarta	2012
170	Mini Market Yomart Jln Jakarta	Bandung	2012
171	Menara Kadin	Jakarta	2012
172	Mayapada Hospital	Jakarta	2012
173	Mall Alam Sutera	Jakarta	2012
174	JIS - Stage 2 Phase 1	Jakarta	2012
175	Hotel Novotel Gajah mada	Jakarta	2012
176	Hotel Holiday Inn Sunter	Jakarta	2012
177	Gedung Multivison	Jakarta	2012
178	Fable Club	Jakarta	2012
179	Cyber 3 (Isolasi Pipa Chiller)	Jakarta	2012
180	Bekasi Trade Centre	Bekasi	2012
181	Airport Bali Tahap 1	Bali	2012
182	Soho Industri	Jakarta	2011
183	Renovasi PIM I	Jakarta	2011
184	Renov Bank UOB Buana	Jakarta	2011
185	Proyek Loreal Cikarang - Isolasi Tangki	Cikarang	2011
186	PIM I, Ext	Jakarta	2011
187	Pabrik Stanley Indonesia	Cikupa - Tangerang	2011
188	Living World Alam Sutera	Jakarta	2011
189	Jakarta Internasional School (JIS)	Jakarta	2011
190	Bandara International Lombok	NTB	2011
191	SOHO Project	Jakarta	2010
192	Renov WTC I, Jl Jend Sudirman	Jakarta	2010
193	Pabrik Morin	Jakarta	2010
194	Menara BTN (AHU)	Jakarta	2010
195	Jogya Dept Store - Bogor	Bogor	2010
196	Indomaret - WTC I Jl Jend Sudirman	Jakarta	2010
197	Hotel Amaris (Isolasi Tangki)	Semarang	2010
198	Green House WTC I, Jl Jend Sudirman	Jakarta	2010
199	Gramedia Mall Pondok Indah I	Jakarta	2010
200	Cyber 3 (Isolasi Tangki)	Jakarta	2010
201	Bandara International Lombok (AHU)	NTB	2010
202	Wisma Metropolitan I	Jakarta	2009
203	Restaurant Paulaner Grand Indonesia	Jakarta	2009
204	PT. Hero Supermarket Tbk	Cibitung	2009
205	Menara BTN	Jakarta	2009
206	Mega Mall Pluit	Jakarta	2009
207	Hotel Paragon City	Semarang	2009
208	Blue Sky Hotel	Balik papan	2009
209	Bandara Soekarno - Hatta Terminal 2E	Jakarta	2009
210	PT. Hero Supermarket Tbk	Cibitung	2008
211	Mall Of Indonesia	Jakarta	2008
212	Mahkamah Konstitusi RI	Thamrin - Jakarta	2007
213	SKA Mall	Arenka - Pekan Baru	2004
214	Diamond City Mall	Nagoya - Batam	2003

Worldwide suppliers of pre-insulated piping systems

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