SNC·LAVALIN

DOCUMENT REVIEW

C1 ☑ **"APPROVED"** - WORK MAY PROCEED DOCUMENT SHALL BE SUBMITTED FOR CONSTRUCTION.

C2 ☐ **"APPROVED AS MARKED"** - REVISE & RE-SUBMIT, WORK MAY PROCEED BASE ON NOTED AMENDMENTS.

C3 ☐ **"DISAPPROVED"** - CORRECT & RE-SUBMIT, WORK MAY NOT PROCEED.

C4 ☐ **"FOR INFORMATION"** FOR INFORMATION ONLY, WORK MAY PROCEED.

C5 ☐ **"FOR INFORMATION AS MARKED"** FOR INFORMATION WITH COMMENTS.

Acceptance in any of these categories in no way relieves the Supplier/Contractor of its responsibility for the due and proper performance of the Works in accordance with the Contract/Purchase Order.

Name: Pongpiech Umpunpong

Signed: Pongpiech

Date: Aug 13, 2015

ALL CHANGES TO THIS DOCUMENT SHALL BE CLOUDED BY CONTRACTOR / SUPPLIER

			Khajornsak	Vinod	
A	4-Aug-15	FIRST ISSUE	KHAJORNSAK	VINOD	WITTAWAS
NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

SCALE:

ADVANCE AGRO ASIA COMPANY LIMITED

Khoakanun Clean Energy Plant Project

Company Catalog & Material Specification For Fire Water Piping(SHURJOINT)

TJEL THAI JURONG ENGINEERING LIMITED	JOB NO. 20039	TH
	TRANSMITTAL NO. T-T-S-P0003-A	REV.
		PAGE 1/69

COMPANY CATALOG & MATERIAL SPECIFICATION

SHURJOINT®

A WORLD LEADER IN MECHANICAL PIPING COMPONENTS

Organization Structure of the *Shurjoint* Group

The ***Shurjoint*** group runs global business from production to sales of grooved couplings and fittings along with other related piping components. The group consists of the sales division ***Shurjoint Piping Products*** and its subsidiaries and the manufacturing division ***Shurjoint Metals*** and its subsidiaries and sub-suppliers.

Sales Division

USA Head Office

Company Name	Functions	Location	Contact Person	Tel/Fax/e-mail
Shurjoint Piping Products, Inc.	USA head office & warehouse	4601 E. Cheyenne Ave., #105 Las Vegas, Nevada 89115, USA	Eric Anderson	Tel: 702-644-4492 Fax:702-644-1091 Email: eric@shurjoint.com
	Atlanta sales office and warehouse	1380 Beverage Drive, Ste. P. Stone Mountain, GA 30083, USA	Brad Johnson	Tel: 770-817-0444 Fax: 770-817-0443 Email: brad@shurjoint.com
	Seattle sales office	3 Ober Strasse (P.O.Box 1038) Snoqualmie Pass, WA 98068, USA	Mark Beach	Tel: 425-434-0080 Fax: 425-434-0081 Email: mark@shurjoint.com
Shurjoint Piping Products, Inc.	Asia/Pacific head office	3F, #130 Xinhu 3rd Rd. (Neihu) Taipei, Taiwan	Howard Hagiya	Tel: 886-2-2792-7929 Fax: 886-2-2792-5159 Email: howardh@shurjoint.com
Shurjoint Korea Co., Ltd.	Seoul sales office & warehouse	105-7 Doosan B/D 3F, Nonhyun-Dong Gangnam-Gu, Seoul, Korea	Daniel Oh	Tel: 82-2-549-4446 Fax:82-2-549-4406 Email: daniel@shurjoint.com
Shurjoint Taiwan Inc.	Taipei sales office and warehouse	3F, No. 219, Chengteh Rd., Sec. 3, Taipei-Taiwan	Arden Huang	Tel: 886-2-2595-1255 Fax:886-2-2595-6860 Email:: ardenh@shurjoint.com

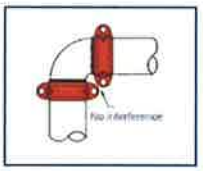
MODEL K-9 RIGID COUPLING

- T&G Design -

The ***Shurjoint*** Model K-9 is a T&G (tongue & groove) design coupling for moderate pressure applications where rigidity is required including valve connections, mechanical rooms, fire mains and long straight runs. The built-in teeth and T&G mechanism firmly grasp the pipe ends to eliminate undesired flex. Support and hanging requirements correspond to ANSI B31.1, B31.9 and NFPA 13.

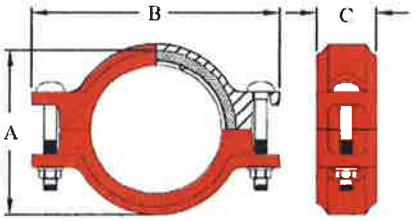
The Model K-9 couplings are comprised of two identical housing segments, EPDM rubber gasket and plated track bolts and nuts. Housing segments are supplied with our standard painted finishes, i.e. orange or RAL3000 red. Optional finishes such as hot dipped zinc galvanized and custom epoxy coatings are available.

K-9 couplings should always be installed so that the coupling bolt pads make metal to metal contact.



No need to worry about bold pad interference as the Model K-9 works well with both regular and short radius elbows and tees.

For Fire Protection pressure rating, listing, and approval information, refer to Data Sheet B-42 or visit ***SHURJOINT*** website, www.shurjoint.com for details or contact your ***SHURJOINT*** Representative.



10 YEAR LIMITED WARRANTY

Full warranty terms can be found on www.shurjoint.com

Model K-9 Rigid Coupling

Nominal Size	Pipe OD	Max. Working Pressure (CWP)*	ASME/ANSI Pressure Class Rating^ @100°F/@38°C	Max End Load (CWP)	Axial Displacement	Dimension			Bolt Size	Weight
						A	B	C		
in mm	in mm	PSI Bar	PSI Nom. class	Lbs kN	in mm	in mm	in mm	in mm	in mm	Lbs Kgs
1¼ 32	1.660 42.2	500 34.5	300 150	1080 4.82	0~0.06 0~1.6	2.56 65	4.33 110	1.77 45	⅜ x 1¾ M10 x 45	1.3 0.6
1½ 40	1.900 48.3	500 34.5	300 150	1410 6.32	0~0.06 0~1.6	2.80 71	4.45 113	1.77 45	⅜ x 2⅛ M10 x 55	1.3 0.6
2 50	2.375 60.3	500 34.5	300 150	2210 9.85	0~0.06 0~1.6	3.27 83	4.88 124	1.77 45	⅜ x 2⅛ M10 x 55	1.5 0.7
2½ 65	2.875 73.0	500 34.5	300 150	3240 14.43	0~0.06 0~1.6	3.86 98	5.39 137	1.77 45	⅜ x 2⅛ M10 x 55	1.8 0.8
76.1 mm	3.000 76.1	500 34.5	300 150	3530 15.68	0~0.06 0~1.6	4.00 102	5.51 140	1.77 45	⅜ x 2⅛ M10 x 55	1.8 0.8
3 80	3.500 88.9	500 34.5	300 150	4800 21.40	0~0.06 0~1.6	4.50 114	5.94 151	1.77 45	⅜ x 2¾ M10 x 70	2.6 1.2
108.0 mm	4.250 108.0	500 34.5	300 150	7080 31.59	0~0.13 0~3.2	5.38 137	7.00 219	2.00 51	⅜ x 2¾ M10 x 70	3.6 1.7
4 100	4.500 114.3	350 24.1	300 150	5560 24.72	0~0.13 0~3.2	5.63 143	7.48 190	2.00 51	⅜ x 2¾ M10 x 70	3.6 1.7
133.0 mm	5.250 133.0	350 24.1	300 150	7570 33.46	0~0.13 0~3.2	6.52 166	8.61 219	2.00 51	½ x 3 M12 x 75	4.6 2.1
139.7 mm	5.500 139.7	350 24.1	300 150	8310 36.92	0~0.13 0~3.2	6.77 172	9.21 234	2.00 51	½ x 3 M12 x 75	4.6 2.1
5 125	5.563 141.3	350 24.1	300 150	8500 37.77	0~0.13 0~3.2	6.89 175	8.98 228	2.00 51	½ x 3 M12 x 75	4.6 2.1
159.0 mm	6.250 159.0	350 24.1	300 150	10730 47.83	0~0.13 0~3.2	7.50 191	9.67 246	2.00 51	½ x 3 M12 x 75	4.4 2.0
165.1 mm	6.500 165.1	350 24.1	300 150	11600 51.57	0~0.13 0~3.2	7.75 197	9.92 252	2.00 51	½ x 3 M12 x 75	5.3 2.4

Model K-9 Rigid Coupling

Nominal Size	Pipe OD	Max. Working Pressure (CWP)*	ASME/ANSI Pressure Class Rating^ @100°F/@38°C	Max End Load (CWP)	Axial Displacement	Dimension			Bolt Size	Weight
						A	B	C		
in mm	in mm	PSI Bar	PSI Nom. class	Lbs kN	in mm	in mm	in mm	in mm	in mm	Lbs Kgs
6 150	6.625 168.3	350 24.1	300 150	12050 53.59	0~0.13 0~3.2	7.87 200	10.04 255	2.09 53	½ x 3 M12 x 75	5.9 2.7
8 200	8.625 219.1	350 24.1	300 150	20430 90.82	0~0.13 0~3.2	10.16 258	13.98 355	2.40 61	¾ x 3½ M16 x 90	9.7 4.4

* Working Pressure is based on roll grooved standard wall carbon steel pipe.
^ The ASME/ANSI pressure class rating is not the design or maximum pressure rating, rather is provided for those that are accustomed to specifying or using ASME/ANSI pressure class rated components such as flange, valves, etc.

MODEL K-9H RIGID COUPLING

Model K-9H Rigid Coupling

Nominal Size	Pipe OD	Max. Working Pressure (CWP)*	ANSI Pressure Class Rating^ @100°F/@38°C	Max End Load (CWP)	Axial Displacement	Dimension			Bolt Size	Weight
						A	B	C		
in mm	in mm	PSI Bar	PSI Nom. class	Lbs kN	in mm	in mm	in mm	in mm	in mm	Lbs Kgs
8 200	8.625 219.1	350 24.1	300 150	20430 90.82	0~0.13 0~3.2	10.29 261	13.08 332	2.48 63	¾ x 4¾ M20 x 120	9.7 4.4

* Working Pressure is based on roll grooved standard wall carbon steel pipe.
^ The ASME/ANSI pressure class rating is not the design or maximum pressure rating, rather is provided for those that are accustomed to specifying or using ASME/ANSI pressure class rated components such as flange, valves, etc.

Performance Data

The following tables show the maximum working pressures (CWP) of ***Shurjoint*** Model K-9/K-9H Rigid Coupling used on both carbon steel and stainless steel pipes. ***Shurjoint*** ductile iron couplings can be used in conjunction with stainless steel pipe in non-corrosive environment as the flow media does not come in direct contact with the coupling housings but rather only the gasket.

Model K-9 on Carbon Steel Pipe

Nom. Size	Cut-Grooved		Roll-Grooved		
in / mm	XS PSI / Bar	STD PSI / Bar	STD PSI / Bar	Sch. 10 PSI / Bar	Sch. 7 PSI / Bar
1¼ 32	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
1½ 40	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
2 50	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
2½ 65	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
2½ 65	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
3 80	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
4 100	600 41.4	600 41.4	500 34.50	400 27.6	300 20.7
5 125	450 31.0	450 31.0	450 31.0	350 24.1	250 17.2
5 125	450 31.0	450 31.0	450 31.0	350 24.1	250 17.2
6 150	450 31.0	450 31.0	450 31.0	350 24.1	250 17.2
6 150	450 31.0	450 31.0	450 31.0	350 24.1	250 17.2
8 200	450 31.0	450 31.0	300 20.7	250 17.2	200 13.8
8 (K-9H) 200	450 31.0	450 31.0	300 20.7	250 17.2	200 13.8

Model K-9 on Stainless Steel Pipe

Nom. Size	Cut-Grooved		Roll-Grooved		
in / mm	Sch. 80S PSI / Bar	Sch. 40S PSI / Bar	Sch. 40S PSI / Bar	Sch. 10S PSI / Bar	Sch. 5S PSI / Bar
1¼ 32	600 41.4	600 41.4	450 31.0	300 20.7	250 17.2
1½ 40	600 41.4	600 41.4	450 31.0	300 20.7	250 17.2
2 50	600 41.4	600 41.4	450 31.0	300 20.7	250 17.2
2½ 65	600 41.4	600 41.4	450 31.0	300 20.7	250 17.2
2½ 65	600 41.4	600 41.4	450 31.0	300 20.7	250 17.2
3 80	600 41.4	600 41.4	450 31.0	300 20.7	250 17.2
4 100	600 41.4	600 41.4	450 31.0	300 20.7	200 13.8
5 125	450 31.0	450 31.0	300 20.7	200 13.8	NR
5 125	450 31.0	450 31.0	300 20.7	200 13.8	NR
6 150	450 31.0	450 31.0	300 20.7	125 8.6	NR
6 150	450 31.0	450 31.0	300 20.7	125 8.6	NR
8 200	450 31.0	450 31.0	300 20.7	100 6.9	NR
8 (K-9H) 200	450 31.0	450 31.0	300 20.7	100 6.9	NR

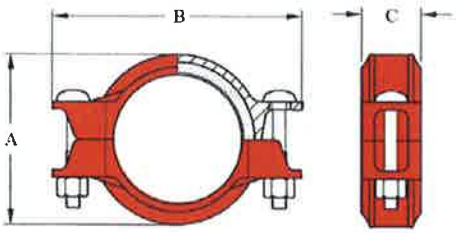
MODEL 7705 STANDARD FLEXIBLE COUPLING

The Model 7705 Standard Flexible Coupling is a standard flexible coupling for use in a variety of general piping applications of moderate pressure services. The model 7705 couplings features flexibility that can deal with misalignment, distortion, thermal stress, vibration and noise and also resist seismic tremors. With the use of Model 7705 couplings you can even design a curved layout. See Typical Applications – Flexible Couplings on ***Shurjoint*** cut sheet #B-19.

All Model 7705 couplings are comprised of two identical ductile iron housings segments, EPDM rubber gasket and plated track bolts & nuts. Housings segments are supplied with our standard painted finishes, i.e. orange or RAL3000 red. Optional finishes such as hot dipped zinc galvanized and custom epoxy coatings are available.

7705 couplings should always be installed so that the coupling bolt pads make metal to metal contact.

For Fire Protection pressure rating, listing, and approval information, refer to Data Sheet B-42 or visit ***SHURJOINT*** website, www.shurjoint.com for details or contact your ***SHURJOINT*** Representative.



10 YEAR LIMITED WARRANTY

Full warranty terms can be found on www.shurjoint.com

Model 7705 Standard Flexible Coupling

Nominal Size	Pipe O.D.	Max. Working Pressure (CWP)*	ASME/ANSI Pressure Class Rating^ @100°F/@38°C	Max. End Load (CWP)	Axial Displace-ment †	Angular Movement **†		Dimensions			Bolt Size	Weight
						Deg. Per Coupling	Per Pipe	A	B	C		
in mm	in mm	PSI Bar	PSI Nom./Class	Lbs kN	in mm	(°)	in/ft mm/m	in mm	in mm	in mm	in mm	Lbs Kgs
1 25	1.315 33.7	500 35	300 150	670 3.12	0.0625 1.6	2°- 45'	0.58 48	2.24 57	3.94 100	1.81 46	⅜ x 1¾ M10 x 45	1.3 0.6
1¼ 32	1.660 42.4	500 35	300 150	1080 4.94	0.0625 1.6	2° - 10'	0.46 38	2.60 66	4.06 103	1.81 46	⅜ x 2⅛ M10 x 55	1.5 0.7
1½ 40	1.900 48.3	500 35	300 150	1410 6.41	0.0625 1.6	1° - 54'	0.4 33	2.83 72	4.25 108	1.81 46	⅜ x 2⅛ M10 x 55	1.6 0.7
2 50	2.375 60.3	500 35	300 150	2210 9.99	0.0625 1.6	1° - 31'	0.32 27	3.31 84	5.08 129	1.89 48	⅜ x 2¼ M10 x 55	1.8 0.8
2½ 65	2.875 73.0	500 35	300 150	3240 14.64	0.0625 1.6	1° - 15'	0.26 22	3.90 99	5.59 142	1.89 48	⅜ x 2⅛ M10 x 55	2.0 0.9
76.1 mm	3.000 76.1	500 35	300 150	3530 15.91	0.0625 1.6	1° - 12'	0.25 21	4.02 102	5.79 147	1.89 48	⅜ x 2⅛ M10 x 55	2.1 1.0
3 80	3.500 88.9	500 35	300 150	4800 21.71	0.0625 1.6	1° - 02'	0.22 18	4.57 116	6.65 169	1.89 48	½ x 3 M12 x 75	2.8 1.3
101.6 mm	4.000 101.6	500 35	300 150	6280 28.36	0.0625 1.6	0° - 54'	0.19 16	5.07 129	7.90 200	2.05 52	½ x 3 M12 x 75	3.6 1.6
108.0 mm	4.250 108.0	500 35	300 150	7080 32.05	0.1250 3.2	1° - 42'	0.36 30	5.43 138	7.56 192	2.05 52	½ x 3 M12 x 75	4.1 1.9
4 100	4.500 114.3	500 35	300 150	7940 35.89	0.1250 3.2	1° - 36'	0.34 28	5.71 145	7.76 197	2.05 52	½ x 3 M12 x 75	4.1 1.9
133.0 mm	5.250 133.0	450 31	300 150	9730 43.05	0.1250 3.2	1° - 23'	0.29 24	6.50 165	9.09 231	2.05 52	¾ x 3½ M16 x 90	5.1 2.3
139.7 mm	5.500 139.7	450 31	300 150	10680 47.49	0.1250 3.2	1° - 18'	0.28 23	6.69 170	9.17 233	2.05 52	¾ x 3½ M16 x 90	5.9 2.7
5 125	5.563 141.3	450 31	300 150	10930 48.59	0.1250 3.2	1° - 18'	0.27 23	6.77 172	9.21 234	2.05 52	¾ x 3½ M16 x 90	5.9 2.7

Model 7705 Standard Flexible Coupling

Nominal Size	Pipe O.D.	Max. Working Pressure (CWP)*	ASME/ANSI Pressure Class Rating^ @100°F/@38°C	Max. End Load (CWP)	Axial Displace-ment †	Angular Movement **†		Dimensions			Bolt Size	Weight
						Deg. Per Coupling	Per Pipe	A	B	C		
in *mm*	in *mm*	PSI *Bar*	PSI *Non Class*	Lbs *kN*	in *mm*	(°)	in/ft *mm/m*	in *mm*	in *mm*	in *mm*	in *mm*	Lbs *Kgs*
159.0 mm	6.250 *159.0*	450 *31*	300 *150*	13790 *61.52*	0.1250 *3.2*	1° - 09'	0.24 *20*	7.48 *190*	9.96 *253*	2.13 *54*	⅝ x 3½ *M16 x 90*	6.6 *3.0*
165.1 mm	6.500 *165.1*	450 *31*	300 *150*	14920 *66.33*	0.1250 *3.2*	1° - 07'	0.24 *20*	7.72 *196*	10.28 *261*	2.13 *54*	⅝ x 3½ *M16 x 90*	6.8 *3.1*
6 *150*	6.625 *168.3*	450 *31*	300 *150*	15500 *68.93*	0.1250 *3.2*	1° - 05'	0.23 *19*	7.87 *200*	10.55 *268*	2.44 *62*	⅝ x 3½ *M16 x 90*	7.0 *3.2*
8 *200*	8.625 *219.1*	300 *20*	300 *150*	17510 *75.37*	0.1250 *3.2*	0° - 50'	0.18 *15*	10.24 *260*	13.78 *350*	2.52 *64*	⅝ x 3½ *M16 x 90*	12.8 *5.8*
8 (7705H) *200*	8.625 *219.1*	450 *31*	300 *150*	26270 *116.82*	0.1250 *3.2*	0° - 50'	0.18 *15*	10.47 *266*	13.50 *343*	2.48 *63*	¾ x 4¾ *M20 x 120*	15.7 *7.1*
10 *250*	10.750 *273.0*	300 *20*	300 *150*	27210 *117.01*	0.1250 *3.2*	0° - 40'	0.14 *12*	13.50 *343*	16.73 *425*	2.52 *64*	¾ x 4¾ *M20 x 120*	18.0 *8.2*
12 *300*	12.750 *323.9*	300 *20*	300 *150*	38280 *164.71*	0.1250 *3.2*	0° - 34'	0.12 *10*	15.35 *390*	18.39 *467*	2.52 *64*	⅞ x 6½ *—*	23.8 *10.8*
200 JIS	8.516 *216.3*	300 *20*	300 *150*	17079 *73.45*	0.1250 *3.2*	0° - 51'	0.18 *15*	10.00 *254*	13.70 *348*	2.44 *62*	¾ x 4¾ *M20 x 120*	12.8 *5.8*
250 JIS	10.528 *267.4*	300 *20*	300 *150*	26103 *112.26*	0.1250 *3.2*	0° - 41'	0.15 *12*	13.27 *337*	16.54 *420*	2.52 *64*	¾ x 4¾ *M20 x 120*	17.6 *8.0*
300 JIS	12.539 *318.5*	300 *20*	300 *150*	37027 *159.26*	0.1250 *3.2*	0° - 35'	0.12 *10*	15.31 *389*	18.81 *478*	2.52 *64*	⅞ x 6½ *—*	22.6 *10.3*

All DIN size 7705 couplings up to DN150 size and the DN200 7705H coupling are VdS approved in addition to cULus and FM approvals.
* Working Pressure is based on roll grooved standard wall carbon steel pipe.
^ The ASME/ANSI pressure class rating is not the design or maximum pressure rating, rather is provided for those that are accustomed to specifying or using ASME/ANSI pressure class rated components such as flange, valves, etc.
† Allowable Axial Displacement and Angular Movement (deflection) figures are for roll grooved standard steel pipe. Values for cut grooved pipe will be double that of roll grooved. These values are maximums; for design and installation purposes these figures should be reduced by: 50% for ¾"/DN20 – 3½"/DN90; 25% for 4"/DN100 and larger to compensate for jobsite conditions.
** Deflection or angular movement is the maximum value that a coupling allows under no internal pressure.

Performance Data

The following tables show the maximum working pressures (CWP) of ***Shurjoint*** Model 7705 Flexible Coupling used on both carbon steel and stainless steel pipes. ***Shurjoint*** ductile iron couplings can be used in conjunction with stainless steel pipe in non-corrosive environment as the flow media does not come in direct contact with the coupling housings but rather only the gasket.

Model 7705 on Carbon Steel Pipe

Nom. Size	Cut-Grooved		Roll-Grooved		
in / *mm*	XS PSI / *Bar*	STD PSI / *Bar*	STD PSI / *Bar*	Sch. 10 PSI / *Bar*	Sch. 7 PSI / *Bar*
1 *25*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
1¼ *32*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
1½ *40*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
2 *50*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
2½ *65*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
3 *80*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
4 *100*	600 *42*	600 *42*	500 *35*	400 *28*	300 *20*
5 *125*	450 *31*	450 *31*	450 *31*	350 *24*	250 *17*
6 *150*	450 *31*	450 *31*	450 *31*	350 *24*	250 *17*
8 *200*	450 *31*	450 *31*	300 *20*	250 *17*	NR
10 *250*	350 *24*	350 *24*	300 *20*	200 *14*	NR
12 *300*	350 *24*	350 *24*	300 *20*	200 *14*	NR

Model 7705 on Stainless Steel Pipe

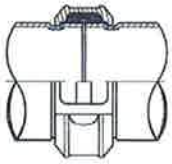
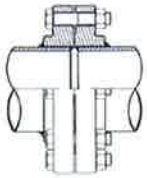
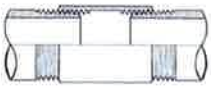
Nom. Size	Cut-Grooved		Roll-Grooved		
in / *mm*	Sch. 80S PSI / *Bar*	Sch. 40S PSI / *Bar*	Sch. 40S PSI / *Bar*	Sch. 10S PSI / *Bar*	Sch. 5S PSI / *Bar*
1 *25*	600 *42*	600 *42*	450 *31*	300 *20*	250 *17*
1¼ *32*	600 *42*	600 *42*	450 *31*	300 *20*	250 *17*
1½ *40*	600 *42*	600 *42*	450 *31*	300 *20*	250 *17*
2 *50*	600 *42*	600 *42*	450 *31*	300 *20*	250 *17*
2½ *65*	600 *42*	600 *42*	450 *31*	300 *20*	250 *17*
3 *80*	600 *42*	600 *42*	450 *31*	300 *20*	250 *17*
4 *100*	600 *42*	600 *42*	450 *31*	300 *20*	200 *14*
5 *125*	450 *31*	450 *31*	300 *20*	200 *14*	NR
6 *150*	450 *31*	450 *31*	300 *20*	125 *9*	NR
8 *200*	450 *31*	450 *31*	300 *20*	100 *7*	NR
10 *250*	350 *24*	350 *24*	200 *14*	NR	NR
12 *300*	350 *24*	350 *24*	200 *14*	NR	NR

SHURJOINT GROOVED PIPING SYSTEM

The Shurjoint grooved piping system is one of the most advanced, versatile, economical and reliable systems available today. After the pipe ends are grooved a gasket is stretched over the pipe ends. The coupling segments are then placed over the gasket and the bolts and nuts are fastened resulting in a secure and leak free joint.

A coupling can be installed 3–4 times faster than a comparable welded or brazed joint and there is no need for a flame or welding torch on the job site. A coupling can be installed by fastening a pair of bolts and nuts while using only a wrench or spanner, whereas a comparable flanged joint requires the fastening of many bolts and nuts with a pair of wrenches. The grooved system allows for easy material take-offs and unlike a threaded system, there is no need to allow for added pipe length for thread engagement. With the removal of just a few bolts one can easily access the system for cleaning, maintenance, changes and or system expansion.

Major Pipe Joining Methods - Quick Comparison

System Type	Grooved	Welded	Flanged	Threaded
Joint Construction				
Pipe End Preparation	Roll-grooving. Fast and easy.	Beveled Ends	Welding of flanges by qualified welders.	Threading by skillful operators is required.
Equipment Required	Roll-grooving machine 	Welding equipment 	Welding equipment 	Pipe threading machine 
Installation	Easy fastening of bolts & nuts using only a wrench or spanner.	Welding tools and supplies required on the jobsite. A skillful and proper weld can be time consuming	A minimum of two wrenches or spanners required. Time consuming to tighten many bolts and nuts.	Pipe wrench required. As the pipe size increases so does the difficulty and force required for proper installation.
Allowance For Axial Displacement And Deflection	Yes – Couplings can allow for both.	No	No	No
Required Space For Installation	Can be installed in small spaces.	Adequate space is necessary for welding tools and welding around the entire O.D. of the pipe.	Adequate space is required as the flange adapter O.D. is large and the wrenches require ample working space.	Adequate space is required for turning the pipe wrench.
Ease of Prefabrication	Very Easy	Difficult	Difficult	Difficult
Surface Corrosion Resistance	Easy - Ant-corrosive paint	Difficult – Hard to paint inside of the pipe after welding.	Easy – Anti-corrosive paint	Easy to paint outside of the pipe after installation but inside threads are vulnerable to corrosion.
Quality Control	Product quality is easily controlled at the factory and or job site. Installation can be visually checked.	Quality of job site welding can be inconsistent. X-ray inspection may be required.	Quality of job site welding can be inconsistent.	Varies depending on skills of workers on the jobsite as all work is usually performed on site.
Maintenance and or Disassembly	Easy to dismantle and reinstall. System is flexible and forgiving.	Very difficult and rigid, cutting and flame is required.	Very difficult to dismantle and re-install due to limited space.	Difficult due to thread engagement, thread corrosion, limited space and need for a union.
Design & Cost Estimating	Easy take-offs and estimating. Most materials can be pre- fabricated.	Labor is difficult to estimate as the individual skill levels of welders is a determining factor.	Labor is difficult to estimate as the skill levels of welders and very accurate make-up is a determining factor.	Labor is difficult to estimate because prefabrication is not possible all work is performed on the job site.

RIGID OR FLEXIBLE?

Shurjoint grooved couplings are classified into two types, flexible and rigid. What are the differences? When and where should they be used? The following information is intended for system designers and installers to better understand the nature of the grooved piping systems. This will allow the designer and installer to make better use of the design features and advantages of grooved piping advantages of grooved piping components and systems.

Type		Angular Movement Deg.	Axial Displacement mm	Rotation after installation	Model Nos.
Flexible Coupling		≧1°	1.6 – 3.2	Yes	7705,7706 7707, SS-8, SS-8X,
Rigid Coupling	Angle-pad Design	< 1°	< 1.6	No	Z05, Z07, C305
	T&G Design	< 1°	< 1.6	No	K9, 7771, SS-7, XH-70
	Bolt-Joint Design	< 0.3°	< 1.6	No	R20

Note:1) Angular movement of flexible couplings 8" and larger sizes should be ≧ 0.5°

2) Axial displacement data based on roll-grooved pipe

Rigid Couplings

The most popular and most widely used couplings today

Shurjoint rigid couplings can be used in applications where you require a rigid joint similar to that of a traditional flanged, welded and or threaded connection. You need not worry about the snaking of the pipe on straight runs, as all *Shurjoint* rigid couplings utilize both a mechanical and frictional interlock design to provide rigidity. Rigid couplings eliminate or reduce undesired angular movement, axial displacement and rotation after installation as is required under normal service conditions. Rigid couplings are some of the most popular and most widely used today.

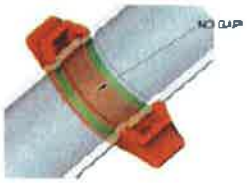
Shurjoint offers three different types of rigid couplings, the angle-pad design, the T&G (tongue and groove) design and the most recent innovation, the butt-joint design. The butt-joint design effectively eliminates the gap between pipe ends, offering increased rigidity.

#R20 Butt-joint Rigid Coupling

- **Angle-pad design:** As the bolts are tightened, the angled bolt pads slide in opposite directions causing the couplings keys to tightly grip the pipe, while at the same time the pipe grooves are forced outward against the coupling keys.

- **T&G design:** The T&G (tongue & groove) mechanism provides a mechanical and frictional interlock resulting in a rigid joint which reduces undesired angular movement. *Shurjoint* precision casting techniques allow the coupling segments to meet metal-to-metal when installed on properly grooved pipe.

- **Butt-joint design:** The unique butt-joint design eliminates the gap in between pipe ends, thus eliminating not only angular and rotational movement but also axial displacement under normal service conditions*. Fluid will not directly contact the gasket nor sit in the gasket pocket. The coupling segments will always come together forming metal-to-metal contact when properly installed. (*Pipes must be cut true and square to achieve a butt-joint.)



Flexible Couplings

Shurjoint flexible couplings allow for full design features in such applications as curved or deflected layouts and or when systems are exposed to outside forces beyond normal static conditions such as seismic events or where vibration and or noise attenuation are a concern. The ability to design in controlled flexibility is an advantageous feature when compared to traditional rigid joining methods such as threading, flanging and welding. When designing with flexible couplings you must allow for proper support to the system so as to eliminate undesired stress **(see Anchoring, hanging and supports on data sheet #B-20)**.

There are several published standards and codes covering grooved piping components. These codes or standards may vary as to the definition or standard for flexible couplings. System designers should confirm which standard(s) and or code(s) are required for the system being designed and they should select the applicable coupling for the application. The NFPA 13 defines a flexible coupling as;

SHURJOINT®

Design Features A-01

"a listed coupling or fitting that allows axial displacement, rotation, and at least 1 degree of angular movement of the pipe without inducing harm on the pipe. For pipe diameters of 8 in. and larger, the angular movement shall be permitted to be less than 1 degree but not less than 0.5 degrees." (NFPA 13- 2007 3.5.4)

For sprinkler systems, NFPA 13 specifies the use of flexible couplings to protect the system against damage from earthquakes and sets some specific examples of how and where they should be used. Designers and installers should design their fire protection systems in compliance with this standard. See Typical Applications of Flexible Couplings on Shurjoint Data Sheet #B-19).

Axial Displacement & Angular Movement (Models 7705 & 7707)

Size		Axial	Angular Movement **† (Deflection)	
Nom. Size	Actual OD	Displace-ment †	Per coupling	Per pipe
in / mm	in / mm	in / mm	degrees	in/ft, mm/m
¾ 20	1.050 26.7	0.0625 1.6	3° – 23'	0.71 58
1 25	1.315 33.4	0.0625 1.6	2° – 45'	0.58 48
1¼ 32	1.660 42.4	0.0625 1.6	2° – 10'	0.45 38
1½ 40	1.900 48.3	0.0625 1.6	1° – 54'	0.40 33
2 50	2.375 60.3	0.0625 1.6	1° – 31'	0.31 26
2½ 65	2.875 73.0	0.0625 1.6	1° – 15'	0.26 22
76.1 mm	3.000 76.1	0.0625 1.6	1° – 12'	0.25 21
3 80	3.500 88.9	0.0625 1.6	1° – 02'	0.21 18
101.6 mm	4.000 101.6	0.0625 1.6	0° - 54'	0.19 16
108.0 mm	4.250 108.0	0.1250 3.2	1° - 42'	0.36 30
4 100	4.500 114.3	0.1250 3.2	1° - 36'	0.34 28
127.0 mm	5.000 127.0	0.1250 3.2	1° - 27'	0.30 25
133.0 mm	5.250 133.0	0.1250 3.2	1° - 23'	0.29 24
139.7 mm	5.500 139.7	0.1250 3.2	1° - 18'	0.28 23
5 125	5.563 141.3	0.1250 3.2	1° - 18'	0.27 23

Size		Axial	Angular Movement **† (Deflection)	
Nom. Size	Actual OD	Displace-ment †	Per coupling	Per pipe
in / mm	in / mm	in / mm	degrees	in/ft, mm/m
159.0 mm	6.250 159.0	0.1250 3.2	1° - 09'	0.24 20
165.1 mm	6.500 165.1	0.1250 3.2	1° - 07'	0.24 20
6 150	6.625 168.3	0.1250 3.2	1° - 05'	0.23 19
8 200	8.625 219.1	0.1250 3.2	0° - 50'	0.18 15
10 250	10.750 273.0	0.1250 3.2	0° - 40'	0.14 12
12 300	12.750 323.9	0.1250 3.2	0° - 34'	0.12 10
200 JIS	8.516 216.3	0.1250 3.2	0° - 51'	0.18 15
250 JIS	10.528 267.4	0.1250 3.2	0° - 41'	0.15 12
300 JIS	12.539 318.5	0.1250 3.2	0° - 35'	0.12 10
14 350	14.000 355.6	0.1250 3.2	0° – 31'	0.06 4.5
16 400	16.000 406.4	0.1250 3.2	0° – 27'	0.05 4.0
18 450	18.000 457.0	0.1250 3.2	0° – 24'	0.04 3.5
20 500	20.000 508.0	0.1250 3.2	0° – 22'	0.04 3.0
22 550	22.000 559.0	0.1250 3.2	0° – 19'	0.04 3.0
24 600	24.000 610.0	0.1250 3.2	0° – 18'	0.03 2.5

Note: † Allowable Axial Displacement and Angular Movement (deflection) figures are for roll grooved standard steel pipe. Values for cut grooved pipe will be double that of roll grooved. These values are maximums; for design and installation purposes these figures should be reduced by: 50% for ¾" – 3½"; 25% for 4" and larger to compensate for jobsite conditions.
** Deflection or angular movement is the maximum value that a coupling allows under no internal pressure.

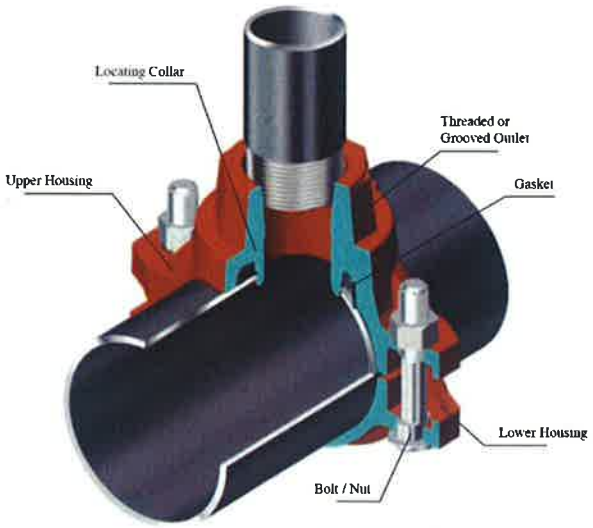
HOLE-CUT PIPING SYSTEMS

The Shurjoint hole-cut piping systems provide a fast and easy mid-point branch outlet, eliminating the need for multiple fittings and allows for easy expansion of the piping system.

The ***Shurjoint mechanical tees Models M21, 7721, M22 and 7722*** provide an easy take-out of a branch outlet without the need for welding. First a hole is cut or drilled at the desired location. The mechanical tee is then positioned so that the built-in locating collar fits within the hole. As the housing bolts are tightened, the pressure responsive gasket forms a leak-tight seal.

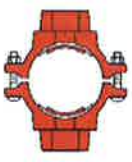
3 + 1 = 1

Couplings Reducing Tee Mechanical Tee



M21 Mechanical Tee

- Grooved-end and threaded outlets are available.
- A mechanical cross connection can be made by combining two upper housing segments.



Model 7721C

The ***Model 723 Saddle-Let*** mechanical tee is the ideal outlet fitting for direct connection to sprinkler heads, short risers, drops, and or gauges.

Welding Outlet Fittings

The Shurjoint welding outlet fittings provide an easy branch outlet along the header or riser and allow for direction connection of sprinkler heads or easy expansion of the piping system.

The ***Shurjoint Model 71 outlet fittings*** are designed to provide a threaded outlet at any desired location along the header. The Model 71 features a counter bore and a 1.6 mm land around the full circumference.

- Made of highly weldable SAE J403 forged steel.
- Ensures a single pass welding and full penetration welds.
- Minimizes the likelihood of any burn through or distortion that might be caused by excessive heat.
- Meets NFPA 13 requirements, UL listed and FM approved.

For grooved outlets see our Models 72C (cut grooved) and 72R (roll-grooved).

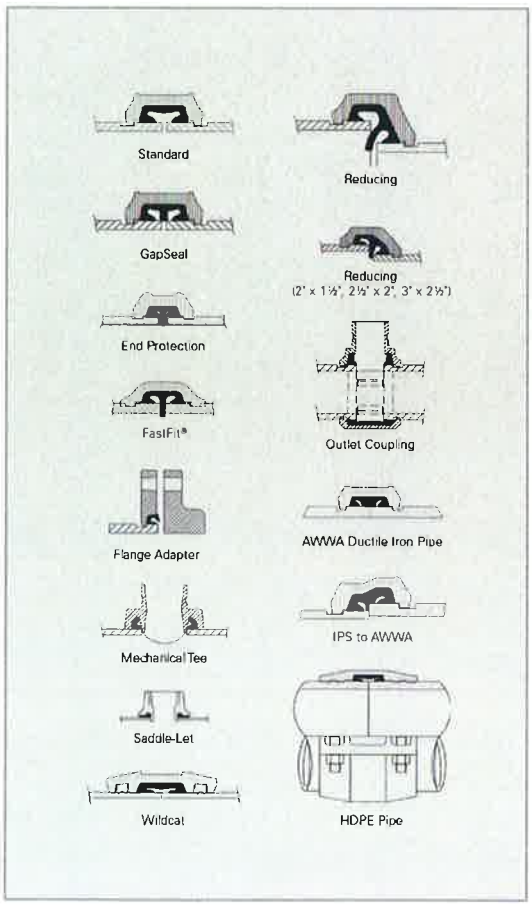
Model 71 Female Threaded Outlet fitting

GASKET SELECTION GUIDE

Over the past 50 years great advances have been made in synthetic elastomer technologies, allowing us to offer a full range of gasket materials for a wide variety of piping applications. ***Shurjoint*** utilizes the finest materials available in our gaskets which are engineered and designed to meet and exceed industry standards such as ASTM D2000, AWWA C606, NSF61, IAPMO, etc. Our continual research, development and testing all serve to advance this field and to develop new and superior solutions for our changing industry. Selecting the proper gasket for the intended service application requires careful consideration of many factors to assure maximum gasket life. Those factors include temperature, fluid media and concentration, and continuity of service. The gaskets color coding helps to identify the gasket grade and compound.

Proper gasket selection is essential for the optimum performance of ***Shurjoint*** grooved couplings, flange adapters and mechanical tees.

1. Gasket styles: ***Shurjoint*** grooved couplings utilize several different gasket styles, standard, GapSeal, EP (End Protection) and FF (Fast Fit). GapSeal gaskets are compatible with standard gaskets and they are interchangeable with each other. Other special styles are not compatible with standard or GapSeal gaskets. Always use the correct gasket style for the coupling model you selected.



2. Vacuum service: ***Shurjoint*** standard gaskets are designed to seal well under vacuum conditions up to 10 inHg (absolute)/254 mmHg (absolute) which may occur when a system is drained. For continuous services greater than 10 inHg (absolute)/254 mmHg (absolute), the use of GapSeal gaskets or EP (end protection) gaskets in combination with rigid style couplings is recommended. Contact ***Shurjoint*** for specific recommendations.

3. Dry pipe and freezer services: ***Shurjoint*** recommends the use of GapSeal Grade "E" gaskets for dry pipe fire protection systems and freezer applications. The GapSeal gasket closes off the gap between the pipes or gasket cavity. This will prevent any remaining liquid from entering the cavities and freezing when the temperature drops. Rigid couplings are preferred for dry pipe, freezer and vacuum applications. Reducing couplings are not recommended for these applications.

Note: Do not use the ***Shurjoint*** standard Lubricant for dry pipe and freezer systems, instead use a petroleum free silicone based lubricant.

4. ANSI/NSF 61 Standard: ANSI/NSF 61 classified gaskets are good for potable water services. The classification categories are "cold" which is limited to +86°F (+30°C) (or maximum ambient distribution temperatures of unheated water) maximum and "hot" which is limited to +180°F (+82°C) (or scalding temperatures of hot domestic water).

5. Lubricant: ***Shurjoint*** Lubricant is recommended for proper gasket installation to prevent the gasket from being pinched. Apply a thin coat to the gasket exterior, gasket lips and/or housing interiors. ***Shurjoint*** Lubricant is available in one pound (450 grams) and one quart (2 pounds or 900 grams) containers. Certified to ANSI/NSF 61.

GASKET GRADE INDEX

Compound	Grade	Color Code	General Service Recommendations	Maximum Temp. Range
EPDM	E	Green Stripe	Good for cold & hot water up to +230°F (+110°C). Also good for services for water with acid, water with chlorine, deionized water, seawater and waste water, dilute acids, oil-free air and many chemicals. Not recommended for petroleum oils, mineral oils, solvents and aromatic hydrocarbons.	-30°F (-34°C) to +230°F (+110°C)
Nitrile	T	Orange Stripe	Good for petroleum oils, mineral oils, vegetable oils, non-aromatic hydrocarbons, many acids and water +150°F (+65°C).	-20°F (-29°C) to +180°F (+82°C)
EPDM	EH	Green + Red Stripe	Good for cold & hot water up to +250°F (+121°C). Also good for services for water with acid, water with chlorine, deionized water, seawater and waste water, dilute acids, oil-free air and many chemicals. Not recommended for petroleum oils, mineral oils, solvents and aromatic hydrocarbons.	-30°F (-34°C) to +250°F (+121°C)
EPDM	E-pw	Double Green Stripe	Specially compounded for cold +86°F (+30°C) and hot, +180°F (+82°C) potable water services. The compound is UL classified per ANSI/NSF 61.	≤+180°F (+82°C)
EPDM	Lube-E	Green + Violet Stripe	A pre-lubricated gasket intended primarily for the fire protection industry.	-30°F (-34°C) to +230°F (+110°C)
White Nitrile	A	White Gasket	Good for oily and greasy food products and processing, as well as pharmaceutical and cosmetics manufacturing. Compounded from FDA approved ingredients (CFR Title 21 Part 177.2600).	+20°F (-7°C) to +180°F (+82°C)
Silicone	L	Red Gasket	Good for dry, hot air without hydrocarbons and some high temperature chemical services. May also be used for fire protection dry systems.	-30°F (-34°C) to +350°F (+177°C)
Neoprene	V	Yellow Stripe	Good for hot lubricating oils and certain chemicals.	-30°F (-34°C) to +180°F (+82°C)
Fluoro-elastomer (Viton)	O	Blue Stripe	Good for many oxidizing acids, petroleum oils, halogenated hydrocarbons, lubricants, hydraulic fluids, organic liquids and air (Viton)with hydrocarbons to +300°F (+149 °C).	+20°F (-7°C) to +300°F (+149°C)
Epichloro-hydrin	M2	White Stripe	Good for aromatic fuels at low temperatures and also for ambient temperature water.	-40°F (-40°C) to +160°F (+71°C)

Special Gaskets for AWWA Ductile Iron Pipe

Compound	Grade	Color Code	Recommended Services	Maximum Temp. Range
Nitrile	S	Red Stripe	Specially compounded for use with AWWA ductile iron pipe and used for petroleum products, mineral oils, vegetable oils and air with oil vapors.	-20°F (-29°C) to +180°F (+82°C)
Haloganated Butyl	M	Brown Stripe	Good for water services, mild dilute acids, oil-free air and many chemicals. The compound is UL classified per ANSI/NSF 61. (AWWA ductile iron pipe use)	-20°F (-29°C) to +200°F (+93°C)

Please note that EPDM grade "EH" gaskets can be used for all applications and services that EPDM grade "E" gaskets are suitable for.

WARNING !

EPDM gaskets for water services are not recommended for steam services unless couplings or components are accessible for frequent gasket replacement.

Failure to select the proper gasket and compound may result in joint leakage or failure resulting in personal injury and/or property damage. Gaskets should never be exposed to temperatures outside their ratings.

GENERAL GASKET SERVICE RECOMMENDATIONS

The following are general service recommendations only and the information provided is based on the best information available from various resources including elastomer manufacturers, leading rubber molders, industry publications and our own laboratory testing and field experience. The information contained herein shall be considered for evaluation purposes and not as a guarantee. When and wherever possible, gasket materials should be tested with simulated service conditions to determine suitability for the intended service application. Unless otherwise noted, the recommendations are based on ambient temperatures. These recommendations do not apply to rubber lined products or rubber sealed valves. If more than one gasket grade is listed the preferred grade is listed first for general services. For chemicals not listed, a combination of chemicals listed or not, service temperatures not listed or borderline services, contact a ***Shurjoint*** Engineering Representative for a recommendation. Note: NR = Not Recommended

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Acetaldehyde	E
Acetamide	T
Acetic Acid up to 10% 100°C (38°C)	E/L
Acetic Acid up to 10-50% 100°C (38°C)	L
Acetic Acid, Glacial 100°C (38°C)	L
Acetic Anhydride	E
Acetone	E
Acetonitrile	T
Acetophenone	E
Acetylene	E/T
Acrylic Resin	V
Acrylonitrile	NR
Adipic Acid	T
Air, oil free	E
Air with vapored oil	T
Alkalis	E
Allyl Alcohol to 96%	E
Allyl Chloride	NR
Alum Sulfuric Acid	O
Alums	E/T
Aluminum Chloride	E/T
Aluminum Fluoride	E/T/O
Aluminum Hydroxide	E/O
Aluminum Nitrate	E/T/V
Aluminum Oxychloride	T
Aluminum Phosphate	E
Aluminum Salts	E/T
Aluminum Sulfate	E/T
Alums	E/T
Ammonia Anhydrous (Pure Ammonia)	NR
Ammonia Gas, Cold	E
Ammonia, Aqua, 10-25%	E
Ammonia, Liquid	E
Ammonium Alum	V
Ammonium Bifluoride	T
Ammonium Carbonate	E
Ammonium Chloride	E/T
Ammonium Fluoride	E
Ammonium Hydroxide	E
Ammonium Metaphosphate	E
Ammonium Nitrate	E/T
Ammonium Nitrite	E
Ammonium Persulfate, to 10%	E
Ammonium Phosphate	T
Ammonium Sulfamate	T
Ammonium Sulfate	E/T
Ammonium Sulfide	E

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Ammonium Thiocyanate	E
Amyl Acetate	E
Amyl Alcohol	E
Amyl Borate	V
Amyl Chloride	NR
Amyl Chloronaphthalene	T
Anderol	O
Aniline	E
Aniline Dyes	E
Aniline Hydrochloride	E
Aniline Oil	E
Animal Fats	A
Anthraquinone	NR
Anthraquinone Sulfonic Acid	NR
Antimony Chloride	E
Antimony Trichloride	E
Argon Gas	E/O
Aroclor(S)	O
Arsenic Acid, to 75%	E/T/O
Arylsulfonic Acid	NR
ASTM #1, 2 & 3 Oil	T
Barium Carbonate	E
Barium Chloride	E/T
Barium Hydroxide	E/T
Barium Nitrate	V
Barium Sulfide	T
Beer	A
Beet Sugar liquors	A
Benzaldehyde	E
Benzene	O
Benzine (see Petroleum Ether)	O
Benzoic Acid	E
Benzol	O
Benzyl Alcohol	E
Benzyl Benzoate	E
Benzyl Chloride	E
Black Sulfate Liquor	T
Blast Furnace Gas	T
Bleach,12% Active Cl2	E
Borax Solutions	E
Bordeaux Mixture	E
Boric Acid	E/T
Bromine	O
Bromine Water	V
Butane Gas	T
Bromotoluene	NR
Butanol (see Butyl Alcohol)	E/T
Butter	A
Butyl Acetate Ricinoleate	E/T

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Butyl Alcohol	E/T
Butyl "Cellosolve Adipate"	E/T
Butyl Phenol	E
Butyl Stearate	T/O
Butylene	T/O
Butylene Glycol	E
Butyne Diol	NR
Calcium Acetate	T
Calcium Bisulphite	T/O
Calcium Carbonate	E/T
Calcium Chlorate	E/T
Calcium Chloride	E/T
Calcium Hydroxide (Lime)	E/T
Calcium Hypochlorite	E
Calcium Hypochloride	E
Calcium Nitrate	E/T/V
Calcium Sulfate	E/T
Calcium Sulfide	E/T
Caliche Liquors	T
Cane Sugar Liquors	A
Carbitol	E/T
Carbonic Acid, Phenol	O
Carbon Bisulphide	O
Carbon Dioxide, Dry	E/T
Carbon Dioxide, Wet	E/T
Carbon Disulphide	O
Carbon Monoxide	E
Carbon Tetrachloride	O
Carbonic Acid, Dry	O
Caster Oil	T/A
Caustic Potash	E/T
Cellosolve	E/V
Cellosolve Acetate	E
Cellosolve (Alcohol Ether)	E
Cellulose Acetate	E
Cellulube 220 (Tri-Aryl-Phosphate)	E
Cellulube Hydraulic Fluids	E
China Wood Oil, Tung Oil	T
Chloric Acid to 20%	E
Chlorine, Dry	O
Chlorine, Water 4000 PPM (max.)	E
Chlorinated Paraffin (Chlorocosane)	T
Chloroacetic Acid	E
Chloroacetone	E
Chlorobenzene	O
Chloralhydrate	NR
Chlorobromomethane	NR

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Chloroform	O
Chlorosulphonic Acid	NR
Chrome Alum	E/T
Chromic Acid, to 10%	O
Chromic Acid, to 25%	O
Chrome Plating Solutions	O
Citric Acid, Saturated	E
Citric Acid	E/T
Coconut Oil	A
Cod Liver Oil	A
Coke Oven Gas	T/O
Copper Carbonate	E/T
Copper Chloride	E/T
Copper Cyanide	E/T
Copper Fluoride	E
Copper Nitrate	E/T
Chlorosulphonic Acid	NR
Chrome Alum	E/T
Chromic Acid, to 10%	O
Chromic Acid, to 25%	O
Chrome Plating Solutions	O
Citric Acid, Saturated	E
Citric Acid	E/T
Coconut Oil	A
Cod Liver Oil	A
Coke Oven Gas	T/O
Copper Carbonate	E/T
Copper Chloride	E/T
Copper Cyanide	E/T
Copper Fluoride	E
Copper Nitrate	E/T
Copper Sulfate	E/T
Corn Oil	A
Cotton Seed Oil	A
Creosol, Cresylic Acid	O
Creosote, Coal Tar	T/O
Creosote, Wood	T/O
Cupric Fluoride	E/T
Cupric Sulfate	E/T
Cyclohexane (Alicyclic Hydrocarbon)	O
Cyclohexanol	V/O
Cyclohexanone	E
Deionized Water	E
Dextrim	T
Diacetone Alcohol	V
Dibutyl Phthalate	E
Dichloro Difloro Methane	T
Dicyclohexylamine	T
Diesel Oil	T
Diethyl Ether	T
Diethyl Sebacate	E
Diethylamine	T
Diethylene Glycol	E/T
Digester Gas	T
Dimethylamine	T
Dioctyl Phthalate	E
Dioxane	E
Dipentene(Terpene-Hydrocarbon)	T
Dipropylene Glycol	T
Dowtherm A	O
Dowtherm E	O

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Dowtherm SR-1	T/E
Ethane	E
Ethanolamine	E
Ethers	NR
Ethyl Acetoacetate	E
Ethyl Acrylate	L
Ethyl Alcohol (Ethanol)	E
Ethyl Cellulose	E
Ethyl "Cellusolve"	E
Ethyl Chloride	E/T
Ethyl Ether	T
Ethyl Oxalate	E
Ethyl Silicate	T
Ethylene Chlorohydrin	E
Ethylene Diamine	E/T
Ethylene Dichloride (Dichloroethane)	O
Ethylene Glycol	E/T
Ethylene Oxide	NR
Fatty Acid	A
Ferric Chloride, to 35%	E/T/O
Ferric Chloride, Saturated	E
Ferrous Nitrate	V
Ferric Hydroxide	E
Ferric Sulfate	T
Fish Oils (Solubles)	A
Fire Fighting Foam Concentrate	E/O
Fluboric Acid	E/T
Fluorine Gas, Wet	NR
Fluorosilicic Acid, to 30%	V
Fly Ash	E
FM200 HFC-227ea	E
Foam	E
Fog Oil	T
Formaldehyde	E/T
Formamide	E/T
Formic Acid, to 25%	E
Freon 11, 130°F (54°C)	T
Freon 12, 130°F (54°C)	T
Freon 113 130°F (54°C)	T
Freon 114,130°F (54°C)	T
Freon F-12	T
Freon 123	NR
Freon 134a,176° (80°C)	E/T
Freon F-21	NR
Freon 22, 130°F (54°C)	V
Fructose	E/T
Fuel Oil	T
Fumaric Acid	E
Furan	NR
Furfuryl Alcohol	E
Gallic Acid	NR
Gasoline, Refined	T
Gasoline, Refined, Unleaded	O
Gelatin	A
Glucose	A
Glue	E/T
Glycerin	E/T
Glycerol	E/T
Glycol	E/T
Glycolic Acid	E
Grease	T/V/O

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Green Sulfate Liquor	T
Halon 1301	E
Heptane	T
Hexaldehyde	E
Hexane	T
Hexanol	T
Hexanol Tertiary	T
Hexyl Alcohol	V/T
Hexylene Glycol	T
Hydrobromic Acid, to 40%	E
Hydrochloric Acid, to 36%, 75°F (24°C)	E
Hydrochloric Acid, to 36%, 158°F (70°C)	O
Hydrocyanic Acid	E
Hydrofluoric Acid, to 75%, 75°F (24°C)	O
Hydrofluosilicic Acid	E
Hydrocyanic Acid, to 10%	E
Hydrofluoric Acid, to 30%	V/O
Hydrofluosilicic Acid, to 50%	T
Hydrogen Phosphide	NR
Hydrogen Gas, Cold	E/T
Hydrogen Gas, Hot	E
Hydrogen Peroxide, to 50%	L
Hydrogen Peroxide, to 90%	O
Hydrogen Sulfide	E
Hydroquinone	T/O
Hydroxylamine Sulfate	E
Hypochlorous Acid, Dilute	E
Isododecane	V
Isobutyl Alcohol	E
Iso Octane, 100°F (38°C)	T
Isobutyl Alcohol	E
Isopropyl Acetate	E
Isopropyl Alcohol	E
Isopropyl Ether	T
JP-3	T
JP-4	T/O
JP-5	T/O
JP-6, 7, 8	T
Kerosene	T
Ketones	E
Lactic Acid	A
Lard Oil	V
Latex (1% Styrene & Butadiene)	O
Lauric Acid	T
Lauryl Chloride	NR
Lavender Oil	T
Lead Acetate	T
Lead Chloride	E
Lead Sulfamate	V
Lead Sulfate	T
Lime and H2O	E/T
Lime Sulfur	O
Linoleic Acid	O
Lithium Bromide	T
Lithium Chloride	T
Linseed Oil	A
Lithium Bromide (Brine)	T/O
Lithium Chloride	T/O
Lubricating Oil, Refined	T

SHURJOINT®

Chemical Resistance B-03

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Lubricating Oil, Sour	T
Lubricating Oil, to 150°F (66°C)	T
Lubricating Oil, 150°F (66°C) to 180°F (82°C)	V/T
Magnesium Chloride	E/T
Magnesium Hydroxide	E/T
Magnesium Nitrate	E/V
Magnesium Sulfate	E/T
Maleic Acid, Saturate	T
Malic Acid	T
Mercuric Chloride	E/T
Mercuric Cyanide	E/T
Mercurous Nitrate	E/T
Mercury	E/T
Methane	T
Methyl Acetate	V
Methyl Alcohol, Methanol	E/T
Methyl Cellosolve (Ether)	V
Methyl Chloride	O
Methyl Ethyl Ketone	NR
Methyl Isobutyl Carbinol	E
Methylene Chloride	O
Methylene Chlorobromide	NR
Methylene Dichloride 100°F (38°C)	O
MIL-L7808	O
MIL-05606	O
MIL-08515	O
Milk	A
Mineral Oils	T
Naphta	O
Naohtalene	NR
Naptha, 160°F (71°C)	O
Napthenic Acid	T
Natural Gas	T
Nevoil	E
Nickel Acetate to 10%, 100°F (38°C)	V
Nickel mmonium Sulfate	V
Nickel Chloride	E/T
Nickel Nitrate	V
Nickel Plating Solution 125°F (52°C) - Max.	E/T
Nickel Sulfate	E/T
Nitric Acid to 10%, 75°F (24°C) - Max.	E
Nitric Acid, 10-50%, 75°F (24°C) - Max.	O
Nitric Acid, 50-86%, 75°F (24°C)	O
Nitric Acid, Red Fuming	O
Nitrocellulose	V
Nitrogen	E
Nitromethane	E
Nitrous Oxide	E
NOVEC 1230 FK-5-1-12	E
Octyl Alcohol VOgisogiric Acid, to 75%, 150°F (66°C)	O
Oil, Crude Sour	T
Oil, Motor	T
Oleic Acid	T
Oilve Oil	T/A
Oronite 8200 Silicate Ester Fluid	O
Orthodichlorobenzene	O
OS-45 Silicate Ester Fluid	O

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
OS-45-1	O
Oxalic Acid	E
Oxygen, Cold	E
Ozone (100 ppm)	E
Palm Oil	T/A
Peanut Oil	A
Palmitic Acid	T
Pentane	T
Perchloric Acid	NR
Perchloroethylene	O
Petroleum Ether (see Benzene)	O
Petroleum Oils	T
Phenol (Carbolic Acid)	O
Phenylhydrazine	E
Phenylhydrazine Hydrochloride	E
Phosphate Ester	E
Phosphoric Acid, to 50%	E
Phosphoric Acid, to 75% and 70°F	E/T
Phosphoric Acid, to 85%, 150°F (66°C) - Max.	O
Phosphate Ester	E
Photographic Solutions	T
Phthalic Anhydride	E
Picric Acid	V
Plating Solutions, (gold, brass cadmium, copper, lead, silver, tin, zinc)	V
Polybutene	T
Polyvinyl Acetate, Solid (In Liquid State is 50% solution of Methanol or 60% solution of H2O)	E
Potash	E
Potassium Alum	E/T
Potassium Aluminum Sulfate	E/T
Potassium Bicarbonate	E/T
Potassium Bichromate	E/T
Potassium Borate	E
Potassium Bromate	E
Potassium Bromide	E/T
Potassium Carbonate	E/T
Potassium Chlorate	E
Potassium Chloride	E/T
Potassium Chromate	T
Potassium Cyanide	E/T
Potassium Dichromate	E
Potassium Ferricyanide	E
Potassium Ferrocyanide	E
Potassium Fluoride	E
Potassium Hydroxide	T
Potassium Iodide	V
Potassium Nitrate	E/T
Potassium Perborate	E
Potassium Perchlorate	T
Potassium Permanganate, Saturated to 10%	E
Potassium Permaganate Saturate 10-25%	E
Potassium Persulfate	T
Potassium Silicate	E/T/V
Potassium Sulfate	E/T
Prestone	T
Propane Gas	T
Propanol	E

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Propargyl Alcohol	E
Propyl Alcohol	E/T
Propylene Dichloride	L
Propylene Glycol	E
Pydraul F-9 and F-150	NR
Pyranol 1467	T
Pyranol 1476	T
Pyroguard "C"	T
Pyroguard "D"	T
Pyroguard 55	E
Pyrrole	E
Ref. Fuel (70 ISO Octane, 30 Toluene)	T
Rapeseed Oil	A
Rosin Oil	T/V
Salicylic Acid	E
Secondary Butyl Alcohol	T
Sewage	E/T
Silver Nitrate	E
Silver Sulfate	E
Skydrol, 200°F (93°C) - Max.	L
Skydrol 500 Phosphate Ester	E
Soap Solutions	E/T
Soda Ash, Sodium Carbonate	E/T
Sodium Acetate	E
Sodium Alum	T
Sodium Benzoate	E/T
Sodium Bicarbonate	E/T
Sodium Bisulfate	E/T
Sodium Bisulfite (Black Liquor)	E/T
Sodium Bromide	E/T
Sodium Carbonate	E/T
Sodium Chlorate	E
Sodium Chloride	E/T
Sodium Cyanide	E/T
Sodium Dichromate, to 20%	E/T
Sodium Ferricyanide	E/T
Sodium Ferrocyanide	E/T
Sodium Fluoride	E/T
Sodium Hydroxide, to 15%	E
Sodium Hydro Sulfide	T
Sodium Hydroxide, to 50%	E
Sodium Hypochlorite, to 20%	E
Sodium Metaphosphate	T
Sodium Nitrate	E
Sodium Nitrite	E/T
Sodium Perborate	E
Sodium Peroxide	E
Sodium Phosphate	T
Sodium Phosphate, Dibasic	T
Sodium Phosphate, Monobasic	T
Sodium Phosphate, Tribasic	T
Sodium Silicate	T
Sodium Sulfate	E/T
Sodium Sulfide	E/T
Sodium Sulfite Solution, to 20%	T
Sodium Thiosulfate, "Hypo"	T
Sohovis 47	T
Sohovis 78	T
Solvasol #1	T
Solvasol #2	T
Solvasol #3	T

Chemical Resistance B-03

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Solvasol #73	T
Solvasol #74	NR
Soybean Oil	A
Spindle Oil	T
Stannic Chloride	T
Stannous Chloride, to 15%	T
Starch	E/T
Steam	NR
Stearic Acid	T
Stoddard Solvent	T
Styrene	O
Sulfonic Acid	E
Sulphite Acid Liquor	E
Sucrose Solutions	A
Sulfur	E/V
Sulfur Chloride	O
Sulfur Dioxide, Dry	E
Sulfur Dioxide, Wet	E
Sulfur Trioxide, Dry	O
Sulfuric Acid, to 25%, 150°F (66°C)	E
Sulfuric Acid, 25-50%, 200°F (93°C)	O
Sulfuric Acid, 50-95%, 150°F (66°C)	O
Sulfuric Acid, Fuming	O
Sulfuric Acid, Oleum	O
Sulfurous Acid	O
Tall Oil	T

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Tannic Acid, all conc.	V
Tanning Liquors (50g. alum. solution, 50g. dichromate solution)	T
Tartaric Acid	E
Tertiary Butyl Alcohol	E/T
Tetrabutyl Titanate	E
Tetrachloroethylene	O
Thionyl Chloride	T
Terpineol	V
Tertiary Butyl Alcohol	E/T/V
Tetrachloroethylene	O
Tetrahydrofuran	NR
Tetralin	NR
Thiopene	NR
Titanium Tetrachloride	O
Toluene, to 30%	T
Transmission Fluid, Type A	O
Triacetin	T
Trichloroethane	O
Trichloroethylene	O
Trichloroethylene, to 200°F (93°C)	O
Tricresyl Phosphate	E
Triethanolamine	E/T
Trisodium Phosphate	E
Tung Oil	T
Turbo Oil #15 Diester Lubricant	O

CHEMICAL SERVICES	
Chemical Composition	Gasket Grade
Turpentine	T
Urea	T/E
Vegetable Oils	T/A
Vinyl Acetate	E
Vinegar	A
Vinyl Chloride	O
Vi-Pex	T
Water, to 150°F (66°C)	E/T/M/S
Water, to 200°F (93°C)	E/M
Water, to 230°F (110°C)	E
Water, to 250°F (121°C)	EH
Water, Acid Mine	E/T
Water, Bromine	O
Water, Chlorinated, to 3500 ppm	E
Water, Chlorine	E
Water, Deionized	E/M
Water, Potable	E-pw
Water, Seawater	E
Water, Waste	E/T/M/S
Whiskey	A
White Liquor	E
Wood Oil	T
Xylene	O
Zinc Chloride, to 50%	E
Zinc Nitrate	E
Zinc Sulfate	E/T

Please note that EPDM grade "EH" gaskets can be used for all applications and services that EPDM grade "E" gaskets are suitable for.

WARNING !

EPDM gaskets for water services are not recommended for steam services unless couplings or components are accessible for frequent gasket replacement. Failure to select the proper gasket and compound may result in joint leakage or failure resulting in personal injury and/or property damage. Gaskets should never be exposed to temperatures outside their ratings.

MATERIALS

Ductile Iron - Housing

Ductile iron is an ideal material for grooved mechanical components, as it provides similar or greater strength to that of wrought or cast steel piping materials such as; forged steel flanges - ASTM A105, carbon steel valves - ASTM A216 WCB, wrought carbon steel pipe - ASTM A53 Gr. B, etc. Most ***Shurjoint*** *components are made of ductile iron conforming to ASTM A536 Gr. 65-45-12 and or ASTM A395 Gr. 65-45-15.*

Ductile iron was first invented in the U.S.A. and U.K. in the late 1940's. Superior strength was achieved by crystallizing graphite in the shape of nodules. The result was ductile iron that had tensile and yield strength properties that were equal to or greater than some steel castings. This superior strength combined with ductile irons excellent castability helped to reduce the weight and cost of many components. Because of these advantages and benefits, many components have been converted from gray iron, malleable iron and steel castings to ductile iron over the past 60 years. Please visit the Ductile Iron Society website; www.ductile.org, for further information.

Ductile Iron
Superior tensile strength with good castability

Gray Iron
Excellent castability but 'brittle' – less strength

Malleable Iron
Stronger than gray iron but poor castability

Microstructure check

International ductile iron specifications equivalent to ASTM A536 Gr. 65-45-12 and or ASTM A395 Gr. 65-45-15 are;

SAE J434: D4512
EN1563: EN-GJS-450-10 or EN-GJS-450-15
JIS G5502: FCD450-10
SABS 936/937: SG42

Physical strength of materials comparative

	ASTM Designation	Tensile Strength Min, psi (MPa)	Yield Strength Min, psi (MPa)	Elongation In 2", %
Ductile Iron Castings	A536: Gr. 65-45-12	65,000 (448)	45,000 (310)	12
Ductile iron castings	A395: Gr.65-45-15	65,000 (448)	45,000 (310)	15
Forged carbon steel	A105	70,000 (485)	40,000 (250)	20
Cast carbon steel	A216: WCB	70,000 (485)	36,000 (205)	22
Carbon steel pipe	A53: Gr. B	60,000 (415)	35,000 (240)	(29.5)
Malleable iron castings	A47: Gr.32510	51,000 (345)	32,000 (224)	10
Gray iron castings	A126: Gr.B	31,000 (214)	Not specified	Not specified

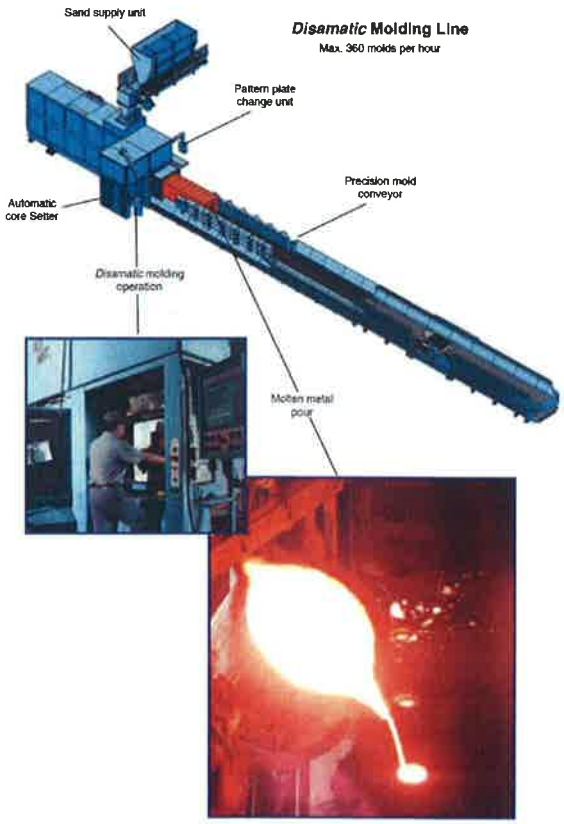
ASTM A536, Grade 65-45-12 (UNS F33100)

Chemical Requirements*	Minimum	Maximum
Carbon, %	3.0	3.9
Silicon, %	2.5	3.0
Manganese, %	0.1	0.4
Phosphorus, %		0.07
Sulfur, %		0.02
Magnesium, %	0.03	0.05
Chromium, %		0.1
Physical Properties		
Tensile Strength, psi (MPa)	65,000 (448)	---
Yield Strength, psi (MPa)	45,000 (310)	---
Elongation, %	12	---

*Reference only as chemical requirements are not specified in ASTM A536

ASTM A395, Grade 65-45-15 (UNS F33100)

Chemical Requirements*	Minimum	Maximum
Carbon, %	3.0	
Silicon, %		2.5
Manganese, %	Not specified	
Phosphorus, %		0.08
Sulfur, %	Not specified	
Magnesium, %	Not specified	
Chromium, %	Not specified	
Physical Properties		
Tensile Strength, psi (MPa)	65,000 (448)	---
Yield Strength, psi (MPa)	45,000 (310)	---
Elongation, %	15	---



Bolts & Nuts

Carbon steel bolts and nuts

Shurjoint products utilize oval neck track bolts conforming to ASTM A449 or ASTM A183 Gr. 2 and heavy duty nuts to ASTM A563 Gr. B, available with UNC threads or ISO metric threads. The UNC track bolts and nuts are supplied electro zinc plated in a silver chromate color and ISO metric bolts and nuts in a gold chromate color. Hot-dip galvanized bolts and nuts are also available upon request.

A Stainless steel bolt fastened with a silicon bronze nut

ASTM A449, Quenched and Tempered Steel Bolts*

Chemical Requirements	Minimum	Maximum
Carbon, %	0.28	0.55
Manganese, %	0.60	
Phosphorus, %		0.040
Sulfur, %		0.050
Physical Properties		
Tensile Strength, psi (MPa)	120,000 (825)	---
Yield Strength, psi (MPa)	92,000 (635)	---
Elongation, %	14	---

*Equivalent to property class 8.8 bolts per ISO 898

ASTM A183, Grade 2 Carbon Steel Track Bolts

Chemical Requirements	Minimum	Maximum
Carbon, %	0.30	
Phosphorus, %		0.05
Sulfur, %		0.06
Physical Properties		
Tensile Strength, psi (MPa)	110,000 (760)	---
Yield Strength, psi (MPa)	80,000 (550)	---
Elongation, %	12	---

ASTM A563, Grade B Carbon and Alloy Steel Heavy Hex Nuts

Chemical Requirements (Bolts)	Minimum	Maximum
Carbon, %		0.55
Phosphorus, %		0.12
Sulfur, %		0.15
Physical Properties		
Hardness, Rockwell	B69	C32

Stainless steel bolts and nuts

Stainless steel track bolts and nuts, type 304 or type 316, are supplied with ***Shurjoint*** stainless steel couplings. Track bolts and nuts are molybdenum disulfide (MoS_2) coated to inhibit galling. As an option, silicon bronze nuts are also available to further reduce the chance of galling.

ASTM A193, Grade 8 (Type 304) Stainless Steel Bolts

Chemical Requirements	Minimum	Maximum
Carbon, %		0.08
Manganese, %		2.00
Phosphorus, %		0.045
Sulfur, %		0.030
Silicon, %		1.00
Chromium, %	18.00	20.00
Nickel, %	8.00	10.50
Physical Properties		
Tensile Strength, psi (MPa)	75,000 (515)	---
Yield Strength, psi (MPa)	30,000 (205)	---
Elongation, %	30	---

ASTM A193, Grade B8M (Type 316) Stainless Steel Bolts

Chemical Requirements	Minimum	Maximum
Carbon, %		0.08
Manganese, %		2.00
Phosphorus, %		0.045
Sulfur, %		0.030
Silicon, %		1.00
Chromium, %	16.00	18.00
Nickel, %	10.00	14.00
Molybdenum, %	2.00	3.00
Physical Properties		
Tensile Strength, psi (MPa)	75,000 (515)	---
Yield Strength, psi (MPa)	30,000 (205)	---
Elongation, %	30	---

Silicon Bronze Nuts

ASTM B98 Alloy B Copper-Silicon Alloy (UNS No. C65100)

Chemical Requirements	Minimum	Maximum
Copper, %	96.0	
Lead, %		0.05
Iron, %		0.8
Zinc, %		1.5
Magnesium, %		0.7
Silicon, %	0.8	2.0
Physical Properties		
Tensile Strength, psi (MPa)	55,000 (380)	
Yield Strength, psi (MPa)	20,000 (140)	
Elongation, %	11	12

Recommended Bolt Torque

Always use factory supplied bolts and nuts for assembly of ***Shurjoint*** couplings. Shown below are the general recommended torque ranges for common sizes of carbon steel bolts. Never exceed the recommended torque range by more than 25% as excessive torque can lead to joint failure, personal injury and or property damage.

Always depressurize and drain the piping system before attempting disassembly, adjustment or removal of any piping component. Follow installation instructions for proper assembly of all ***Shurjoint*** components. For questions contact ***Shurjoint***.

Bolt Size		Proper Torque Range	
mm	in	N-m	Lbs-Ft
M8	5/16" - 18	9 – 18	7 – 14
M10	3/8" - 16	20 – 30	15 – 22
M12	1/2" – 13	40 – 68	30 – 50
M16	5/8" - 11	81 – 122	60 – 90
M20	3/4" - 10	129 – 137	96 – 175

For stainless steel bolts, reduce by 20%

Rubber Gasket Compounds

The 20th century was the era of innovation in plastic and rubber materials. Among the new synthetic rubber compounds that most impacted our industry were EPDM (ethylene propylene diene monomer) and Nitrile rubbers.

*Please refer to the Gasket Selection Guide (**Shurjoint** cut sheet #B-03) for additional information relating to service temperatures and chemical resistance.*

EPDM is recognized as the most water resistant rubber available today. Good for cold & hot water up to 250ºF (121ºC), waste water, water with acid, deionized water and seawater. EPDM is not recommended for use with petroleum based oils and fuels, hydrocarbon solvents and aromatic hydrocarbons.

Laboratory high temperature oven testing

Green Stripe
Grade "E"

Green + Violet Stripe
Grade "Lube-E"

Green + Red Stripe
Grade "EH"

Shurjoint Grade "E" EPDM is compounded per ASTM D2000 designation 2CA615A25B24F17Z. Peroxide curing and post curing give a higher crosslink density, which provides a higher aging resistance than required in AWWA C606.

	AWWA C606 2CA 615A25B24F17Z	Shurjoint Standard
Basic Requirements		
Hardness, Durometer A, point	65±7	60±5
Tensile strength, psi, min.	1500 psi (10.34 MPa)	1500 psi (10.34 MPa)
Elongation, %, min.	300 %	300 %
Heat Aging Properties	After aged at 212°F (100°C) for 70 hours	After aged at 257°F (125°C) for 70 hours
Change in Durometer hardness, max.	+10 point	+5 points
Change in tensile strength, max.	-25%	-10%
Change in ultimate elongation, max.	-25%	-20%
Compression Set, Method B, max.	25%	20%

Laboratory hot water testing

Use ***Shurjoint*** Grade "E-pw" for potable water and food processing services. The Grade "E-pw" is UL classified per ANSI/NSF 61 for cold +86°F (30°C) and hot +180°F (82°C) potable water services. EPDM seals are recommended for use in breweries as they have the least impact on the characteristics of beer or wort.

Double Green Stripe

Note: EPDM materials used in domestic water applications with high levels of chlorine and or chloramines should be subjected to resistance testing, as not all materials will be suitable. EPDM materials with higher saturated ethylene content and lower carbon black content are recommended for chloramine and chlorine resistance. Contact ***Shurjoint*** for further information.

NBR, Buna-N, and Nitrile all represent the same copolymer of butadiene and acrylonitrile (ACN), which is inherently resistant to hydraulic fluids, lubricating oils, transmission fluids and other non-polar petroleum based products and water less than 150° F (65° C). The higher the ACN content, the higher the resistance to oils and heat, but the lower elastic characteristics and compression set. NBR displays poor resistance to hot water and steam.


Orange Stripe

Shurjoint grade "T" NBR rubber is compounded based on ASTM D2000 designation 5BG615A14B24Z and exceeds the requirements of AWWA C606. Grade "T" is a general purpose compound with a medium ACN level. For fuels, especially those with a low aniline point, such as premium or unleaded gasoline, ASTM referenced fuels B & C and naphtha, use ***Shurjoint*** grade "M2" Epichloro-Hydrin or grade "O" Flurocarbon.

	AWWA C606 5BG615A14B24Z	Shurjoint Standard
Basic Requirements		
Hardness, Durometer A, point	60±7	60±5
Tensile strength, psi, min.	1500 psi (10.34 MPa)	1500 psi (10.34 MPa)
Elongation, %, min.	300 %	300 %
When heat aged at 212°F (100 °C) for 70 hours		
Change in Durometer hardness, max.	+10 point	±10 points
Change in tensile strength, max.	-25%	-20%
Change in ultimate elongation, max.	-30%	-30%
Compression Set, Method B, max.	25%	25%

Use ***Shurjoint*** Grade "A" white Nitrile gaskets for oily and greasy food products and processing, as well as pharmaceutical and cosmetics manufacturing. The Grade "A" is compounded from FDA approved ingredients (CFR Title 21 Part 177.2600).


White Gasket

Use ***Shurjoint*** Grade "S" Nitrile gaskets for joints with AWWA ductile iron pipe. Good for mineral oils, vegetable oils, air with oil vapors and water less than 150°F (65°C).


Red Stripe

Silicone (VMQ) ***Shurjoint*** Grade "L" Silicone compound features high temperature range stability and low temperature flexibility. Recommended for dry heat and air without hydrocarbons up to 350° F (177° C). Silicone compounds are used in many food and medical applications as they do not impart odor or taste. Not recommended for hot water or steam services.


Red Gasket

Chloroprene (CR, Neoprene) ***Shurjoint*** Grade "V" chloroprene rubber is a general purpose elastomer that demonstrates good resistance to lubricating oils, animal & vegetable fats and greases. Chloroprene is not effective in aromatic and oxygenated solvent environments and is not recommended for hot water and steam services.


Yellow Stripe

Fluorocarbon (FKM) FKM is a highly fluorinated carbon backboned compound, which is also known by the commercial name of Viton®. ***Shurjoint*** Grade "O" fluorocarbon compound offers excellent resistance to harsh chemical and ozone attack with a thermal stability to 300°F (149°C). The Grade "O" gasket is recommended for use with oils, gasoline, hydraulic fluids, hydrocarbon solvents and extended fuels that fall outside the service parameters of grade T / NBR compounds. Not recommended for steam services. (Viton® is a registered trademark of DuPont.)


Blue Stripe

Epichloro-Hydrin (ECO) ***Shurjoint*** Grade "M2" compound offers good to excellent resistance to aliphatic hydrocarbon and aromatic hydrocarbon fuels at low temperatures, LP gases & fuels, mineral oils and many solvents. ECO offers limited resistance to many organic chemicals.


White Stripe

Halogenated Butyl (CIIR) ***Shurjoint*** Grade "M" CIIR is specially compounded for use with AWWA ductile iron pipe for water services, mild dilute acids, oil-free air and many chemicals. The compound is UL classified for potable water use per ANSI/NSF 61.


Brown Stripe

Service temperatures The following chart can serve as a general guide for temperature and media compatibility for ***Shurjoint*** gaskets. The range shown below is only a guide and users should always test the gasket materials for the specific operating and service application, as conditions can vary.

	Air	Hot Water
EPDM Grade E	-30 to +230°F -34 to +110°C	230°F 110°C
EPDM Grade EH	-30 to +230°F -34 to +110°C	250°F 121°C
EPDM Grade Lube-E	-30 to +230°F -34 to +110°C	230°F 110°C
NBR Grade T	-20 to +180°F -29 to +82°C	150°F 65°C
VMQ Grade L	-30 to +350°F -34 to +177°C	150°F 65°C
CR Grade V	-30 to +180°F -34 to +82°C	150°F 65°C
FKM Grade O	+20 to +300°F -7 to +149°C	212°F 100°C
ECO Grade M2	-40 to +160°F -40 to +71°C	150°F 65°C
CIIR Grade M	-20 to +200°F -29 to +93°C	180°F 82°C

*EPDM gaskets for water services are not recommended for steam services unless coupling or components are accessible for frequent gasket replacement.

SHURJOINT

PIPING PRODUCTS INC.

April 21, 2003

To whom it may concern:

Statement of Durability
&
Design Life

1. **General**:

The Shurjoint products including rubber gasketed couplings and grooved-end fittings are basically designed to comply with the requirements of ANSI/AWWA C606-97, which provides the water industry the minimum requirements of grooved and shouldered joints, including materials, groove dimensions, and of ASTM F1476-01, which specifies performance of gasketed mechanical couplings, including hydrostatic proof testing, bending moment proof testing. The Shurjoint products also satisfy the testing requirements and carry the approvals by UL, FM, VdS, LPC, and WRAC, wherever applicable.

2. **Materials**:

(1) Housings: Ductile iron ASTM A536 Grade 65-45-12 (equivalent to BS EN 1563-97 Grade ENGJS-450-10)
(2) Bolts & Nuts: Carbon steel to ASTM A183 or ASTM A449.
(3) Gaskets: ASTM D2000 Designation No. 2CA615A25B24F17Z (EPDM Grade E)

3. **Testing**:

(1) Hydrostatic proof testing (ASTM F1476 A5.2): 150% of the listed working pressure in the Shurjoint product catalog
(2) Hydrostatic testing for items UL listed (UL 213 Table 9.1): 3 – 5 times rated working pressure depending on sizes.

Sizes 1 through 6 inches: 5 times
Sizes 8 through 10 inches: 4 times
Sizes 12 inches and larger: 3 times

(3) Bending moment testing: To F1476 Table A6.1, UL 213 & FM Class Number 1920

(4) Rubber gasket testing (2CA615A25B24F17Z):

Durometer harness: 65±7
Tensile strength: 1500 psi min.
Ultimate elongation: 300 % min.

When heat aged at 100°C for 70 hours:
Change in Durometer hardness: +10 max.
Change in tensile strength: - 25% max.
Change in ultimate elongation: - 25% max
Compression set (Method B): 25% max.

4. **Design Life**:

60 years

The Grade E EPDM gaskets are especially good for water services of a wide range of temperature change, -34°C to +110°C, but their service life rapidly deteriorates when used at constant temperature of 85°C and above. According to our own testing, the Shurjoint Grade E rubber gaskets will keep effectively elastic for 225 years at service temperature of 60°C (water).

Ductile iron castings and bolts & nuts are supposed to provide as same service life as that of steel pipe.

We, therefore, certify that our products duly satisfy the generally requested service life of 60 years.

5. **Quality system of the foundry**:

ISO9001:2000 Quality Management System certified by Lloyds Register Quality Assurance with Certificate No. 955771.

- Last Item-

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PHONE: +886-2-2501-2008 • FAX: [FAX NUMBER]

10F-2, 235 Lung Chiang Rd, Taipei Taiwan
Tel: +886-2-2515-0528 Fax: +886-2-2515-0630
E-mail: shurjt@ms26.hinet.net

Shurjoint Piping Products, Inc.

June 30, 1999

-TEST REPORT-

No. SJ-9901

Subject: EPDM rubber gasket service time presumption by means of compression set change

Test Pieces: Sample A: Identified as CFE630L/A (Polisar compound, 1.5 hrs post-cure)
Sample B: Identified as CFE630L/B (Polisar compound, 4.0 hrs post-cure)
Both sample pieces were submitted by Chin-Fa Rubber Co. Ltd.

Test Method: 54 test pieces each type of samples were prepared and 6 pieces each were placed in three different air ovens of three different temperatures of 100°C, 120°C, and 140°C and held for 70 hours, 300 hours and 1000 hours. Each group (6 pieces) was placed in room temperature for ½ hours for recovery. Test piece dimension: 29.0mm dia. x 12.7mm high.

Compression Set Test Result (average of the results of 6 test pieces):

Temperature and hours	Sample A	Sample B
100°C x 70 hours, %	12.81	13.50
100°C x 300 hours, %	21.50	18.51
100°C x 1000 hours, %	35.35	32.49
120°C x 70 hours, %	19.37	11.80
120°C x 300 hours, %	29.66	21.95
120°C x 1000 hours, %	51.08	38.77
140°C x 70 hours, %	22.29	15.08
140°C x 300 hours, %	42.53	24.98
140°C x 1000 hours, %	76.80	45.09

Service time presumption:
The above-listed test results were plotted on a time/compression set chart first, from which you can get the predicted time when compression set may reach 60%, the maximum allowed value to keep rubber effectively elastic. See chart 1 and chart 3. Then, the predicted time of compression at each temperature obtained from above was plotted on a temperature/time chart, from which you can predict the service life of the rubber tested. (Cf. Arrhenius model) See chart 2 and 4.

Notes: This test was conducted December 23, 1998 through Feb. 3, 1999 at the Laboratory of Tai-Hau Iron & Steel Co., Ltd., the foundry of the Shurjoint products. Shurjoint is prepared to submit necessary test pieces to any party (ies) for verification.

Chart 1: Sample A Compression Set

Time(hours)	100°C	120°C	140°C
70	12.81	19.37	22.29
300	21.50	29.66	42.53
1000	35.35	51.08	76.80

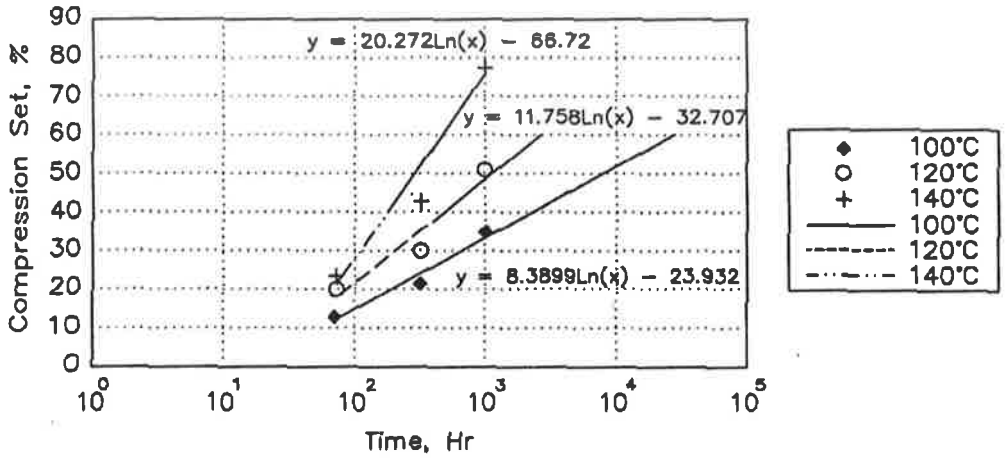


Chart 2: Sample A Predicted Service Time

Temp.	Time(hours)	1/T	Time(days)	Time(years)
60°C	2263745	0.00300	94322.7	258.41
80°C	191936	0.00283	7997.4	21.91
100°C	22113.27	0.00268	921.4	2.52
120°C	2656.034	0.00254	110.7	0.30
140°C	518.5241	0.00242	21.6	0.06

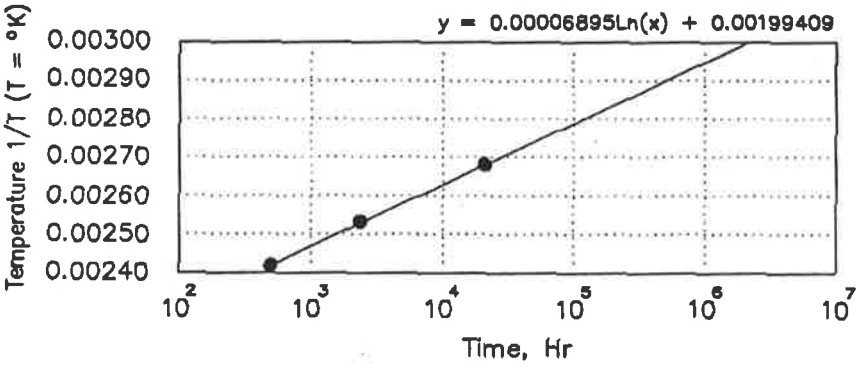


Chart 3: Sample B Compression Set

Time(hours)	100°C	120°C	140°C
70	13.50	11.80	15.08
300	18.51	21.95	24.98
1000	32.49	38.77	45.09

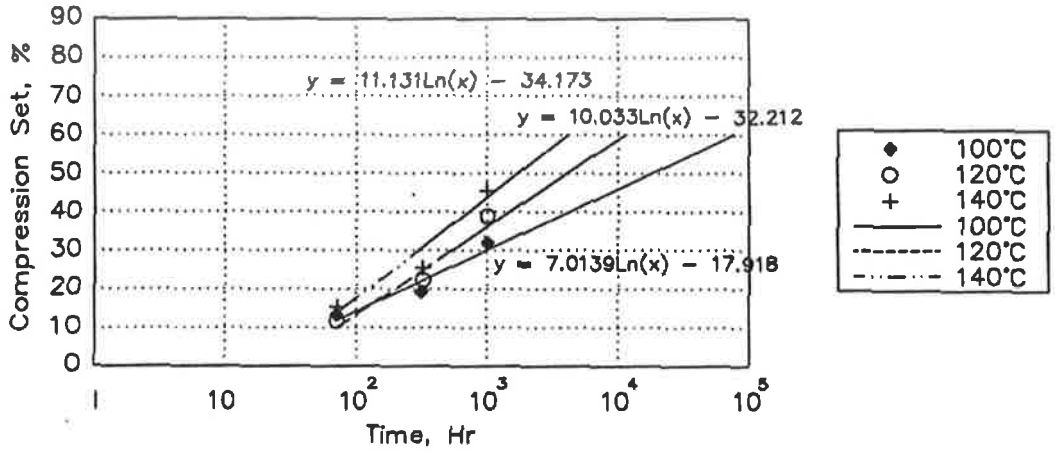
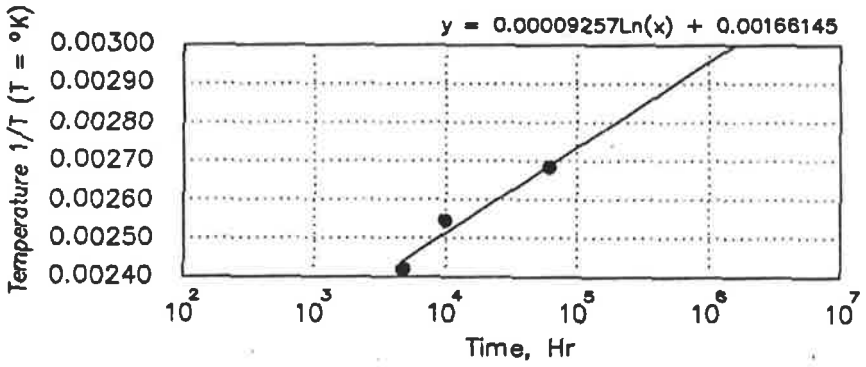


Chart 4: Sample B Predicted Service Time

Temp.	Time(hours)	1/T	Time(days)	Time(years)
60°C	1967567	0.00300	81982.0	224.61
80°C	313116	0.00283	13046.5	35.74
100°C	66774.96	0.00268	2782.3	7.62
120°C	9807.181	0.00254	408.6	1.12
140°C	4724.069	0.00242	196.8	0.54



SHURJOINT®

550H **V-08**

MODEL 550H PIPE JOINT LUBRICANT

SHURJOINT pipe joint lubricant Model 550H is a tan colored non-toxic paste. The lubricant is recommended for proper gasket installation and to help prevent the gasket from being pinched. The lubricant is applied in a thin coat to the gasket exterior, the gasket lips and/or the housing interiors. ***Shurjoint*** lubricant is available in one pound (450 grams) and one quart (2 pounds or 900 grams) containers. Certified to ANSI/NSF 61.

Features:

- Applies equally well to wet or dry surface.
- Contains no petroleum.
- Will not support bacteria.
- Will not deteriorate natural or synthetic rubber, plastic gaskets or cast iron pipe.
- Suitable for all types of pipelines, including potable water pipelines.
- Excellent working range, 0°F to 150°F.
- Will not impart taste, color or odor to water in pipelines flushed in accordance with recommended AWWA procedures.

Usage Guide:

(Approximate)

Gasket (Inch)	Number of Gaskets	
	One Pound	Two Pounds
2	220	440
3	180	360
4	100	200
6	80	160
8	60	120
10	40	80
12	36	72
14	28	56
16	24	48
18	20	40
20	16	32
24	12	24

10 YEAR LIMITED WARRANTY

Full warranty terms can be found on www.shurjoint.com

Directions:

1. ***Shurjoint*** 550H lubricant is ready for use.
2. See Assembly leaflet for detailed instructions pertaining to particular ***Shurjoint*** pipe joint lubricant being assembled.

MATERIAL SPECIFICATIONS

• Compounds:

Name	CAS#
Proprietary blend of soap	61790-44-1
Glycol	57-55-6
Filler	12001-26-2

General Notes:

- **Warning**: Piping systems must always be depressurized and drained before attempting disassembly and or removal of any components.
- ***Shurjoint*** reserves the right to change specifications, designs and or standard equipment without notice and without incurring any obligations..

Job Name:	**System No.**	**Location:**
Contractor:	**Approved:**	**Date:**
Engineer:	**Approved:**	**Date:**

Shurjoint *product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact* ***Shurjoint*** *Technical Service.* ***Shurjoint*** *reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligations to make such changes and modifications on* ***Shurjoint*** *products previously subsequently sold.*

บริษัท ลีลาวงศ์ จำกัด Tel. + 66 (0) 2726 - 4701
LEELA WONG CO., LTD. Fax. + 66 (0) 2726 - 4711

COMPANY PROFILE

HEAD OFFICE	:	92 Sukhaphibal 2 Road Praves , Bangkok 10250 THAILAND TEL : 66-2-7264701-10 FAX : 66-2-7264711 E-mail : info@leelawong.com WEB SITE : www.leelawong.com
ESTABLISHMENT	:	1992
AREA SPACE	:	8000 sqm. in Praves, 1000 sqm in downtown
STAFF	:	25 persons with contact person listed
Deputy Manager	:	Sasithorn Yaemarun
Sales Support	:	Orawan Chupinyo , Apinya Buathonglang , Jatuporn Wannasen , Wannapa Fahchaipoom ,
Technician	:	Prateep Eiamsa-ard , Panu Polpoon , Chatree Nil-Anthong
Account staff	:	Natnicha Sompee , Pechrada Nuchraksa ,
Stock controller	:	Boomhome Pootom, Bundit Poosuwan,
Product list	:	Attached

บริษัท ลีลาวงศ์ จำกัด Tel. + 66 (0) 2726 - 4701
LEELA WONG CO., LTD. Fax. + 66 (0) 2726 - 4711

Corporate Profile

Trustworty products, optimum customer satisfaction

Head office	:	1630-1632 Songwad Road , Sampanthawong, Bangkok 10100 Tel. 66-2-266-8120 (22) Fax. 66-2-266-8123
Sales office	:	92 Sukhaphibal 2 Road, Praves, Bangkok 10250 Tel. 66-2-726-4701 Fax. 66-2-726-4711
Web site	:	www.leelawong.com
E-mail	:	info@leelawong.com
Establishment	:	1992
Banker	:	Bangkok Bank, Kasikornbank
Our business	:	importer, stockist and distributor of piping system
Our customer	:	high –rise buildings, power plants, electronic plants, automobile, central distribution warehouse, M&E contractors etc.
Our commitment	:	Highest quality product, Speedy on time delivery Optimum customer satisfaction

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LEELA WONG CO., LTD. Fax. + 66 (0) 2726 - 4711

Our product range

Product Specification

Pipes -

High quality steel pipe British Standard BS1387 ½" – 6",TIS 277-2532

High quality ERW steel pipe ASTM A53 Gr. A / B ½"- 30"

High quality seamless steel pipe API 5L Gr. B ½"- 12"

High quality ERW stainless steel pipe ASTM A312 Tp 304 / 316 ½"- 20"

High quality seamless stainless steel pipe ASTM A316 Tp304/316L ½"– 10"

Polypropylene pipe & fittings(PP-R) DIN8077,8078

PVC pipe from Nawa Plastic TIS 17-2532 Class 13.5,8.5,5

Fittings - Valves

Grooved and hole cut piping system AWWA C606 , ASTM A536 Gr. 65-45-12, NFPA 13

Malleable Iron fittings ASTM A197 - ANSI B16.3

Malleable Iron fittings BS 6681 - B21 , TIS 249-2540

Fabricated butt-welding carbon steel A234 Gr .WPB - ANSI B16.9

Forge carbon steel fittings A105 N 3000 Lbs.

PVC fitting for pressure work TIS 1131-2535 , for drainage TIS 1410-2540

Water meter ISO 4064 Class B,

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AUTO INTERIOR PRODUCT

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TETRA PAK

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92 SUKHAPIBAL 2 ROAD, PRAVET, BANGKOK 10250, THAILAND

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Project Reference

MHE DEMAG

KOLANG ELECTRONIC

CONTINENTAL AUTOMOTIVE

CELESTICA ELECTRONIC

CELESTICA ELECTRONIC

CONTINENTAL AUTOMOTIVE

GRAND SETHIWAN

GRAND SETHIWAN

TYTEX GROUP

DAI - I CHI PACKAGING

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STANLEY –WELLGROW

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Tel. 0-2726-4701 (10) Fax. 0-2726-4711
www.leelawong.com E-mail : suladda@leelawong.com

SHURJOINT Mechanical Piping Components Project Reference

ITEM	PROJECT NAME	YEAR OF PROJECT
1	Bayer Material Science - Maptaput Industrial Estate Rayong	2012
2	Cargill Meat (Thailand) Limited - Nakornratchasima	2012
3	Summit Auto Seats - Chachaengsao	2012
4	Hitachi Metal - Rojana Industrial park Ayutthaya	2012
5	Canon Prachiburi (Thailand) 304 Industrial Park - Prachiburi	2012
6	Caterpillar Inc. - Medium Truck Type Tractor - Hemaraj Rayong	2012
7	Mitsubishi Electric Thai Auto Parts Co., Ltd. - Siam Eastern Cholburi	2012
8	Mitsubishi Electric Consumer Product - Amata Nakorn Cholburi	2012
9	Toyoda Gosei (Thailand) Automotive Products - Amata Nakorn	2012
10	Ryobi Die Casting (Thailand) Ltd - Amata City Rayong	2012
11	Ichikoh Industries (Thailand) Co., Ltd. - Amata City Rayong	2012
12	Kao Thailand - Amata Nakorn Cholburi	2012
13	Sumitomo Electric Wiring Systems (Thailand) Amata City - Tayong	2012
14	Jelly Belly Candy Company (Thailand) Ltd. - Eastern Seaboard Rayong	2012
15	SCG PAPER - Khon Kaen plant	2012
16	Magnecomp Precision Technology Public Co., Ltd. - Rojana Ayutthaya	2012
17	ABPR 2 & 1 Combined Cycle Cogeneration Plant - Amata City Rayong	2012
18	กรมการขนส่งทางบกศูนย์หมอชิต กระทรวงคมนาคม	2012
19	Electrolux Laundry Systems Factory Thailand	2011-2012
20	Customs Bureau Office extension phase - Suvannabhumi Airport	2011-2012
21	Amata B-Grimm Power - Amata Nakorn Cholburi	2011-2012
22	Warehouse of Asia - DSG Hemaraj Industrial Zone Saraburi	2012
23	Rohm Integrated Systems Thailand - Navanakorn Pathumthani	2011-2012
24	SCG Paper - Ratchaburi plant	2012
25	Western Digital Navanakorn - Pathumthani	2012
26	S-ONE - Map Ta Phut Industrial Estate Rayong	2011-2012
27	Laem Chabang Logistics Nippon Express - Cholburi	2011-2012

28	Electricity Generating Authority of Thailand - Bang Pa In Powerplant	2011-2012
29	Omron Rojana Industrial Park - Ayudhaya	2011-2012
30	Honda Rojana Industrial Park - Ayudhaya	2011-2012
31	Thai Summit Rojana Industrial park #2 - Ayudhaya	2011-2012
32	Panasonic Electric Works (Thailand) - Khon Kaen	2011-2012
33	Minibea Thailand - Lopburi extension plant PH10	2011-2012
34	Park Ventures The Ecoplex on Wittayu - Wireless Road Bangkok	2010-2012
35	โรงพยาบาลระยอง กรมการแพทย์กระทรวงสาธารณสุข	2011-2012
36	Park Ventures The Ecoplex on Wittayu - Wireless Road Bangkok(San&Air)	2011
37	Valeo Siam Thermal System Co., Ltd. - Amata Nakorn Cholburi	2011
38	Canon R10 - Navanakorn Industrial estate Nakornratchasima	2011
39	Nikon (Thailand) Co., Ltd. - Rojana Industrial Park Ayudhaya	2011
40	Isuzu Gateway City Industrial Estate - Chachengsao	2011
41	U-Shin (Thailand) Co., Ltd. Hemaraj Eastern Seaboard Industrial Estate	2011
42	Siam Chemical - Bangpoo Industrial Estate Samutprakarn	2011
43	Asian Stanley International Co., Ltd. - Lat Lum Kaeo Pathumthani	2011
44	Sumitomo Rubber New Factory - Amata City Rayong	2010-2011
45	Seagate Technology (Thailand) Ltd - Nakornratchasima	2010-2011
46	Precision Plastic Co., Ltd. - Rojana Industrial Park Ayudhaya	2010-2011
47	The Goodyear Tyre and Rubber Company - Khlongluang Pathumthani	2011
48	Knorr Unilever Food Solutions Asia - Gateway Industrial Estate	2010-2011
49	Chempark Warehouse - Lat Krabang Industrial Estate	2011
50	IDS Johnson & Johnson Warehouse - Lat Krabang Industrial Estate	2011
51	Essilor Manufacturing Thailand - Amata Nakorn Cholburi	2011
52	E-DA Sevensun Co., Ltd. - Pinthong Industrial Estate Cholburi	2011
53	H-ONE Co., Ltd. - Pinthong Industrial Estate Cholburi	2011
54	The Golden Foods Siam - Ongkarak Nakornnayok	2010-2011
55	Cold Aseptic Filling - Oishi Group Navanakorn , Prathumthani	2010-2011
56	Electricity Generating Authority of Thailand Nongchok Substation	2010
57	Pratunum Center Renovation - Bangkok	2010-2011
58	Pantip Plaza IT Shipping Mall - Pratunum Bangkok	2010-2011
59	Michelin Siam Co., Ltd. (NKK) - Nongkhar Saraburi	2010
60	Klockner Eastern Seaboard Industrial Estate - Cholburi	2010-2011
61	Electricity Generating Authority of Thailand - Headquarter Nonthaburi	2010-2011
62	Bridgestone Factory 7,8 Tire warehouse extension - NongKae Saraburi	2010

63	Sumitomo Rubber Extension phase - Amata City Rayong	2010
64	Western Digital Navanakorn Extension Phase IV	2010
65	โรงพยาบาลโรคทรวงอก นนทบุรี กรมการแพทย์กระทรวงสาธารณสุข	2010
66	อาคารประชุมอเนกประสงค์ซูเลียน - บางบัวทอง นนทบุรี	2010
67	อาคารเฉลิมพระเกียรติ คณะครุศาสตร์ มหาวิทยาลัยจุฬาลงกรณ์ - กรุงเทพ	2010
68	โรงพยาบาลนครพิงค์ เชียงใหม่ กรมการแพทย์กระทรวงสาธารณสุข	2010
69	Toshiba Storage Device (Thailand) Co., Ltd. Klongluang Pathumthani	2009
70	SSPC SIT Industry - Rojana Industrial Park Ayudhaya	2009
71	อาคาร สนง.กรมศุลกากร กรุงเทพ	2009
72	Reckitt Benckiser Healthcare Manufacturing (Thailand) Ltd.	2009
73	SCG Logistics Management - LaemChabang Chonburi	2009
74	Noventa coffee factory - 304 Industrial Park - Prachinburi	2009
75	Aisin Thai Automotive Casting - Prachinburi Industrial Park	2009
76	Thai Asahi Kasei Spandex - Sahaphat Group Chonburi	2009
77	โรงพยาบาลบางละมุง ชลบุรี กรมการแพทย์กระทรวงสาธารณสุข	2009
78	Water Treatment Plant for IRPC-A petrochemical Industry - Rayong	2009
79	Canadia Bank Tower-Diamond Island , Phanom Penh	2009
80	AIP Auto Interior Product - Eastern Seaboard Industrial Park	2009
81	F & N Creation - Ayudhaya	2008-2009
82	Continental Automotive (Thailand) - Amata City Rayong	2008-2009
83	GIFFARINE (Skyline Laboratories) - Navanakorn Industrial Park	2008
84	โรงพยาบาลอ่างทอง กรมการแพทย์กระทรวงสาธารณสุข	2008
85	โรงเรียนสาธิต - นิคมอมตะนคร ชลบุรี	2008
86	MHE Demag Factory - Hi Tech Industrial Estate Ayudhaya	2008
87	Automated Precast pallet circuit -Lumlukka Preuksa Real Estate	2008
88	Kolang Factory - Navanakorn Industrial Estate	2008
89	DAI-I-CHI Packaging - Wellgrow Industrial Estate, Chacheongsao	2008
90	DKSH Diethelm Distribution Centre - Bangplee	2008
91	Institute of Dermatology - Ratchavitee Bangkok	2008
92	โรงงานผลิตเครื่องดื่มกระทิงแดง โซนใหม่ - ปราจีนบุรี	2008
93	โรงไฟฟ้า อ.จะนะ สงขลา	2007
94	อาคารสถาปัตยกรรมศาสตร์ มหาวิทยาลัยมหาสารคาม	2007
95	Siam Micheline IV & VII, Laemchabang Industrial Estate Cholburi	2007
96	Celestica Electronic Laem Chabang Industrial Estate Cholburi	2007

97	Western Digital III - Bang Pa In , Ayudhya	2007
98	Sun Valley Food processing Cargill - Nakorn Ratchasima	2007
99	Stanley Works - Wellgrow Industrial Estate Chachoengsao	2007
100	Seagate Technology (Thailand) Ltd - Nakornratchasima	2006
101	Panjaphol Paper - Ayudhaya	2006
102	Stock Exchange of Thailand (Vibhavadi Rangsit)	2006
103	Unilever Factory	2006
104	BT Residence Sukhumvit Soi 8	2006
105	Korat Material Center - warehouse for Seagate	2005
106	Gold Label Seasoning Sauce Warehouse	2005
107	CP Seven-Eleven Bangbuathong Renovated Warehouse	2005
108	Celestica Electronic Plant	2005
109	Setthiwan Thanee Tower	2004-2005
110	Glow SPP 3 facility to Powerplant - Maptaphut Rayong	2004
111	Michelin Tyre Expansion Warehouse	2004
112	Electricity Generating Authority of Thailand - Mae Moh	2004
113	Polyplex factory new fire protection system	2003
114	Thai Preserve Food new factory	2003
115	Tank farm for Toluene , Paraxylene, Orthoxylene for Thai Tank Terminal	2003
116	UNOCAL Mechanical shop - Offshore Platform floating storage unit	2003
117	CP Seven-Eleven Extension Warehouse	2003
118	Por-Or-Sor-Wor Foundation to Ministry of Public Health	2002
119	Water Supply Tunnel of Metropolitan Waterwork Authority of Thailand	2002
	Bangkhen - Bangkok	

Update : June 30,2012

บริษัท ลีลาวงศ์ จำกัด Tel. + 66 (0) 2726 - 4701
LEELA WONG CO., LTD. Fax. + 66 (0) 2726 - 4711

WHO WE ARE , WHERE WE FROM

Aiming at provide utmost efficient services to customers, in 1992 the Greater Bangkok Sales Department are enlarged and branched from her mother company which is long established in wholesale of iron and steel ; the new company LEELA WONG.
The production department also splits out and had been set up to form a new company namely LEE BROTHERS DEVELOPMENT CO., LTD. ; the business transaction is foundry of cast iron.

LEELA WONG focused her business activities of trading the owned imported goods as well as locally made. We are stockist and distributor of the following premium brands :-

-High quality seamless steel pipes from JFE - Japan
-High quality ERW steel pipes from Hyundai - Korea and Seah – Korea
-Water meters from Zenner-Germany
-Grooved and Hole cut Piping System from TYCO Shurjoint – USA / Taiwan
-Brass & Bronze valves from Idrosanitaria Bonomi-Italy
-Clamp joint repair concept from Straub-Switzerland
-Ductile iron fittings & valves – Leeman
-Malleable Iron fittings ; Black & Galvanized - TM

Besides the own imported and own manufactured items , we are also dealer for various premium brands locally products such as steel pipe from SAHA THAI STEEL PIPE PCL., plastic pipe from NAWA PLASTIC (elephant brand PVC pipe) of which the list of index of price list is also attached for quick reference.

Company mission : Quality is our business philosophy.

VAN LEEUWEN
Thailand

Company Presentation
VAN LEEUWEN Thailand

Our Identity

VAN LEEUWEN

Who are we?

- Indispensable link between manufacturer and buyer
- Specialist in steel pipes and pipe and tube applications
- Provider of customized services
- Keeping stock throughout the world

Our Core Business

VAN LEEUWEN

Products

- Pipes, tubes and hollow sections
- Fittings, flanges and valves
- Bar steel, plated bars

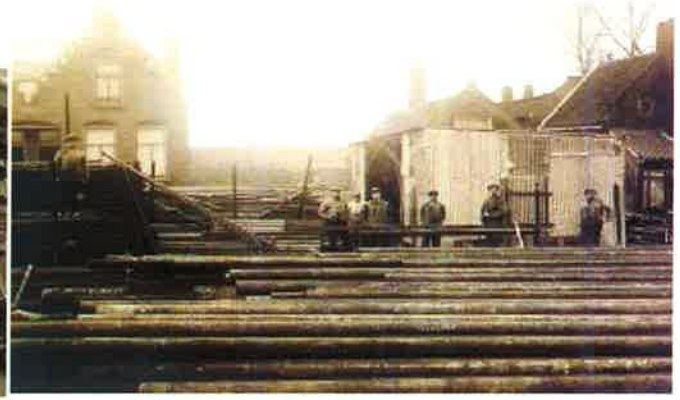
Carbon steel, stainless steel and alloyed steel

Services

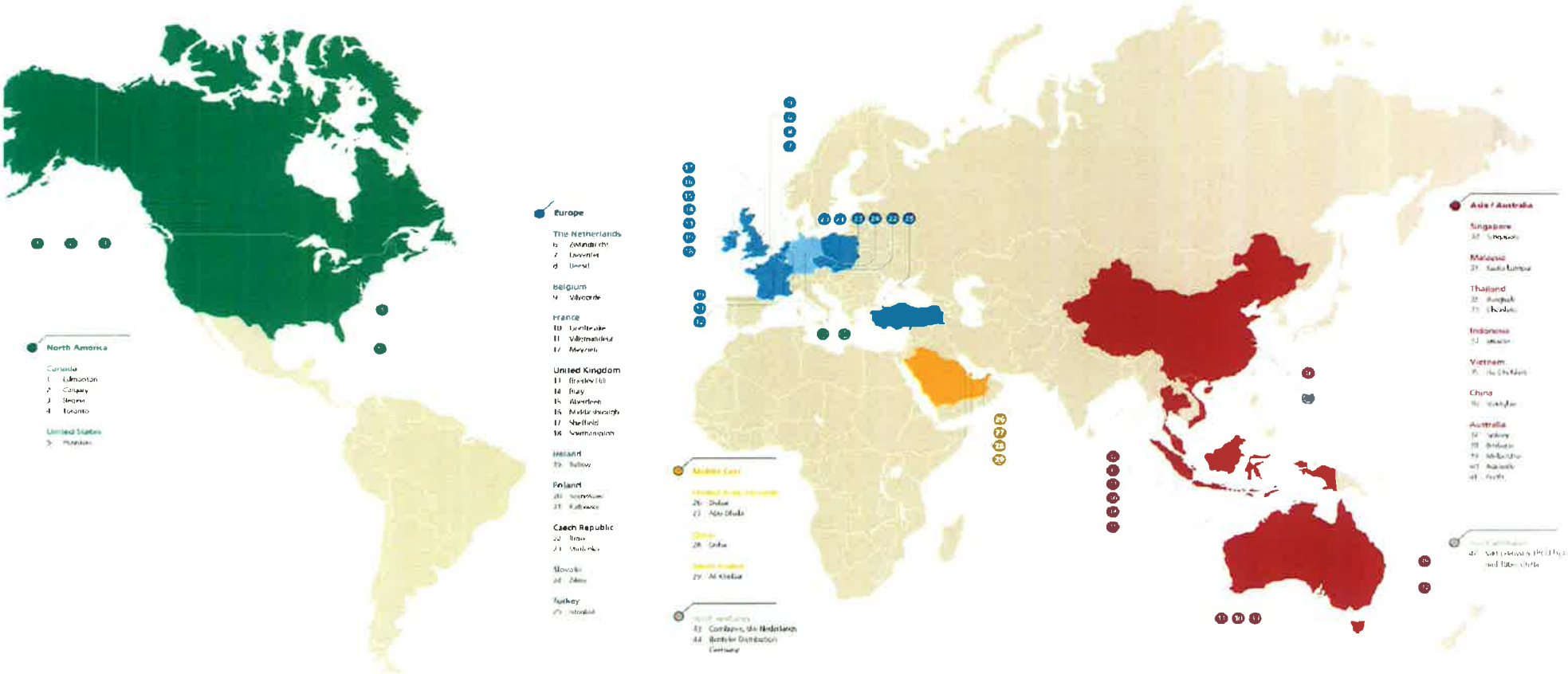
- Treatments
- Project management
- Supply Chain Management

Our Heritage

- 1924 — Founded in **Zwijndrecht**
- 1947 — Expanded into **Belgium**
- 1950-1970 — Established **Europe** networks
- 1970-1990 — Expansion into North America, Asia, Australia
- 1990 – 2013 — Eastern Europe, Middle East, China



Our Global Network



VL Thailand – local contact point

Office in Bangkok

- Established in 1991
- Total of 28 employees
- ISO 9001 : 2008 approved
- Core Business: Distribution and Project Business
- Reporting under regional headquarters in Singapore

Warehouse in Chonburi

- Warehouse of 6,500 square meters
- Stock Level of 1,700 tons of pipes, fittings and flanges
- Value added services as vendor managed inventory, additional testing, customized packing and color coding etc.

VLT Stock Delivery Program

VAN LEEUWEN

Material Grade	Pipes	Flanges	Fittings
Carbon Steel	A106 Grade B A333 Grade 6 A53/API 5L Grade B X42/X52/X65 A335 P5, P11, P22, P9, P91, P92 Execution: SMLS, ERW, EFW, SAW	A105N, A350 LF2 Execution: Blind, Weld Neck, Socket Weld, Slip On, Threaded (RF, RTJ)	A105N, A234 WPB, A420 WPL6, A234 WP5, WP11, WP22, WP9, WP91, WP92 Execution: LR/SR Elbows, Tees, Reducers, Caps, Couplings, Olets, etc.
Stainless Steel	A312 304(L) A312 316(L) A790 S31803/S32750/S32760 A928 S31803/S32750/S32760 Execution: SMLS, WLD	A182 F304(L) A182 F316(L) A182 F51 A182 F60 Execution: Blind, Weld Neck, Socket Weld, Slip On, Threaded (RF, RTJ)	A182 304L/316L A403 304L/316L A815 S31803/S32750 Execution: LR/SR Elbows, Tees, Reducers, Caps, Couplings, Olets, etc.

VLT Value Added Services

VAN LEEUWEN

Value Added Services

- **Project Management Services**

- **Logistics Solutions & Supply Chain Management:** VMI – Vendor managed inventory, Long term MRO / frame agreements for supply of bulk materials

- **Procurement Solutions**: Special and exotic materials and any other materials outside our regular stock range (i.e. Duplex, Super duplex, Incoloy, Hastelloy, Inconel, 321, 904, etc.) sourced from our global Van Leeuwen network of trusted suppliers

- **Quality Assurance**: Additional material testing (PMI, UT/X-Ray, Charpy, etc.), marking, packing, coating, cutting, etc. as per clients requirements

Supported by VL Singapore

VAN LEEUWEN

Regional Headquarters and Warehouse in Singapore

- Established in 1979
- Total of 70 employees
- Regional headquarters and warehouse in one central location
- Warehouse of 18,000 square meters
- 9,000 tons of pipes, fittings and flanges in CS, SS, Duplex and High Yield material grades

Supported by global HQ

VAN LEEUWEN

Global Headquarters and Warehouse in Zwijndrecht / Netherlands

- Global HQ in Zwijndrecht/Netherlands
- 50 offices and 18 stock holding points worldwide
- Total of 1,030 employees
- Global turnover of EUR 658 mil in 2012
- Total of 70 employees
- Regional headquarters and warehouse in one central location
- Warehouse of 80,000 square meters and 100.000 square meters of outdoor storage
- 45,000 tons of pipes, fittings and flanges in CS, SS, Duplex and High Yield material grades

Product Impressions

Cooperating Brands

VAN LEEUWEN

Fields of application

VAN LEEUWEN

- Oil & Gas
- Refineries
- Chemical Plants
- Shipbuilding
- Pipelines
- Water Treatment
- Food processing
- Construction
- And many more...

Project References Process

VAN LEEUWEN

Year	Project Name	Project Description	Value USD	EPC	Client	Country
2011	Line Flare GSP5 Project	Gas seperation pipeline improvement	550,000	PTT GSP	PTT GSP	Thailand
2011	GHU Turnaround Project	Shutdown de-bottling improvement	650,000	IRPC	IRPC	Thailand
2010	Thai Oil CCG Project	Petrochemical complex	1,000,000	Technip	Thai Oil PCL	Thailand
2010	Thai Lube TDAE Project	Petrochemical complex	750,000	Worley Parsons	Thai Lube	Thailand
2008	Star Petroleum Project	New Jet Fuel Processing Plant and Storage Project	4,000,000	CBI Thailand	Star Petroleum Refining Company Limited	Thailand
2008	MOC Cracker Project	Main Automation System of MOC Cracker Project	5,000,000	Yokogawa (Thailand) Ltd	Map Ta Phut Olefins Co., Ltd	Thailand
2007	CCC Interconnecting Pipeline	Pipe Rack - Interconnecting Pipeline Project	8,000,000	Christiani Nielsen	Reformer and Aromatics Complex II (ARC)	Thailand
2006	Thailand ATC Reformer and Aromatic Complex II	ATC Reformer and Aromatic Complex II	2,000,000	GS Engineering and Construction	The Aromatics (Thailand) Public Co Ltd	Thailand
2006	Thailand ATC Reformer and Aromatic Complex II	ATC Reformer and Aromatic Complex II	4,000,000	SK Engineering and Construction	The Aromatics (Thailand) Public Co Ltd	Thailand
2006	Quiten Lactic Acid Project	Lactic acid plant of PURAC in Rayong	3,500,000	Direct	PURAC	Thailand
2004	EO/EG Project	Construction of chemical plant	380,000	Samsung Engineering Co Ltd	TOC Glycol Company Limited	Thailand
2003	TOM	Construction of Olefins Plant	600,000	Chiyoda	Thai Olefins	Thailand
2000	BPA	Construction of Polycarbonate Plant	1,400,000	Toyo Thai	Bayer	Thailand
1997	Asphalt Plant	Construction of Asphalt Plant	1,800,000	Bechtel International	Thai Bitumen	Thailand
1997	Copper Refinery	Construction of Copper Refinery	400,000	Sofrasid	Thai Copper	Thailand

Project References Offshore, O&G

VAN LEEUWEN

Year	Project Name	Project Description	Value USD	EPC	Client	Country
2013	Long Term Agreement Phase 47-52	CS+SS WHP Pipes, Fittings, Flanges (Time Frame 2014 – 2016)	7,000,000	CUEL	Chevron	Thailand
2013	Nong Yao Project	Duplex processing pipes WHP+WPP	425,000	WorleyParsons	Mubadala Petroleum	Thailand
2013	Phase 46	WHP fittings	110,000	CUEL	Chevron	Thailand
2013	Manora Project	Cu-Ni Pipes, Fittings, Flanges for WPP	150,000	Clough	Mubadala Petroleum	Thailand
2013	RFCCU Revamp T&I Project	Shutdown + Revamp of residue fluidized catalytic cracking unit; CS, CS (Sour), SS, Alloy PFF over 2.000 line items	1,500,000	Foster Wheeler International	Star Petroleum Refinery Co.	Thailand
2013	TOL EI-PSA3 Project	Construction of Emission improvement Pressure Swing Absorption unit; Supply of 36" – 42" low temperature pipe	1,000,000	Foster Wheeler International	Thai Oil PCL	Thailand
2013	CO2 Supplement Project	Construction of additional gas line from Ethane Separation Plant; Supply of 60 tons 48" – 60" SS Pipe	450,000	Prax Air	Prax Air	Thailand
2013	BCP TGTU Project	Construction of Tail Gas Treating Unit. Supply of CS, CS (Sour) and Alloy PFF	1,000,000	Thai Woo Ree (SKEC Subsidiary)	Bangchak Petroleum PCL	Thailand
2013	MOC TEGF Project	Construction of flare gas manifold; Supply of CS and SS PFF	450,000	Callidus Honeywell	SCG MOC	Thailand
2009	PTT LNG Project	LNG Plant	500,000	GS Engineering & Construction	PTT LNG	Thailand
2008	Star Petroleum Project	New Jet Fuel Processing Plant and Storage Project	4,000,000	CBI Thailand	Star Petroleum Refining Company Limited	Thailand
2001	Randong Project	Construction of Offshore Platforms	1,500,000	Clough Unithai	Clough Unithai	Thailand
2000	North Pailin 1 + 2	Erecting & Expansion of Offshore Platforms (North Pailin 1 + 2)	800,000	Mc Dermott	Unocal	Thailand

Project References Power Gen

VAN LEEUWEN

Year	Project Name	Project Description	Value USD	EPC	Client	Country
2013	Kaew Lamduan Power Plant Project	Construction of 10MW Bio-Mass Power Plant; Heavy wall CS SMLS pipe.	500,000	Bangkok Industrial Boilers	Kaew Lamduan Power Supply	Thailand
2013	Teesside EFW Project	Upgrade of Energy from Waste Power Plant	350,000	Thyssenkrupp Uhde (Thailand)	Teesside WTE power station	Thailand
2012	GULF JP Project	Construction of 7 gas fired Power Plants - Total 3.000 MW. Supply of CS, SS and AS PFF.	5,000,000	Mitsubishi Power / Toyo Engr	GULF	Thailand
1998	Power Plant	Construction of Power Plant	400,000	Siemens / Westinghouse	Thai Oil	Thailand
1997	Co-generation Plant	Construction of Power Plant	440,000	Black & Veatch	Gulf Co-Generation	Thailand
1997	Co-generation Plant	Construction of Power Plant	650,000	Black & Veatch	Thai Co-generation	Thailand

Project Examples: PURAC

VAN LEEUWEN

Project Name:	**Purac Quinten OPS5 Project Lactic Acid Production Plant**
Year:	**2006 - 2007**
Engineering:	**Qtec Engineering / Sh Asia**
Scope of work:	**Supply of Pipes, Fittings and Flanges**
Material Grades:	**Carbon, Stainless and Duplex (A106 B, API5L, TP316, UNS31803)**
Project Value:	**140 mil THB (USD 4.5 mil)**

Project Examples: CUEL

VAN LEEUWEN

Project Name:	**CUEL Chevron Frame Agreement**
Year:	**2010 – 2012 + 2014 - 2016**
Engineering:	**CUEL - 27 + 54 Wellhead PF**
Scope of work:	**Supply of Pipes, Fittings and Flanges**
Material Grades:	**Carbon and Stainless (A106 B, API5L, F52, TP316)**
Project Value:	**120 mil THB (USD 3.9 mil)** **190 mil THB (USD 6.1 mil)**

CUEL

Project Examples: Wheatstone

VAN LEEUWEN

Chevron Wheatstone Australia Project (2012):

- **Scope: Two LNG processing trains with a combined capacity of 8,9 million t/y - a domestic gas plant**
- **Bechtel awarded Van Leeuwen the piping bulk package of USD 100 million**
- **Fabricated by Kencana, STP&I Thailand and Clough Thailand**

Van Leeuwen Worldwide

VAN LEEUWEN

Zwijndrecht, The Netherlands

Shirley Hill, United Kingdom

Brisbane, Australia

Oberlaatse, Belgium

Chonburi, Thailand

Sydney, Australia

Singapore

Deventer, The Netherlands

Abu Dhabi, United Arab Emirates

Meyzieu, France

Boxtel, The Netherlands

Shanghai, China

Van Leeuwen Thailand Team

VAN LEEUWEN

Thank you very much for your attention.

VLT Contact Point

VAN LEEUWEN

For more information please contact us at

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Tel.: +66 2 248 0994 ext 501
Fax: +66 2 642 5087 - 88

Warehouse Chonburi

341 Moo 6, Highway No. 331
Km 91, Bo-Win, Sriracha
Chonburi 20230, Thailand

LRQA
Business Assurance

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
3330 AB Zwijndrecht
The Netherlands

has been approved by Lloyd's Register Quality Assurance
to the following Quality Management System Standard:

ISO 9001 : 2008

The Quality Management System is applicable to:

Sales, procurement, stockholding and distribution of carbon steel, alloy and stainless steel, alloy and stainless steel pipes and tubes, hollow sections, valves, fittings, flanges, bars, structural steel, related products and services including cutting, re-stamping as per PED 97/23/EC and material finishing.

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Approval Certificate No:
RQA653313

Original Approval	:	20 November 1998
Current Certificate	:	1 December 2012
Certificate Expiry	:	30 November 2015

Issued by: Lloyd's Register Nederland B.V. for and on behalf of
Lloyd's Register Quality Assurance Limited

UKAS MANAGEMENT SYSTEMS
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LRQA
Business Assurance

CERTIFICATE SCHEDULE

Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
3330 AB Zwijndrecht
The Netherlands

Head Office:

Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
3330 AB Zwijndrecht
The Netherlands

Activities:

Sales, procurement, stockholding and distribution of carbon steel, alloy and stainless steel, alloy and stainless steel pipes and tubes, hollow sections, valves, fittings, flanges, bars, structural steel, related products and services including cutting, re-stamping as per PED 97/23/EC and material finishing.

Locations:

Van Leeuwen Pipe & Tubes Australia
Dandanong South VIC 3175,
1/82 Greens Rd
Australia

Van Leeuwen Pipe & Tube Australia Pty Ltd
93-113 Lee Holm Road
St. Marys, NSW 2760
Australia

Van Leeuwen Pipe & Tubes Australia
Redbank Industrial Estate 16
General Macarthur Pl
Redbank – Brisbane
QLD 4301
Australia

Approval Certificate No: RQA 653313	Original Approval	:	20 November 1998
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LRQA
Business Assurance

CERTIFICATE SCHEDULE

Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
3330 AB Zwijndrecht
The Netherlands

Locations:

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Wingfield SA 5013
Port Adelaide
Australia

Van Leeuwen Pipe & Tubes Australia Pty Ltd
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WA 6155 Perth - Canning Vale
Australia

Van Leeuwen België N.V.
Schaarbeeklei 189
1800 Vilvoorde
Belgium

Van Leeuwen Pipe & Tube s.r.o.
areál MSV Metal Studenka
ul. R. Tomáška 859
742 13 Studenka
Czech Republic

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Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
3330 AB Zwijndrecht
The Netherlands

Locations:

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Czech Republic

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76600 Le Havre
France

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France

Van Leeuwen Tubes SAS
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59200 Kuala Lumpur
Malaysia

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Business Assurance

CERTIFICATE SCHEDULE

Van Leeuwen Pipe and Tube Group B.V.
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Locations:

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Van Leeuwen Precisie B.V.
Hamburgweg 6
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The Netherlands

Van Leeuwen Stainless B.V.
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The Netherlands

Van Leeuwen KSA
Van Leeuwen UBSCO
Middle East Commercial Complex
1st Floor, Office 4, P.O.Box 79420 Al-Khobar 31952
Saudi Arabia

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Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
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Locations:

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627893 Singapore
Singapore

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12A Floor, 487/1 Si Ayutthaya Road, Khwaeng
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Khet Ratchathwi, 10400 Bangkok
Thailand

Van Leeuwen Pipe and Tube (Thailand) Ltd
Chonburi Industrial Estate (Bo-Win),
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District Bo-Win Amphur Sri Racha
Chonburi Province
Thailand

Van Leeuwen Pipe & Tube (Middle East) LLC
Al Ghaith Tower, Suite 1203,
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Abu Dhabi
United Arab Emirates

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Business Assurance

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Van Leeuwen Pipe and Tube Group B.V.
Lindtsedijk 120
3330 AB Zwijndrecht
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Locations:

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Van Leeuwen Wheeler Ltd.
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Van Leeuwen Wheeler Ltd.
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United Kingdom

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UKAS MANAGEMENT SYSTEMS
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Van Leeuwen Pipe and tube (Thailand) Ltd. (Brand List)

Description	Brand	Origin	Reference
Pipe (Seamless) Carbon Steel/Alloy Steel	JFE	Japan	Catalog
	Nippon Steel / Sumitomo	Japan	Catalog
	Mittal Steel	International	Catalog
	VM /VALLOUREC	International	Catalog
	HUTABATORY	Europe	Catalog
	Salzgitter	Europe	Catalog
	TMK	Europe	Catalog
Pipe (Seamless) Stainless Steel			
	KOBE	Japan	Catalog
	POSCO	Korea	Catalog
	KUZE	Japan	Catalog
Pipe (Welded) Carbon/Stainless/Alloy	EEW	International	Catalog
	MIJU	Korea	Catalog
	Seah	Korea	Catalog
	Hyundai	Korea	Catalog
	Husteel	Korea	www.husteel.com
Fitting Carbon/Alloy/stainless)	Benkan	Thailand	Catalog
	TK bend	Korea	Catalog
	SK Bend	Korea	www.skbend.com
	ERNE	Austria	Catalog
	GAM/OMR	Italy	www.gam-group.it
	TCC BEND	Korea	Catalog
	DK BEND	Korea	Catalog
flange Carbon/Alloy/stainless)	ULMA	Spain	Catalog
	MELESI	Italy	Catalog
	Metafar	Italy	Catalog
	AJOO	Korea	Catalog
	DS KOREA	Korea	Catalog
Forge fitting Carbon/Alloy/stainless)	Penn Machine	USA	Catalog
	Viar	Italy	Catalog
	MEGA	Italy	Catalog
	IML	Italy	Catalog
	AJOO	Korea	Catalog
	Ulma	Spain	Catalog

DK