



CFC - FREE

Polyurethane System

Environment Friendly

TERRA-GARD™

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

**UNDERGROUND
PIPING SYSTEM**



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



PT. RICWIL (INDONESIA)



APPROVED

CERTIFICATE OF COMPLIANCE

This certificate is issued for the following

HI-GARD PRE-INSULATED PIPE SYSTEM

Prepared for:

Ricwil (Malaysia) Sdn Bhd
No. 5, Jalan Utarid US/13, Seksyen U5
40150 Shah, Selangor Darul Ehsan
Malaysia

FM Approvals Class 4924

Approval Identification: 3033612

Approval Granted: March 27, 2009

Said Approval is subject to satisfactory field performance, continuing follow-up Facilities and Procedures Audits, and strict conformity to fire constructions as shown in the Approval Guide, as online resource of FM Approvals.

*For more than 160 years FM Approvals has partnered with business and industry
to reduce property losses.*



Richard P. Ferron, P.E.
Asst. Vice President, Group Manager

GENERAL INFORMATION



This literature has been assembled for your information. The systems described are typical and only depict those systems that have been "Standardized" to meet reoccurring design parameters. RICWIL can engineer, preinsulate a piping system To satisfy most design requirements and invites inquires for specially designed piping systems. if additional engineering information is required, contact your local representative or call RICWIL JAPAN LTD. TOKYO, JAPAN AT (03) 436-0791 TLX 242-3037 RICWIL J

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TERRA-GARD™ Piping System

TERRA-GARD is an underground piping system for distribution of hot or chilled fluids at temperatures up to 130°C. Every system is pre-engineered and factory tested before shipment. Carrier pipe is supplied in customer's choice of materials which include steel, copper, stainless steel, aluminum, brass, polyvinyl chloride (PVC), and fiberglass reinforced polyester (FRP). PVC or H.D.P.E. jacketing is standard, but customer can also specify jacketing of fiberglass reinforced plastic. Terra-Gard is shipped in 6 meter or 12 meter random lengths, with 130-150 mm of carrier pipe exposed at unit ends to facilitate field joining.

Benefits

Since 1910, RICWIL® has devoted its activities solely to the design, manufacture and installation instructions of preinsulated, prefabricated piping systems.

RICWIL Terra-Gard is an inexpensive underground distribution system that will provide many years of efficient service.

Terra-Gard™ — Single Source for Entire System

Give RICWIL one purchase order for your Terra-Gard system and receive a complete, engineered preinsulated system; including carrier pipe, thermal insulation, protective jacketing, fittings and joining materials to meet customer's requirements, includes with our total package are engineered installation drawings and the service a factory trained field instructor.

Design Flexibility

RICWIL's Terra-Gard™ system is not a stock item, but rather a combination of available material that meets your specific design requirements.

Faster Installation

One delivery brings all piping materials-preinsulated and prefabricated, resulting in less material handling and storage problems. All units are part-numbered in accordance with installation drawing for easy identification, resulting in a fast, systematic installation of your system.

Reduced Field Cost

A Terra-Gard™ system is prefabricated to actual job requirements and dimensions so there is no material wastage. Prefabrication eliminates field insulating and jacketing..

Quality Controlled

RICWIL® systems must pass a rigid inspection at our plant. Preengineered and factory fabricated with modern techniques by well-trained fabricators are the customer's assurance of quality. Terra-Gard systems arrive at the job-site with all insulation protected from the elements. Insulation remains dry and efficient throughout shipping, storage, and installation.

Maximum System Efficiency

All Terra-Gard™ jackets provide a positive moisture barrier. Polyurethane foam insulation with its low K factor along with the jacket material assures minimal system heat loss or gain. RICWIL Terra-Gard represent the highest product quality and maximum installation efficiency for all buried hot, or chilled fluids up to 130°C.

A. Carrier Pipe

Terra-Gard can be furnished with any carrier pipe to customer's specifications.

The followings are most commonly used carrier pipes.

A.1 Steel pipes

A.1.1 ASTM A 53 Gr.B Std weight ERW or SEAMLESS

A.1.2 API 5L Gr.B Std weight ERW or SEAMLESS

A.1.3 JIS G 3454 STPG 38 SCH 40 ERW or SEAMLESS

A.1.4 JIS G 3452 SGP

A.1.5 BS 1387 or DIN2448 ST35

A.2 Copper pipe

A.2.1 ASTM B-88 type M,L, or K.

A.2.2 JIS H 3300

B. Insulation

B.1 Material: Rigid polyurethane foam injected by foaming machine in one continuous process

B.2 Density : 45/kg/rn3 CFC Free

B.3 Thermal Conductivity: 0.02 W/m.°K
(0.017 Kcal/m.hr.°C) at 20°C

B.4 Compressive strength: 2.0 kg/cm²

B.5 Closed cell Content: mm 90%

B.6 Temperature limit: 130°C
For higher temperature, consult RICWIL engineering department

B.7 Shear strength: 4.0 kg/cm²

B.8 Water permeability: 2.2 perm-inches

C. Jacket

C.1 MATERIAL

Standard TERRA-GARD Jacket material is extruded high density polyethylene black in colour.

C.2 QUALITY

C.2.1 ASTM D 1248 TYPE 4 CLASS 3

C.2.2 JIS K6761

C.2.3 BS 3284/1967 TYPE50

C.2.4 DIN 8074/75

C.3 WALL THICKNESS

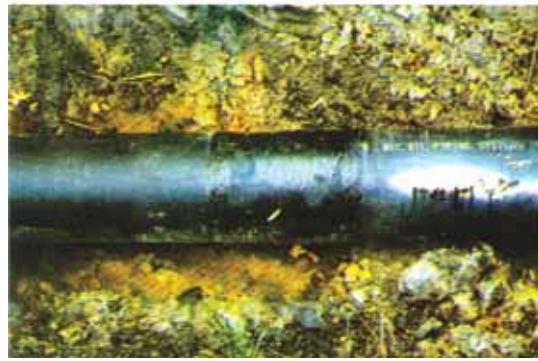
Jacket wall thickness varies from 2.5 mm to 8 mm depending on carrier pipe size.

D. Fittings

D.1 Elbows, tees and anchors.

All accessories, such as elbows, expansion loops, tees and anchor units, are supplied preinsulated and prefabricated and are PART-NUMBERED in accordance with installation drawings.

Allowance for pipe expansion and/or contraction is provided for at elbows during fabrication at the factory. Fittings are manufactured with material identical to straight sections. All carrier pipe weld seams are hydrostatically tested to at least 17.5 Kg/cm² pressure. Technical informations will be supplied upon request.



Handling and Storage

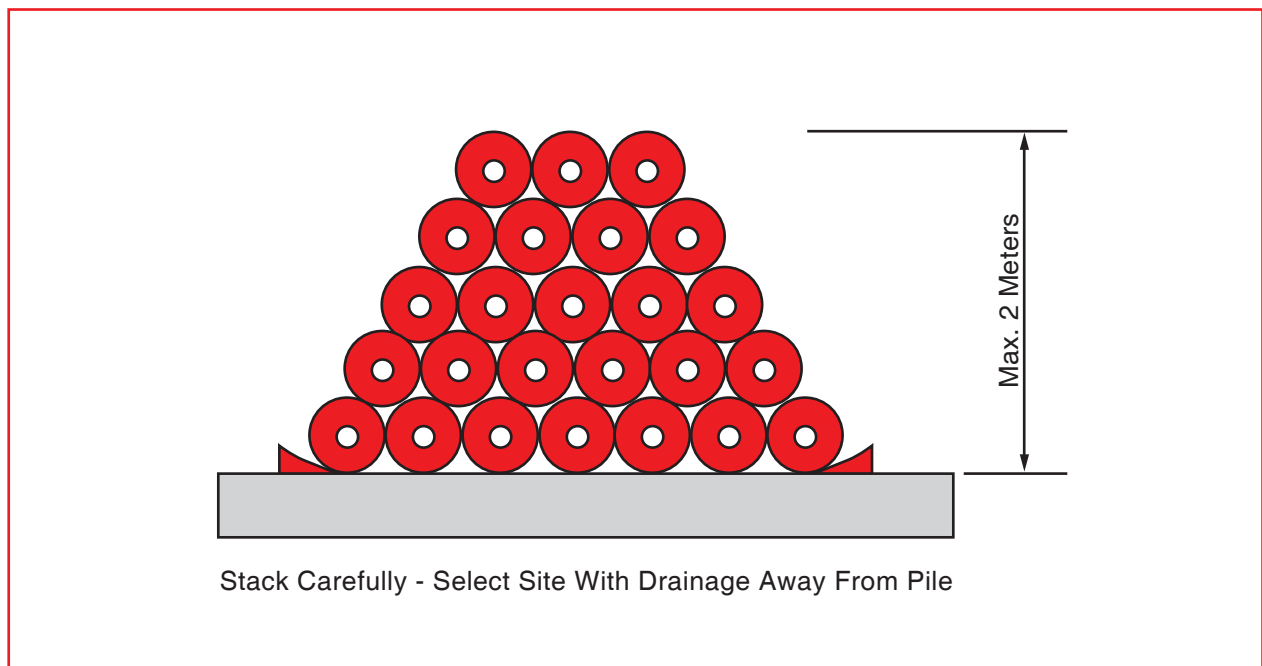
Handling Units

- (1) Do not drag or drop units.
- (2) Do not use chains or other devices which might puncture jacket.
A nylon webbed sling (min. 150 mm width) must be used for unloading.
- (3) Joint materials (insulation and accessories) should be stored indoors protected from the weather and loss until needed

Storing Units

- (1) Units can be stockpiled.
- (2) Never exceed a stack height of 2 meters.
- (3) Prevent dirt and debris from entering pipe.
- (4) Be careful to avoid damage to pipe ends.

Fig. 1 Storage of TERRA-GARD™ Units



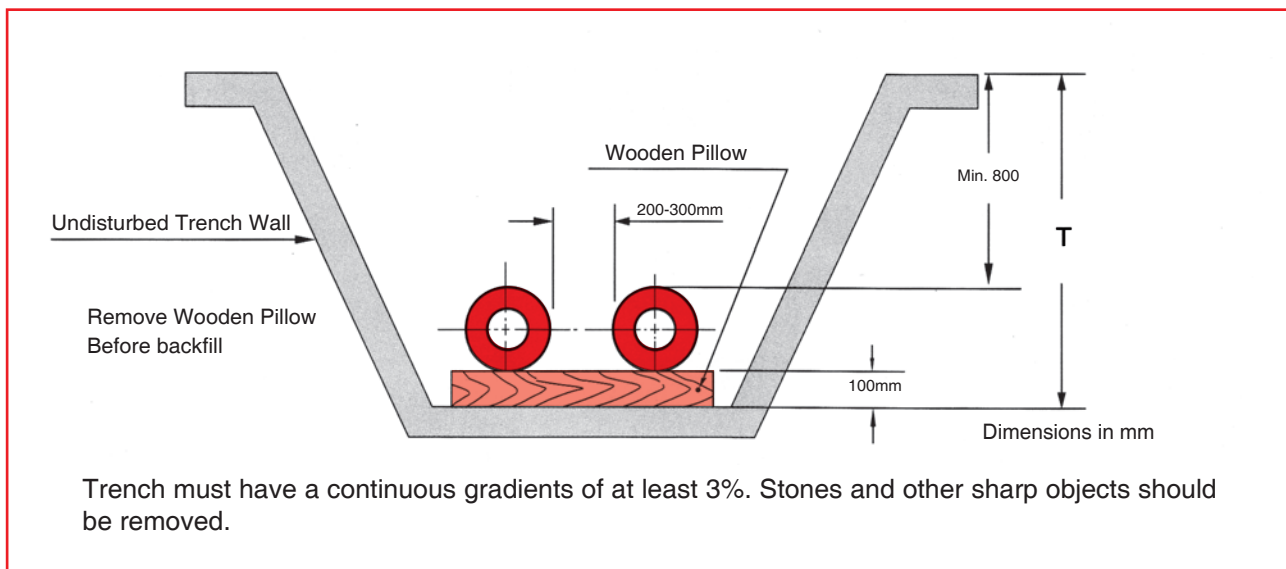
Trenching and Wall Entry

Trenching

- (1) Keep trench narrow, but allow sufficient width for proper tamping. Trench bottom should be smooth and free of sharp objects. When the trench bottom is unstable, the trench width should be at least 5 jacket diameters. The bottom should be stabilized by over-excavating for at least 1.5 diameters and replaced by stable materials for bedding and sidefill. When the trench bottom is hard rock or hard shale, a stable material at least 150 mm thick should be placed on top of the over-excavated bottom.

RICWIL does not have or assume any responsibility for trenching, shoring, excavation or backfilling since these matters are solely within the province of the installing contractor and the owner's representatives.

Fig. 2. Pipe Trench

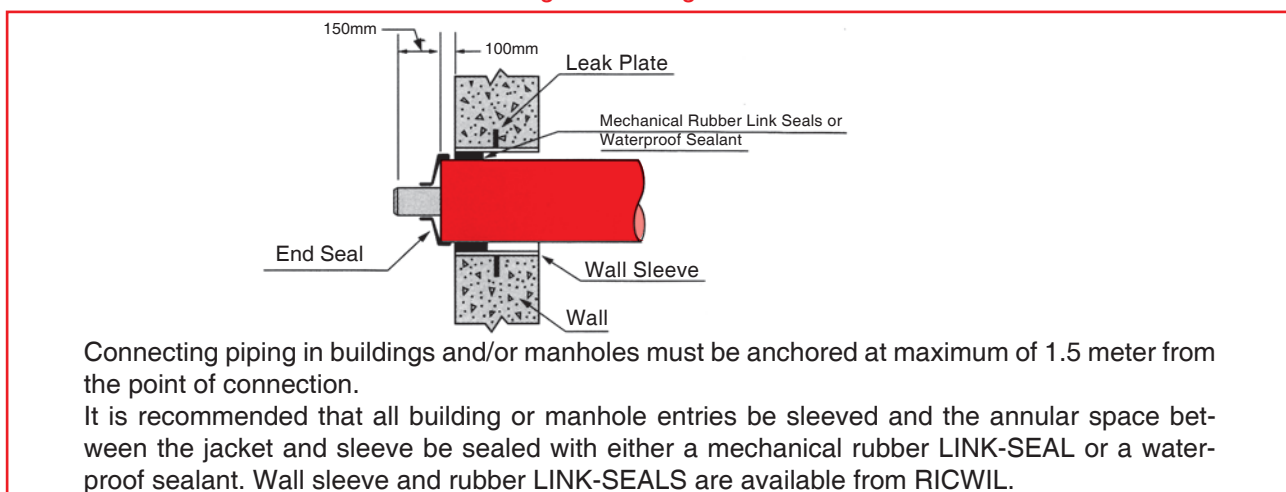


Trench Depth

- (1) The line(s) shall be installed at elevations shown on contract drawings. The trench depth should always allow for a minimum cover height of 800 mm over the top of the jacket. With 90% backfill compaction and minimum 800 mm of cover, the system will then withstand AASHTO H-20 traffic loads.

Wall Entry

Fig. 3. Building Tie-ins



Trenching for Branch and Backfilling

Trenching For Branch

- (1) Pipe trench for branches must be excavated at a different level from that of main runs. It would depend upon outside diameters of main runs and branch line.

Fig. 4 Branch take-off to lower level.

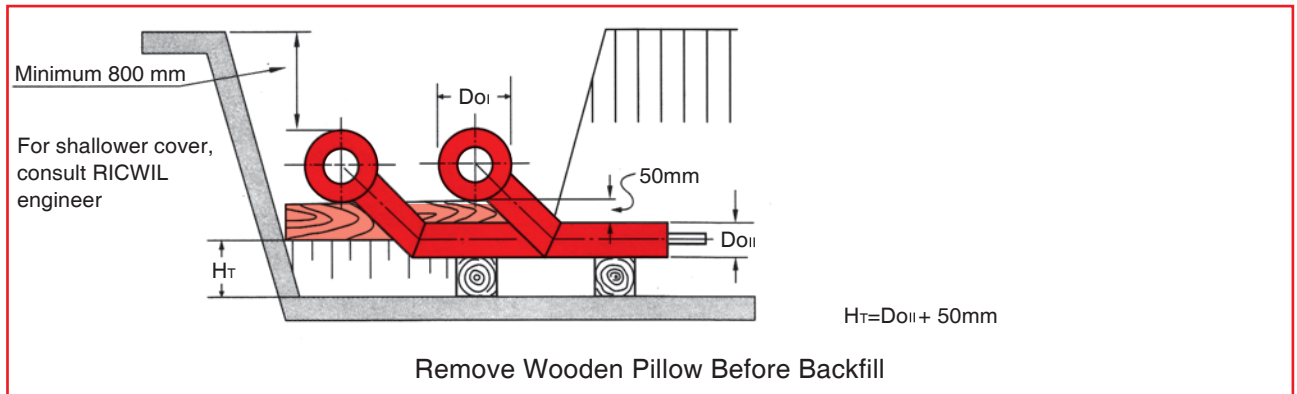
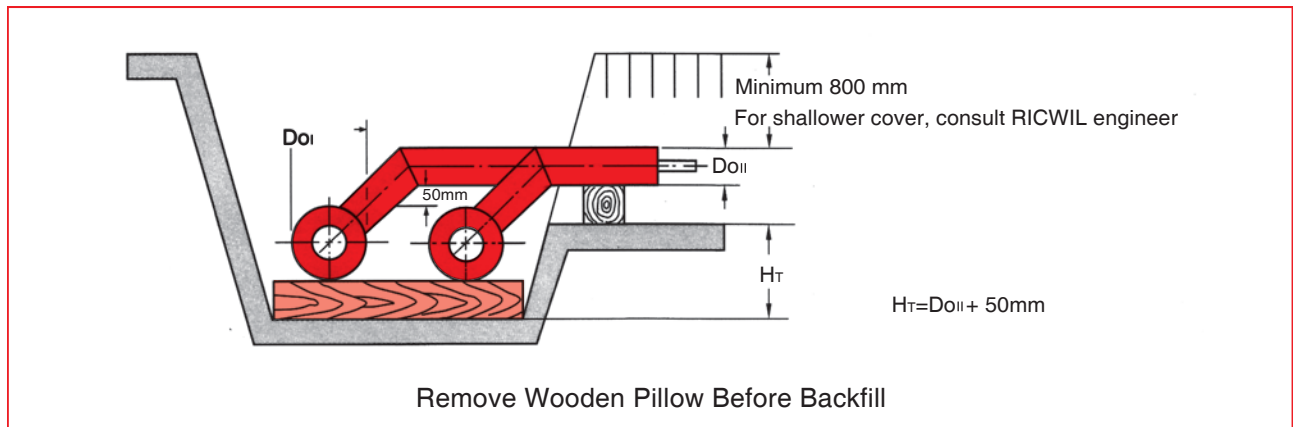


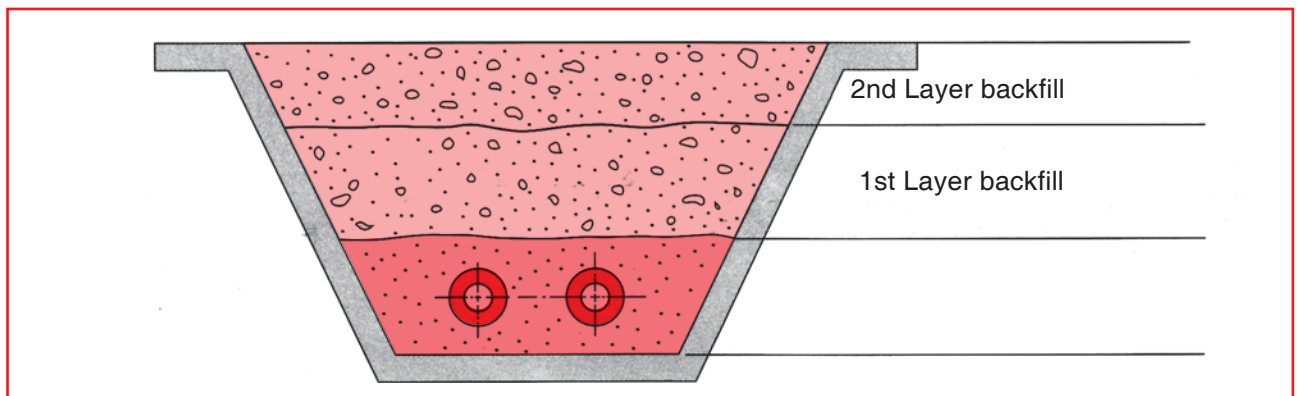
Fig. 5 Branch take-off to higher level.



Backfilling

- (1) Recommended backfill specifications are as follows: Using selected materials, hand-tamp in 150 mm layers to 150 mm above top of jacket. Do not use frozen, fill, sod, cinders or large stones as backfill. Do not compact the backfill with heavy-wheeled or tracked equipment. It is recommended that machine and traffic crossings should be protected with timber until the fill has settled. Backfilling shall be carried on simultaneously on both sides of the jacket in such a manner that injurious side pressures do not occur.

Fig. 6 Backfill of trench



(5) Trim excess cured polyurethane foam on galvanised sheet. Remove all paper tape and clean all the edges. Cover the pour hole by aluminium tape and rivet the two air holes.

(B) Heat Actuated Shrink Sheet Installation Procedure.

(6) Remove the protective release plastic from the heat actuated shrink sheet. Center shrink sheet so it is over the galvanised sheet and evenly overlapping adjacent jacket. Wrap snugly around the joint with edges of sheet should extend 2" or more onto adjacent jacket. Overlapping ends of sheet should align evenly and permit easy access to install closure. (Fig. 4)

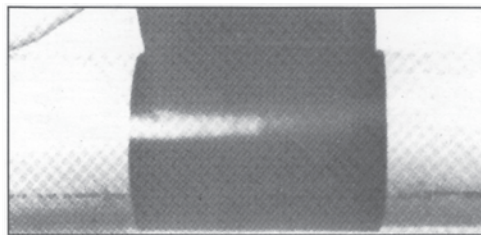
closure application



1. Remove the release paper from the adhesive strips on the closure. Press in position centering over the exposed sheet end.



2. Using a blow torch adjust flame length to approximately 22" (50 cm) to produce a yellow flame. Using the yellow portion of the flame, heat the closure evenly until the thermochromic paint changes in color from green to black.



3. With gloved hand, smooth any wrinkles working outward from the center.

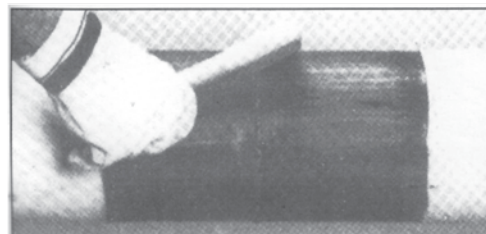
WRAPAROUND Pipe Sleeve Installation Instructions

Materials and Equipment

1. Appropriate size WPCT sleeve and WPCP III closure
2. Blow torch
3. Propane tank
4. AD 1358 propane regulator and gauge
5. AD 1434, 30 foot propane hose
6. Standard safety equipment such as gloves, goggles, hard hats, etc.

Note:

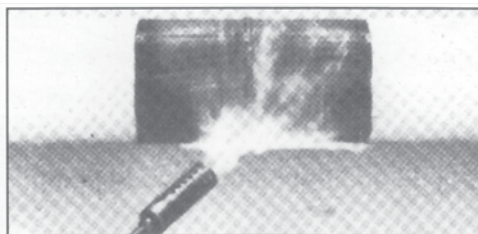
Two sets of equipments are required for pipes 16" (400mm) in diameter and larger.



1. Clean exposed steel area and adjacent pipe coating that will be covered by WPCT sleeve with a hand or power wire brush to remove loose and foreign materials.

Note:

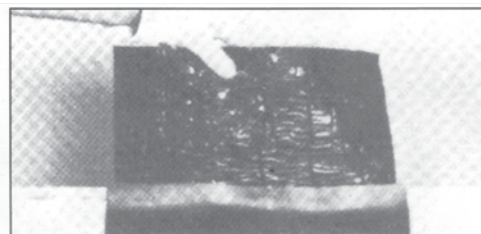
Coal tar-remove white wash paint on the surface of coating to be covered by WPCT. Painted coatings-remove white wash paint on the surface of coating to be covered by WPCT.



2. Preheat joint area until hot to the hand approximately 140°F (60°C). Preheating reduces installation time and ensures proper bonding.

Note:

Two people working on opposite sides of the pipe are recommended for installing sleeves on pipe 16" (400mm) in diameter and larger.

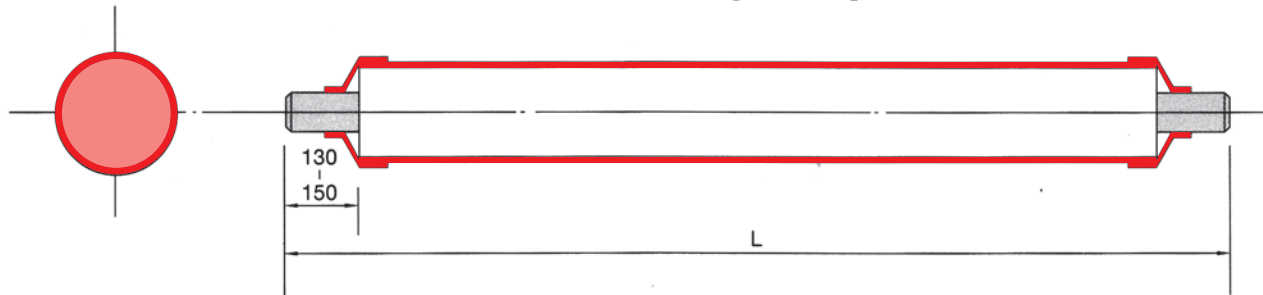


3. Remove the protective release plastic from the coated sleeve. Center sleeve so it is over the weld and evenly overlapping adjacent pipe coating. Wrap snugly around pipe so that the shrink sleeve runs circumferentially around the pipe.

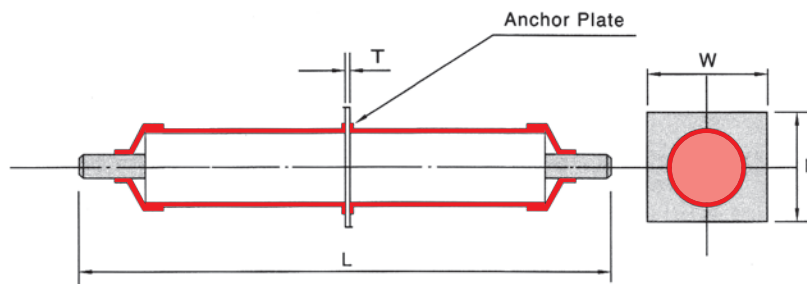
Note:

1. Clean overlap area of the sleeve to remove dirt and other foreign materials.
2. Edges of sleeve should extend 2" or more onto adjacent pipe coating.
3. Overlapping ends of sleeves should align evenly.
4. Position overlap to permit easy access to install closure.

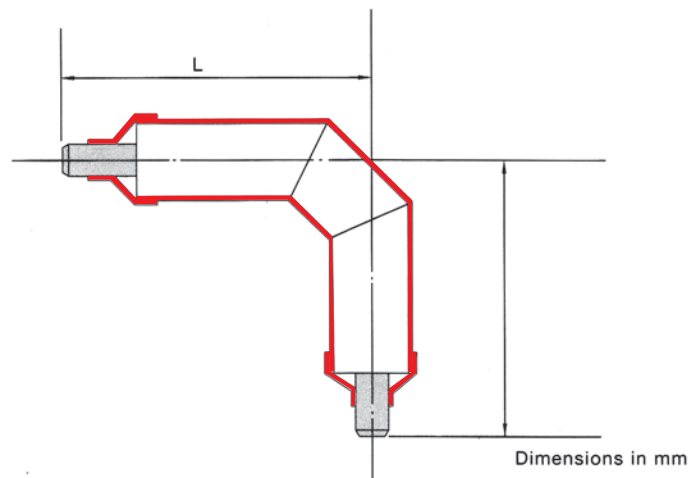
Preinsulated Straight Pipes



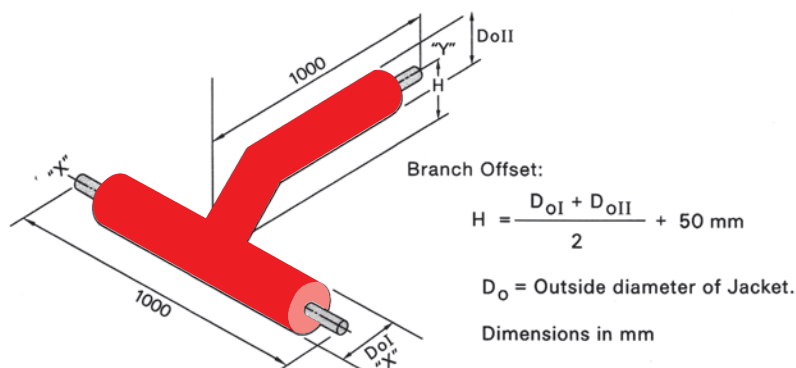
Prefabricated-Preinsulated Anchor Unit



Preinsulated Prefabricated Elbows



Preinsulated Prefabricated Tees



Proposed Specification for TERRA-GARD™ System

Clause	Remarks
1. Underground Piping System All thermally insulated underground piping system shall be RICWIL TERRA-GARD™ fill-in type without air-gap or approved equal. The thermal insulating jacket shall be of non-metallic sectional factory preinsulated and prefabricated type. It shall be structurally strong, water tight and entirely resistant to corrosive elements normally encountered underground. It shall consist of the carrier pipe, insulation, jacket, anchors, fittings, wall seals, expansion provision and field joining materials. TERRA-GARD™ system components shall be of the physical properties shown below. TERRA-GARD™ system shall be installed strictly in accordance with the manufacturer's recommendations and instructions. The preinsulated pipes shall be of the product of the manufacturer who has been engaged in manufacturing preinsulated pipes at least for the last 10 years.	Specify Aqualearn leak detection system if required.
2. Carrier Pipe Unless otherwise specified, carrier pipe shall be either of the following standard. (a) ASTM A53 Gr.B Std weight seamless black. (b) JIS G 3454 STPG 38 Sch40 seamless black (c) BS 1387 or DIN 2448 ST35 (d) For pipe size 20" and larger, carrier pipe shall be API 5L Gr.B SAW or JIS G3457 STPY 41. Minimum wall thickness shall be 9.5mm. All carrier pipe end shall be bevelled for field welding in accordance with ASTM or JIS standard and shall be properly protected with plastic cover.	Select most suitable carrier pipe.
3. Insulation Insulation shall be polyurethane foam injected by foaming machine in one continuous process and foamed in place completely filling the annular space between carrier pipe and jacket. Insulation shall be of the following characteristics.	
3.1 Density Minimum 45 kg/m³ (4.7 lb/ft³).	Specify if higher density is required. 50 kg/m ³ , 75 kg/m ³
3.2 Thermal Conductivity 0.02 W/m.°K or 0.017 Kcal/m.hr. °C	a) 0.021 W/m.°K for 50 kg/ m³ b) 0.023 W/m.°K for 75 kg/ m³

Proposed Specification for TERRA-GARD™ System

Clause	Remarks														
3.3 Compressive Strength 2.0 kg/cm² (29psi) a) 2.8 kg/cm³ (40psi) for 50 kg/m³ b) 5.0 kg/cm³ (71psi) for 75 kg/m³ 3.4 Closed Cell Content Min 90% by volume 3.5 Insulation Thickness Insulation thickness shall be selected on economical bases in such a manner to ensure that heat gain at maximum 5°C does not exceed recognized standard. <table border="0"> <tr> <td>Pipe size (NB)</td><td>Min thickness</td></tr> <tr> <td>15mm - 300mm</td><td>25 mm</td></tr> <tr> <td>350mm and over</td><td>35 mm</td></tr> </table> 4. Outer Jacket Jacket shall be extruded high density polyethylene tube complying to: <table border="0"> <tr> <td>ASTM</td><td>D 1248 TYPE CLASS 3</td></tr> <tr> <td>JIS</td><td>K 6761</td></tr> <tr> <td>BS</td><td>3284/1967 TYPE 50</td></tr> <tr> <td>DIN</td><td>8074/75</td></tr> </table> 5. Fittings All fittings shall be prefabricated and preinsulated. Prefabricated and preinsulated elbows, loops and tees shall be furnished and installed where shown on plans and shall consist of pipe, insulation, and jacket conforming to the same specification as hereinbefore specified for straight runs. Expansion loops shall be of proper design in accordance with stress limits indicated by The Code for Pressure Piping, ANSI B31.1. Loop piping shall be installed in jacket suitably sized to handle indicated pipe movement. ALTERNATE: Where space does not permit, the use of loops, expansion joints in manholes shall be provided.	Pipe size (NB)	Min thickness	15mm - 300mm	25 mm	350mm and over	35 mm	ASTM	D 1248 TYPE CLASS 3	JIS	K 6761	BS	3284/1967 TYPE 50	DIN	8074/75	Specify if PVC jacket or other type of jacket is desired If expansion loop can not be used because of limited space, specify bellows or ball joints or other expansion joints.
Pipe size (NB)	Min thickness														
15mm - 300mm	25 mm														
350mm and over	35 mm														
ASTM	D 1248 TYPE CLASS 3														
JIS	K 6761														
BS	3284/1967 TYPE 50														
DIN	8074/75														

Proposed Specification for TERRA-GARD™ System

Clause	Remarks
6. End Seals and Gland Seals. Terminal ends of jacket inside manholes, pits, or building walls shall be equipped with End Seals consisting of a heat shrinkable polyethylene bulk-head installed to the pipe and jacket. Where there is no anchor within 1 .5 meter of a terminal end, jackets shall be equipped with Gland Seals consisting of a packed stuffing box and gland follower mounted on a steel plate installed to end of jacket. Terminate all jackets 100 mm beyond the inside face of manhole or building walls to protect any exposed piping insulation from damp-wall condensation. If pipe is cut due to field alteration, End-Seal (shipped loose) must be applied prior to welding of carrier pipe or apply elastometric compound furnished by manufacturer. 7. Leak Plates and Rubber Link-Seal To provide an effective moisture barrier, awll sleeve with leak plate at building or manhole walls must be provided. Wallsleeve and leakplates shall consist of steel sleeve and steel plate flange 100 mm larger in outside diameter than the steel wall sleeve. Between jacket and wall sleeve, rubber LINK-SEAL must be installed to prevent ingress of water and moisture. 8. Field Joints Field joint must be performed strictly in accordance with manufacturer's recommendations. Straight joints shall be field insulated using polyurethane foam, split P.E. connector band and polyethylen shrink sleeve. 9. Manufacturer's Field Installation Instructor A Manufacturer's Field Service Instructor is to be present during critical periods of installation and testing of the system. 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. On completion of the installation, the contractor shall deliver to the owner a certificate from the manufacturer stating that the installation has been made in accordance with the manufacturer's recommendations. 10. Manufacturer's Shop Drawings Drawings for approval are prepared by the manufacturer for each project in accordance with the requirements of the contract plans and specifications set forth herein. After approval of the drawing and descriptive brochure, part numbers are assigned to each unit. These part numbers are shown on the drawing which thus becomes a shop drawing. Each unit is marked and tagged to correspond with the part numbers shown on the shop drawing. Shop drawings, with part numbers, accompany actual shipments.	

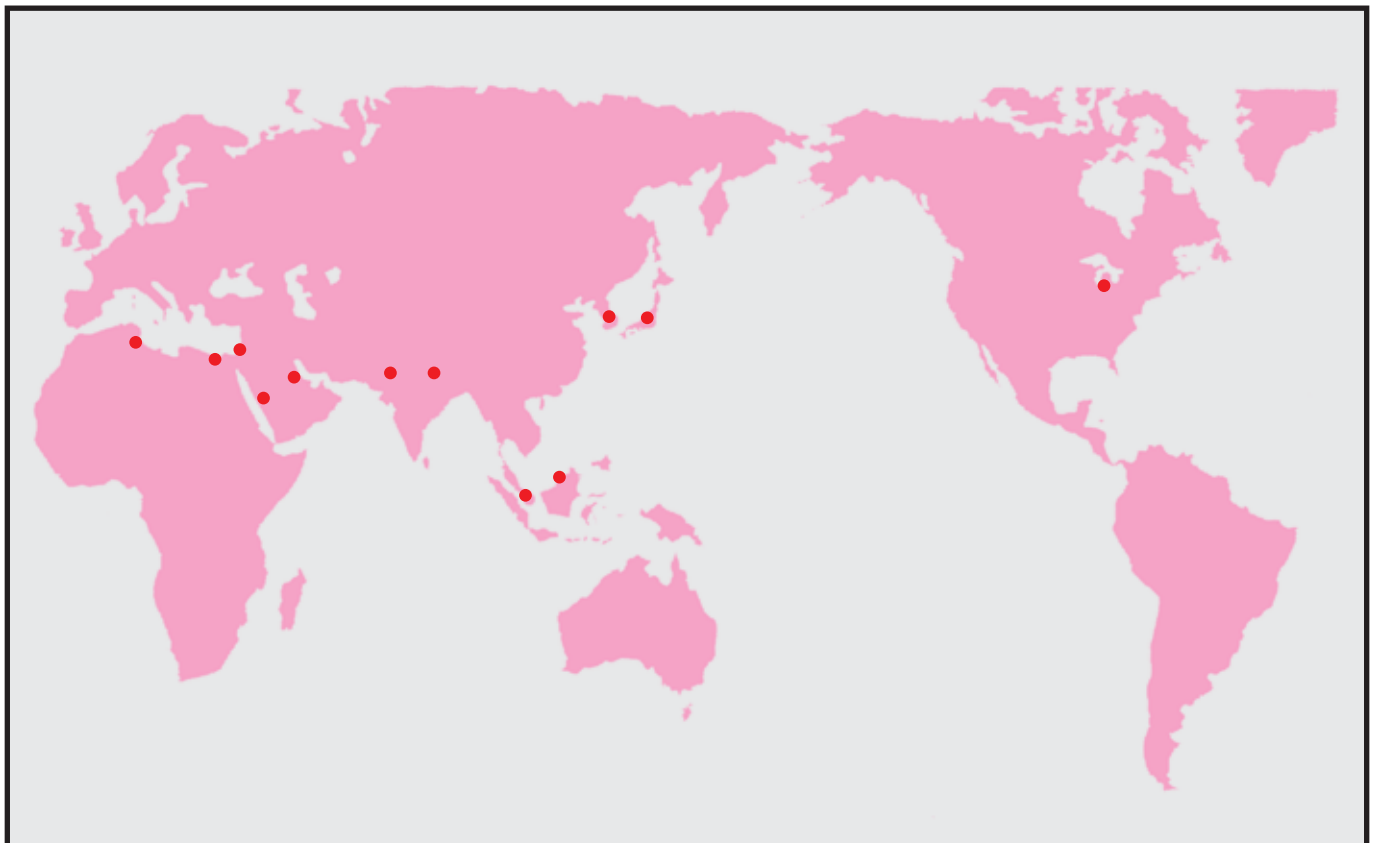
Exportation of RICWIL Products

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 preinsulated 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



PROJECT REFERENCES



Location: Indonesia

Bandara Internasional Kualanarnu, Medan
Bandara Internasional, Lombok
Menara BTN, Jakarta
Hotel Paragon City, Semarang
Blue Sky Hotel, Balikpapan
Wisma Metropolitan I, Jakarta
PT. Hero Supermarket Thk, Cibitung
Mega Mall Pluit, Jakarta
Bandara Soekarno-Hatta, Jakarta
Mall Of Indonesia, Jakarta
Mahkamah Konstitusi RI, Thamrin-Jakarta
SKA Mall, Arenka - Pekanbaru
Diamond City Mall, Nagoya - Batam

Location: Malaysia

Applied Magnetics
Bank Bumiputra Training Centre
Bandar Sunway
Core I
Core II
Cima
Centre Point Sabah
CAMS
Cardio Therapy Centre, KLGH
Carsem Ipoh
Crystal Hill Langkawi
City North
Dunlop Estate
DLTM, Lumut
Dayang Tegas, Nilai
Equatorial Hotel, Penang
Food Specialities
FRIM Bukit Kepong
General Hospital, Penang
General Hospital, Ipoh
Genting Project
General Hospital, Alor Setar
General Hospital, Upgrading (KLGH)
Hospital Kanak-Kanak, KL
Hospital Sultanah Aminah
Ipoh Green Town
Islamic College
Intel Penang
International Youth Centre
Istana Tetamu & Carcosa
18th Storey Govt. Bldg.
Istana Hotel K.L.
Innovation Electronics
Intan, Jalan Ilmu
Istana Sharif Ali
JKR 26
JKR 92
JKR Bukota
JKR Training Centre, Bangi
Jami - Swillyn, Shah Alam
JDC
Jabatan Bekalan Air
KL Plaza
Kelantan Stale Secretariate
Kelab Darul Ehsan
Kuwait Embassy
KL Hilton
KTM Extension
Kuching Civic Centre
Kelab Perdana Diraja
Kamaya Electric, Ipoh
LLN Sub-Station
Lake Club
Lot 10
MAS Air Cargo Terminal
Mutiara Beach Hotel

Maybank Phoenix Assurance Bldg.
Motorola Senawang, Seremban
Matsushita
Matsushita Electronic Devices
MAS Stimulator Extension
Mosanto Electronic (MEMC)
MAS Hanger
Normah Medical Centre
New Straits Times
Navat Base Lumut
Nationat Library -
New Genting Hotel
Nucleus Hospital
Police Headquarters
Perangsang
Petronas I
Petronas It
Petronas Bangi Ph 2
Petronas Stadium Bangi
Pernas tnt. Hotel
Pernama
Porim
Port Klang Power Station Ph 2
Parliament House Renovation
Polytechnic Kota Bahru
Pusat Komercial / Perdagangan
Polytechnic PD
PANB (Kewangan)
PGU II
Polytechnic, Ipoh
Porla
RTM Alor Star
Riversite Hotel Kuching
Riverview Hotel Kuching
Samundra Hotel
Semua House
Syariah Court
Shell Training Centre
Shell Miri
Shell Office Extension
Sport Complex Shah Alam
Syarikat Telekom Malaysia, KL
Samsung Seremban
Sheraton, Langkawi
Sarawak Shell Berhad,
Selangor Turf Club
Tun Hussein Cnn Eye Hospital
TTD I
Tenglu Sulaiman, Bungalow
Tissue Centre
Tung Shin Hospital
Telekom, Museum
Terendak Military Hospital
Taylor College
Timuran, Shah Alam
UTM, Skudai
USM, Sn tsandar Perak
USM Perak Ph 2
University Hospital
University Utara Malaysia, Kedah
- Block Library
- Block Pentadbiran
University Malaya, KL
UKM - Bangi
Vista Sutra, Kuantan
Western Digital
Wisma Persekutuan, Kota Bahru

Location: Brunei

Auditorium at Inst. of Education Negara
Brunei D'salam
A 32 Sugar Store
Balai Pengadapan for Perdana Wazir's

Residence
Brunei University
BLNG
Calibration Centre
Dewan Bahasa, Tutong
Dewan RBT
Forecom, Plywood
Govt. Office Temburong
Gadong & Berakas Telephone
Jurudong Palace
Health Clinic Tutong
Istana Extension
International Convention Centre
Istana Tetamu
Istana Nurul Izzah
Istana Nurul Izzah Ph.4
Istana Nurul Izzah Ph.5
Istana Taqwa
Kiarong Mosque
K B Clinic
Lambak School
Letter & Parcel Processing
Legal Dept. Bldg.
Mabohai
MODTC
New Language & Literature
Princess Umi Kaltum Al-Residence
Port Authority
Rapier Workshop Logistics
RBPC Gusset Hse. No.2
RBPC No.3
RBPC Guest Hse. No.5
RBPC Guest Hse. No.6
RBPC Grandstand No.2
RBGCC Club House
Resource Centre
Shellduck Storage Area
Sherri House
Telecom HQ
VIP Housing No.2

Location: Singapore

Blood Bank
Changi Airport
Changi Airport Terminal 2
GH Hospital Replacement
Hitachi Hi-Tech
Hyatt Regency
Law Court
National Cap
NCB, Singapore
Ocean Tower
Thomas De La Rue
TTS Hospital
Turbine Overhaul Services
Telecom Pasir Ris

Location: Saudi Arabia(Algeria)Jordan/ China

King Abdulaziz Military
Cantonment Tabut, Ph. I.
University of Oran.
King Abdulaziz Military
Cantonment Tabut, Ph. II.
Cantonment Tabut, Ph. III.
Cantonment Tabut, Ph. IV.
Queen Alia Int, Airport Amman.
King Abdulaziz Military Academy Riyadh,
Saudi Arabia ABC Portion
Cameroon, Elf Oil Co, Sub-eas Line.
Queen Alia Int. Airport, Amman, Jordan,
Royal Pavilion.

King Abdulaziz Military Academy Riyadh,
Saudi Arabia ICG Portion.
Baoshan Steelworks, Shang-hai.
The King Khalid Military City Complex.
Saudi Arabia, Area 15S.
Field artillery centre & School & Infantry
centre & school, Khamis Mushayt.
The King Khalid Military City Hafar
Alb8tin, S. Arabia, Area 8, 12 & 18.
Yamouk University, Faculty of Engrg &
Infra II Aman, Jordan.

Location: USA/Canada /Alaska/ Korea

Sun Oil
International Harvester
New England Petroleum
Manhattan St. Hospital
Bahama Oil
Chervon
Philip Morris
Gulf Interstate
(Delmarva).
Conoco
Amoco (Vepco)
Louisiana Power
and Light
Bethlehem Steel
Irving Oil
Union Camp.
E.I. Dupont
Ciba-Geigy
Union Carbide
Hoeschst Fibers
Diamond International
Alyeska
Taterstate
Collier Carbon
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