

The background of the entire page is a dark blue grid with faint, light-colored technical drawings. In the top right corner, there is a circular technical drawing with various lines and symbols. In the bottom left corner, there is a large technical drawing of a gear or a similar mechanical part, showing its profile and internal structure. The main title 'PEXGOL' is centered in the upper half of the page.

# PEXGOL

## Engineering Guide



**Golan Plastic Products**, manufacturer and distributor of PEXGOL, is a world leader in providing comprehensive solutions for the transportation of every type of hot, corrosive or abrasive liquid materials of every kind. Golan Plastic Products is the only worldwide manufacturer that specializes in large diameter, cross-linked polyethylene pipe systems, providing industrial and mining sectors throughout the world with the most cost-effective, long term solutions available.

Established in 1964, GPP today is a global company listed on the Tel-Aviv stock exchange. Our global reputation and reliable brand name is based on accredited international standards in more than 40 nations, along with a decades-long proven track record with established clients in dozens of countries around the world.

For more information about our company, products and projects, please visit our website: [www.pexgol.com](http://www.pexgol.com)

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## INTRODUCTION

PEXGOL pipes are produced by Golan Plastic Products, an industrial enterprise owned by Kibbutz Shaar Hagolan. Golan Plastic Products was established in 1964 as an extrusion plant and today it is one of the biggest plastic products producers for the building sector in Israel.

In 1975 Golan Plastic Products began manufacturing hot water pipes made of crosslinked polyethylene using the peroxide high pressure process. These pipes, sold under the name of PEXGOL, are now well-known for their quality and reliability in Israel and in the international market.

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Whereas the products shown in this catalogue illustrate and describe the current state of their development, Golan reserves the right at all times to make such technical alterations as it shall see fit to its products. Although every care has been taken in the preparation of the information, specifications and other data included in this catalog, we cannot rule out inadvertent errors or omissions.

Purchasers should take into account possible deviations or variations which will not substantially diminish the functionality or performance of the products and in many cases, are designed to improve the same.

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Table No 1.1: **Properties**

Test	Standard	Required	Nominal	Frequency
Resin				
MFR	ASTM D1238 ISO 1133	1.7 – 2.3	1.9	Every batch
Density	ASTM D1505 ISO 1183	926 Kg/m <sup>3</sup>	55 Kg/m <sup>3</sup>	Every batch
Water content	ASTM D6869 ISO 15512	<0.1%	<0.1%	Every batch
Master Batch				
Melt Flow Rate (MFR)	ASTM D1238	1.0 – 3.0	1.61	Every batch
Carbon Black Content CBC	ASTM D4218	2.0 – 2.6	2.4	Every batch
Pipe				
Density	DIN 53455	938 kg/m <sup>3</sup>	938 kg/m <sup>3</sup>	
Cross linking degree	ISO 10147	70%	80%	At least twice a batch
Elongation at break	ISO 6259-1, ISO 6259-3	350%	>400%	Every batch
Tensile strength (at 20°C)	DIN 53455	19 N/mm <sup>2</sup>	>19 N/mm <sup>2</sup>	At least twice yearly
% Carbon black	ISO 6964	-	Special Formulation	
Resistance to weathering	ISO 14531-1, Annex C	a) Thermal stability b) 95°C hydrostatic strength c) Elongation at break	Comply	Type test
Longitudinal reversion	ISO 2505	<3%	<2.5%	Every Batch
Stabilizers migration	NCh2086	At least 50% of a virgin sample	>50%	Annually
Oxidative Induction Time (OIT)	EN 728 ISO TR 10837	>20 minutes at 200°C	>40 minutes at 200°C	Every batch
Oven aging 160°	ATEC	After 100 hours, at least 50% elongation compare to virgin material	After 100 hours, 90% elongation compare to virgin material	Twice weekly
Thermal stability at 110°C	AS2492 DIN 16892	8760 h	>10,000	Once per year
Pent test	ASTM F876	100 h	>100 h	Once per year
Squeeze off	ISO 14531	1000 h (Pre cooling at - 50°C)	>1000 h	Type test
RCP	ISO 14531	lc/dn ≤ 4,7; at -50°C	lc/dn =0.2 at -50°C	Type test
Impact strength (at 20°C)	DIN 53453	No failure	No failure	Type test
Moisture absorption (at 20°C)		0.01 mg/4d	< 0.01 mg/4d	Type test
Oxygen permeability (at 80°C) for pipe with oxygen barrier	DIN 4726	< 0.1 gm/m <sup>3</sup> x day	0.02	Annually

Table No 1.2: **Thermal Properties**

	Value	Unit	Tested for standard
Service temperature range	-80+120	°C	
Coefficient of linear expansion (at 20°C)	1.4x10 <sup>-4</sup>	$\frac{m}{m \cdot ^\circ C}$	DIN53752
Coefficient of linear expansion (at 100°C)	2.05x10 <sup>-4</sup>	$\frac{m}{m \cdot ^\circ C}$	
Softening temperature	+133	°C	
Specific heat	2.3	$\frac{kJ}{kg \cdot ^\circ C}$	DIN53765
Coefficient of thermal conductivity	0.35	$\frac{W}{m \cdot ^\circ C}$	DIN 4725

Table No 1.3: **Electronic Properties**

	Value	Unit	Tested for standard
Specific internal resistance (at 20°C)	10 <sup>15</sup>	Ω.m	
Dielectric constant (at 20°C)	2.3	-	
Dielectric loss factor (at 20°C/50Hz)	1x10 <sup>-3</sup>	-	DIN53483
Rupture voltage (at 20°C)	60-90	kV/mm	

### International approvals

To view the certificates please see our website:  
[www.pexgol.com/about-us/international-certificates](http://www.pexgol.com/about-us/international-certificates)

	Deutscher Verein des Gas-und Wasserfaches e.V (incl. drinking water approval)		International certification network
	Israeli Standard Institute Standard Mark Approval		International ISO 9001 Approval
	Poland Standard Institute Approval		Süddeutsches Kunststoff-Zentrum Amtlich anerkannte Prüfanstalt für Kunststoffe GERMANY
	Center SEPRO Heating System Ukraine Standard Institute Approval		Russian Standard Institute Approval
	Australian Standard Institute (incl. Gas & drinking water approval)		NSF INTERNATIONAL America Standard Food Approval Drinking Water
			South Africa Standard Institute Approvals

**PEXGOL pipes are produced according to the DIN Standards 16892/16893 and the Israeli standard 1519 Part 1. These Standards show the working pressures of PEXGOL pipes at various temperatures.**

The working pressures for PEXGOL pipe are determined by the following equation:

$$P = \frac{2\sigma t}{D-t} \quad \text{or} \quad P = \frac{2\sigma t}{\text{SDR}-1} \quad \text{or} \quad \frac{\sigma}{s}$$

P = Maximum working pressure (kg/cm<sup>2</sup>)

σ = Long term strength at the design temperature (kg/cm<sup>2</sup>)

D = Outside diameter (mm)

t = Wall thickness (mm)

S = ISO 4065 series

$$\text{SDR (Standard Dimensions Ratio)} = \frac{D}{t} = 2s + 1$$



Pressure testing:  
All pipes undergo strict quality pressure testing

**Table No 3.1: The values of σ change with the temperature as follows:**

Temp. (°C)	σ (kg/cm <sup>2</sup> )
10	85
20	76
30	66.5
40	59
50	52.5
60	48
70	42.5
80	37.5
90	33.5
95	32
110	18.75

Notes:

The design stress σ is calculated with a safety factor of 1.25. The stress values and the working pressures in the following table were calculated according to DIN 16893-2000. These values are relevant for water.

#### Allowable working pressures

The working temperatures in Table 4&5 are the fluid temperature.

In case of chemicals and corrosive agents, the working pressures might have to be derated according to the data in the chemical resistance tables.

*Please consult us!*

**Table No 3.2: Allowable working pressures (bar) for conveying water in PEXGOL pipes, with a safety factor C = 1,25**  
(see full table - in supplements, page 91)

Temperature in °C	Years of service	Class 10	Class 12	Class 15	Class 19	Class 24	Class 30
		Pipe series (S)					
		7.6	6.3	5	4	3.2	2.5
		Standard dimension ratio (SDR)					
		16.2	13.6	11	9	7.4	6
10	100	11.20	13.50	17.00	21.40	26.90	33.89
20	100	9.90	11.90	15.00	18.90	23.80	29.99
30	100	8.80	10.60	13.30	16.80	21.10	26.59
40	100	7.80	9.40	11.80	14.90	18.70	23.56
50	100	7.00	8.30	10.50	13.20	16.70	21.04
60	50	6.30	7.50	9.50	11.90	15.00	18.90
70	50	5.60	6.70	8.50	10.70	13.40	16.88
80	50	5.10	6.10	7.50	9.50	12.00	15.12
90	50	4.50	5.40	6.80	8.60	10.90	13.73
95	50	4.10	4.90	6.40	8.10	10.30	12.98
110	50	2.40	2.90	3.80	4.70	5.90	7.43

**Table No 4.1: PEXGOL PIPE CLASS "10" (SDR 16.2 S7.6)**  
Working pressures: 10 bar at 20°C, 4 bar at 95°C, 6 bar for gas

Cat No	O.D. (mm)	Wall thickness (mm)	I.D. (mm)	Weight (kg/m)
PA-754.7 BLK	75	4.7	65.8	1.03
PA-905.6 BLK	90	5.6	78.8	1.47
PA-1106.8 BLK	110	6.8	96.4	2.18
PA-1257.7 BLK	125	7.7	109.6	2.81
PA-1408.7 BLK	140	8.7	122.6	3.55
PA-1609.9 BLK	160	9.9	140.2	4.62
PA-20012.4 BLK	200	12.4	175.2	7.23
PA-22513.9 BLK	225	13.9	197.2	9.12
PA-25015.5 BLK	250	15.5	219	11.30
PA-28017.3 BLK	280	17.3	245.4	14.12
PA-31519.5 BLK	315	19.5	276	17.91
PA-35521.9 BLK	355	21.9	311.2	22.67
PA-40024.7 BLK	400	24.7	350.6	28.81
PA-45027.8 BLK	450	27.8	394.4	36.48
PA-50030.9 BLK	500	30.9	438.2	45.05
PA-56034.6 BLK	560	34.6	490.8	53.6
PA-63038.9 BLK	630	38.9	552.2	71.50
PA-71043.8 BLK	710	43.8	622.4	90.75

All pipe dimensions, including pipes with larger wall thickness, can be supplied by special order.

**Table No 4.2: PEXGOL PIPE CLASS "12" (SDR 13.6 S6.3)**  
Working pressures: 12 bar at 20°C, 5 bar at 95°C, 7.5 bar for gas

Cat No	O.D. (mm)	Wall thickness (mm)	I.D. (mm)	Weight (kg/m)
PA-634.7 BLK	63	4.7	53.6	0.85
PA-755.6 BLK	75	5.6	63.8	1.21
PA-906.7 BLK	90	6.7	76.6	1.73
PA-1108.1 BLK	110	8.1	93.8	2.57
PA-1259.2 BLK	125	9.2	106.6	3.31
PA-14010.3 BLK	140	10.3	119.4	4.15
PA-16011.8 BLK	160	11.8	136.4	5.43
PA-20014.7 BLK	200	14.7	170.6	8.47
PA-22516.6 BLK	225	16.6	191.8	10.75
PA-25018.4 BLK	250	18.4	213.2	13.42
PA-28020.6 BLK	280	20.6	238.8	16.60
PA-31523.2 BLK	315	23.2	268.6	21.04
PA-35526.1 BLK	355	26.1	302.8	26.68
PA-40029.4 BLK	400	29.4	341.2	33.86
PA-45033.1 BLK	450	33.1	383.8	42.89
PA-50036.7 BLK	500	36.7	426.4	52.85
PA-56041.2 BLK	560	41.2	477.6	66.50
PA-63046.6 BLK	630	46.6	537.4	84.60
PA-71052.2 BLK	710	52.2	605.6	106.8

**Table No 4.3: PEXGOL PIPE CLASS "15" (SDR 11 S5)**  
Working pressures: 15 bar at 20°C, 6 bar at 95°C, 9 bar for gas

Cat No	O.D. (mm)	Wall thickness (mm)	I.D. (mm)	Weight (kg/m)
PA-162 BLK	16	2.0	13	0.09
PA-202 BLK	20	2.0	16.2	0.11
PA-252.3 BLK	25	2.3	20.4	0.16
PA-322.9 BLK	32	2.9	26.2	0.26
PA-403.7 BLK	40	3.7	32.6	0.42
PA-504.6 BLK	50	4.6	40.8	0.65
PA-635.8 BLK	63	5.8	51.4	1.03
PA-756.8 BLK	75	6.8	61.4	1.44
PA-908.2 BLK	90	8.2	73.6	2.09
PA-11010 BLK	110	10.0	90	3.11
PA-12511.4 BLK	125	11.4	102.2	4.03
PA-14012.7 BLK	140	12.7	114.6	5.02
PA-16014.6 BLK	160	14.6	130.8	6.60
PA-20018.1 BLK	200	18.1	163.8	10.23
PA-22520.4 BLK	225	20.4	184.2	12.97
PA-25022.7 BLK	250	22.7	204.6	16.05
PA-28025.4 BLK	280	25.4	229.2	20.10
PA-31528.6 BLK	315	28.6	257.8	25.46
PA-35532.2 BLK	355	32.2	290.6	32.30
PA-40036.3 BLK	400	36.3	327.4	41.5
PA-45050 BLK	450	40.9	368.2	52
PA-50045.4 BLK	500	45.4	409.2	65.00
PA-56050.9 BLK	560	50.9	458.4	82.00
PA-63057.3 BLK	630	57.3	515.6	103.00
PA-71064.5 BLK	710	64.5	581	129.50

All pipe dimensions, including pipes with thicker wall measurements, can be supplied by special order.

**Table No 4.4: PEXGOL PIPE CLASS "19" (SDR 9 S4)**

Working pressures: 19 bar at 20°C, 9.5 bar at 95°C, 11.5 bar for gas

Cat No	.O.D (mm)	Wall thickness (mm)	I.D. (mm)	Weight (kg/m)
PA-637.1 BLK	63	7.1	48.8	1.25
PA-758.4 BLK	75	8.4	58.2	1.75
PA-9010.1 BLK	90	10.1	69.8	2.50
PA-11012.3 BLK	110	12.3	85.4	3.75
PA-12514.1 BLK	125	14.1	97	4.90
PA-14015.7 BLK	140	15.7	108.6	6.10
PA-16017.9 BLK	160	17.9	124.2	7.90
PA-20022.4 BLK	200	22.4	155.2	12.40
PA-22525.0 BLK	225	25.0	175	15.55
PA-25027.9 BLK	250	27.9	194.2	19.30
PA-28031.3BLK	280	31.3	217.4	24.20
PA-31535.2 BLK	315	35.2	244.6	30.65
PA-35539.7 BLK	355	39.7	275.6	39.00
PA-40044.7 BLK	400	44.7	310.6	49.40
PA-45050.3 BLK	450	50.3	349.4	62.50
PA-50055.8 BLK	500	55.8	388.4	77.00
PA-56062.5 BLK	560	62.5	435	96.70
PA-63070.0 BLK	630	70.0	489.4	122.00
PA-71078.9 BLK	710	78.9	552.2	154.9

**Table No 4.6: PEXGOL PIPE CLASS "30" (SDR 6 S2.5)**

Working pressures: 30 bar at 20°C, 12.5bar at 95°C, 19 bar for gas

Cat No	O.D. (mm)	Wall thickness (mm)	I.D. (mm)	Weight (kg/m)
PA-6310.5BLK	63	10.5	42	1.7
PA-7512.5 BLK	75	12.5	50	2.4
PA-9015 BLK	90	15	60	3.5
PA-11018.3 BLK	110	18.3	73	5.2
PA-12520.8 BLK	125	20.8	83.4	6.8
PA-14023.3 BLK	140	23.3	93	8.5
PA-16026.6BLK	160	26.6	106.8	11
PA-18029.9 BLK	180	29.9	120	14
PA-20033.2 BLK	200	33.2	133.5	17.2
PA-22537.4 BLK	225	37.4	150	22
PA-25041.5 BLK	250	41.5	167	27
PA-28046.5 BLK	280	46.5	187	34
PA-31552.3 BLK	315	52.3	210	43
PA-35559 BLK	355	59	237	55
PA-40066.7 BLK	400	66.7	266.5	70
PA-45075 BLK	450	75	300	89
PA-50083.4 BLK	500	83.5	333	108.5
PA-56093.4BLK	560	93.5	373	135.5
PA-630105 BLK	630	105	420	171.5
PA-710118.3 BLK	710	118.3	473	217.7

**Table No 4.5: PEXGOL PIPE CLASS "24" (SDR 7.4 S3.2)**

Working pressures: 24 bar at 20°C, 10 bar at 95°C, 15 bar for gas

Cat No	O.D. (mm)	Wall thickness (mm)	I.D. (mm)	Weight (kg/m)
PA-122 N	12	2.0	8	0.06
PA-162.2 BLK	16	2.2	11.6	0.09
PA-202.8 BLK	20	2.8	14.4	0.15
PA-253.5 BLK	25	3.5	18	0.23
PA-324.4 BLK	32	4.4	23.2	0.38
PA-405.5 BLK	40	5.5	29	0.59
PA-506.9 BLK	50	6.9	38.2	0.92
PA-638.6 BLK	63	8.6	45.8	1.45
PA-7510.3 BLK	75	10.3	54.4	2.07
PA-9012.3 BLK	90	12.3	65.4	2.97
PA-11015.1 BLK	110	15.1	79.8	4.45
PA-12517.1 BLK	125	17.1	90.8	5.73
PA-14019.2 BLK	140	19.2	101.6	7.21
PA-16021.9 BLK	160	21.9	116.2	9.40
PA-20027.4 BLK	200	27.3	145.2	14.65
PA-22530.7 BLK	225	30.8	163.4	18.59
PA-25034.2BLK	250	34.2	181.6	23.00
PA-28038.3 BLK	280	38.3	203.4	29.00
PA-31543.1 BLK	315	43.1	228.8	37.00
PA-35548.5 BLK	355	48.5	258	47.00
PA-40054.7 BLK	400	54.7	290.6	59.00
PA-45061.5 BLK	450	61.5	327	75.00
PA-50068.5 BLK	500	68.5	363	93.00
PA-56076.7 BLK	560	76.7	406.5	117.00
PA-63086.3 BLK	630	86.3	457	148.00
PA-71097.3 BLK	710	97.3	515	185.4

All pipe dimensions, including pipes with thicker wall measurements, can be supplied by special order.



## Transportation of PEXGOL pipes

An outstanding feature of the PEXGOL pipe is flexibility, which enables the pipe to return to its original diameter after transportation on relatively small drums or in coils. As a result, we are able to supply longer lengths of pipe, compared to other types.

### Coils

From diameter 25 mm to 160 mm, PEXGOL pipes are available in standard coils of 50m or 100 meters.

Longer pipe lengths are available in coils according to customer's specifications.

### Straight sections

PEXGOL pipes in larger diameters up to 630 mm with plain ends can be ordered in a maximum length of 11.8m (to fit into standard 40ft containers).

### Pipes with Flared Ends

Pipes with a diameter of up to 160 mm with one or two flared ends are available in coils in lengths according to the table. PEXGOL pipes in larger diameters up to 630 mm with or without flared ends can be ordered in a maximum length of 11.8m (to fit into standard 40ft containers).

**See coiling options and drums&straight sections tables in Supplements.**

## Comparison with other plastic pipes

PEXGOL pipes are produced from a special type of polyethylene. This is a high density polyethylene (HDPE) with a very high molecular weight. During production the raw material is extruded under high pressures and temperatures in the presence of a special catalyst. While the pipes are being extruded the material crosslinks, resulting in an unbreakable (chemical) cross-connection between the adjacent long molecules of the polyethylene. As a result of the crosslinking, a 3-dimensional network is formed and the pipe is considered as one enormous molecule.

The combination of a special raw material of very high molecular weight and the crosslinking process result in a special pipe having several important qualities:

- Corrosion resistance
- Excellent mechanical resistance
- Unique chemical resistance
- Very low friction coefficient-  
 $C=155$  in Hazen-Williams Formula
- Excellent abrasion resistance
- Very good resistance to heat
- Excellent longevity
- No longitudinal crack formation or other stress cracks
- Low creep
- No stone sediments due to pipe smoothness

**These properties provide important advantages compared to normal pipes which are not crosslinked:**

1. High working pressures.
2. High working temperature - up to 110°C and above.
3. Excellent durability in harsh corrosive conditions:
  - Industrial pipelines
  - Slurry lines
  - Tailing lines
  - Dewatering lines
  - Corrosive ground
4. Immunity against improper pipe laying procedures
5. Low head losses enabling considerable savings in cost

Regular polyethylene pipes are limited to a working temperature of up to 40°C according to ISO Standard 4427. They are also very sensitive to scratches resulting from careless handling during transportation and laying of the pipes. In non-crosslinked pipes (such as PE, PP or PB), cracks may appear after a few years.

These stress cracks occur as a result of the internal pressure or external stresses such as pipe bending or stone impregnations as a result of poor sand bedding. This phenomenon is also known as slow crack growth (SCG). The sensitivity to stress cracking is a material property, common for non-crosslinked pipe materials. SCG does not appear in crosslinked PE pipes due to the 3-dimensional crosslinked structure of PEXGOL pipes, which totally blocks the growth of these cracks. The excellent resistance of PEXGOL pipes to SCG makes it an ideal choice for industrial piping, gas transportation, chemical and regular sewage transportation. Because of this high-level resistance, it is possible to lay PEXGOL pipes in trenches without sand bedding!

## Industrial applications

The PEXGOL pipes with their excellent abrasion resistance to chemical and abrasions are ideal conduit for a wide range of industrial applications where conventional pipes would be unsatisfactory due to the abrasiveness of conveying slurries or because of vulnerability to chemical damage by solutions and acids - PEXGOL pipes present a successful and cost-effective solution.

The industrial applications of PEXGOL pipes include transporting:

- Slurries (gypsum; sand; salt; phosphates; silts; potash, and more.
- Various chemicals.
- Industrial wastes.

A list of projects is available from our sales department or on our website [www.pexgol.com](http://www.pexgol.com)

## PEXGOL pipe & fittings for process pipeline

### 1. Pipe class Selection according to:

- 1.1 Design temperature.
- 1.2 Working pressures –according to the required flow rates and specific gravity of the fluid
- 1.3 basic safety factor(design coefficient):
  - 1.25 for water and fluids with the classification A in the chemical resistance list
  - for materials with classification B,C,D in the chemical resistance list please consult us
  - 1.5 for Air supply lines

### 2. Design temperature definition rules:

- 2.1 Buried pipes: according to the temperature of the liquid flowing through the pipe.
- 2.2 Exposed pipes: Design temperature should be calculated by adding 20°C to the maximum ambient temperature (e.g. a design temperature of 60°C for max. ambient temperature of 40°C).
- 2.3 Alternatively according to the temperature of the liquid flowing through the pipe (if it is higher than 60°C).

### 3. Pipes under vacuum conditions:

Minimum pipe class: class 15.

### 4. Selection of fittings for PEXGOL Pipes

- 4.1 Only fittings approved by PEXGOL pipes Service Dept. may be used.
- 4.2 The installation instructions published by PEXGOL pipes Service Dept. state service limitations (if existing) for each type of fitting.
- 4.3 Special fixpoint clamps should be used as before and after the fittings.
- 4.4 For questions, please contact PEXGOL Pipes Service Department.

### 5. PEXGOL Pipes with flared ends

- 5.1 PEXGOL pipes up to 160 mm, in lengths according to the table "PEXGOL pipes in coils", can be ordered with lared end and metal flanges.
- 5.2 Larger diameter PEXGOL pipes (up to 630 mm) can be ordered in any length up to 11.5 meters (to fit into 40 ft containers) with one or two flared ends.
- 5.3 Flared ends can connect two PEXGOL pipes or a PEXGOL pipe to a fitting.
- 5.4 There is no need for an additional gasket.
- 5.5 The flanges are supplied according to the industrial standard ASA 150. Other flanges are available on special orders.
- 5.6 A flared end connection is used throughout the range of allowable working temperatures and pressures.
- 5.7 Prefabricated PEXGOL elbows with flared ends are also available.
- 5.8 Special fixpoint clamps should be used before and after the flared ends.

### 6. Pre-fabricated PEXGOL Elbows

- 6.1 Order prefabricated elbows with diameters up to 630 mm of 630 mm.
- 6.2 The standard bending radius is approximately  $R = 3D$  OR  $R=1.5D$  for 45° or 90° elbows.
- 6.3 Order elbows with plain ends, for either flanged couplings or electrofusion fittings.
- 6.4 Order elbows with flared ends.
- 6.5 A flared end connection can be used throughout the range of allowable working temperatures and pressures.
- 6.6 Special fixpoint clamps should be used before and after the flared ends.

### 7. PEXGOL Spigot Reducers

- 7.1 PEXGOL Spigot reducers of all sizes can be ordered on request (see the product page for more details).
- 7.2 The Spigot reducers are supplied with flared ends with or without flanges.
- 7.3 Special Fixpoint clamps should be used before and after the flared ends.

### 8. PEXGOL spacers

- 8.1 PEXGOL spacers of all sizes can be ordered upon request (see the product page for more details).
- 8.2 The spacers are supplied with flared ends with or without flanges.
- 8.3 Special Fixpoint clamps should be used before and after the flared ends.

### 9. PEXGOL instrument tees

- 9.1 PEXGOL instrument tees of all sizes can be ordered upon request (see the product page for more details).
- 9.2 The Inlet is made of metal (stainless steel or other corrosive resistant metal can be specified).

### 10. PEX lined steel fittings

- 10.1 PEX lined steel fittings offer a complementary solution in the following cases:
  - 10.1.1 There is a need for a fitting which is not available as an all-PEXGOL fitting.
  - 10.1.2 The all-PEXGOL fitting is too long.
  - 10.1.3 A special shape ia required.
- 10.2 The PEX lined steel fittings are supplied practically in any size and shape (see the product page for more details).
- 10.3 All the PEX-lined steel fittings can be connected to the flared ends of the PEXGOL pipes without an additional gasket.
- 10.4 All the PEX-lined steel fittings should be fully supported when installed on pipe bridges.

### 11 .Pex2Pex electrofusion couplers

- 11.1 Pex2Pex electrofusion couplers can be used for the same pressure rating as PEXGOL pipes SDR 11.

### 12. Special high temperature electrofusion couplers

- 12.1 Special high temperature electrofusion couplers of all sizes can be specified on request.

## 13. G.P Flanged Couplings

- 13.1 Available from 63 mm (with 2" flange) to 500 mm (with 20" flange).
- 13.2 All couplings comply with ASA 150 flange standard.
- 13.3 Flanged couplings may be used throughout all the range of allowable working temperatures and pressures for PEXGOL Pipes.
- 13.4 Special fixpoint clamps should be used before and after the fittings.

## 14. Stainless Steel Saddles

- 14.1 Available for PEXGOL Pipes from 110 mm up to 500 mm.
- 14.2 Flanged or threaded outlets (internal thread).
- 14.3 Maximum outlet diameter - up to half of the pipe's outside diameter.
- 14.4 In case of corrosive liquids for which stainless steel is not resistant, the saddles may be ordered with a special rubber coating over the flange and neck.
- 14.5 Stainless steel saddles may be used throughout all the range of allowable working temperatures and pressures for PEXGOL pipes.

## 15. Influence of Temperature changes on PEXGOL Pipes

- 15.1 PEXGOL Pipes placed above the ground or over bridges tend to get longer when temperature rises (snaking phenomenon) and will get shorter as the temperature goes down.
- 15.2 Fixpoints or guiding clamps may be used for restraining the elongation of the pipe (mainly due to aesthetic considerations).
- 15.3 There is no need to protect the pipe itself against thermal stresses, as they are absorbed by the pipe.
- 15.4 No need for installation of "expansion points" or omegas.
- 15.5 Special fixpoint clamps should be used before and after the fittings.

## 16. PEXGOL pipes above the ground

- 16.1 PEXGOL pipes can be placed directly on ground that is free from rocks or sharp stones.
- 16.2 There is no need for special bedding!

### Designing guide lines

For each application, we ask you to fill out the application questionnaire and return it to us, so that we can decide which pipe class to use and recommend the complete solution (PEXGOL pipes & fittings) for your application. We aim to establish direct contact between our technical support and the client's designers.

For each pipeline section, the designers should design the following items and in the following order:

#### 1. PEXGOL elbows - See our PEXGOL natural Bending Radius in PEXGOL pipes.

Wherever possible use our straight pipes with a "natural bend". PEXGOL pipes come in straight sections in maximum length of 11.8 meters. They can come with one or two flared ends and flanges. If you have to bend a pipe with a longer length, order two sections and make a longer pipe by connecting it with a reinforced electrofusion Coupler.

Always choose the length of the two sections so that the electrofusion coupler is not in the exact location of the bend (See enclosed drawings).

There are objects in the line which are not straight pipes or elbows (meaning – Steel Tees, Laterals, etc.) they will be supplied in the same shape as common steel fittings but with a Pex lining.

You can choose Standard items from our Catalog.

However, if you see later that you need to make a non-standard item with a slightly longer or shorter legs, you can do so and ask us for approval.

These items must always come with flanges at all ends.

The standard items come with fixed flanges. For each end you can choose if the flange will be a fixed flange or a loose flange.

#### 2. Expansion joints & Omegas loops:

You do not need such an item in a PEXGOL system. If they exist – cancel them!

#### 3. Where do we need a flange?

3.1 We need a flange if we have a valve in the line.

3.2 We need a flange if we have a flanged object (for example - Tees , Laterals etc. ) in the line.

#### 4. If you cannot use the straight pipe sections with the "natural bend", use our 3XD or 1.5x D elbows.

4.1. Please note that our 1.5x D elbows are significantly longer than the Regular 1.5x D elbows.

4.1.1 Therefore please use the dimensions in our table "Prefabricated Elbows"

4.2 The 3XD elbows should be preferred to the 1.5 XD (if you can accommodate them) since they reduce head losses and abrasion rate.

4.3 If you cannot "install" the 3XD elbows in 45° or 90° degrees, try to "install" the 1.5 XD PEXGOL elbows.

4.4 You can specify other non-standard angles in special order.

4.5 If you do not have enough space for PEXGOL elbows, you can specify PEX-lined steel elbows.

#### 5. In addition to straight pipe sections and elbows ,the following items may be supplied from a PEXGOL material: Concentric or Eccentric Reducers and Instrumentation Tees. However, they should be discussed in details regarding the length, etc.

5.1 Alternatively they may be supplied a steel-lined items.

#### 6. The influence of temperature changes on pipeline length:

6.1 The length of PEXGOL pipes can increase by 0.3% for a temperature increase of 20°C.

6.2 This means 3 mm for every 1 meter.

6.3 This means that if you want to install a straight PEXGOL pipe section between two steel flanges, you have to specify the length of the PEXGOL pipe section shorter by few mm than the length between two steel flanges (so that you can install it easily) and take advantage of the thermal expansion of the PEXGOL pipe.

#### 7. "Field welding":

7.1 Please also allow "Field welding" in order to compensate the deviation of the actual length of the pipe during the installation from the designed length. In most cases these "Field welds" will be done with Electrofusion Couplers so you do not have to provide other means.

7.2 If you are using only mechanical connectors, you should design some of them so that the final pipe length can be shortened on site.

#### 8. Fixpoints

8.1 Fixpoints should be designed before and after each fitting (for example - flared end connection as specified in our engineering guide.

8.2 The designers should make themselves well acquainted with our engineering guide.

## 9. Specifying the length of the PEXGOL straight sections and elbows as separate items :

- 9.1 This will be done after all the design has been completed and approved by the designers and by Golan.
- 9.2 It is a good practice to specify a longer section in order to allow for the measuring inaccuracies and other sources of mistakes.

Please note that you can use the field welds to compensate.

### **Lifetime calculations for Slurry pipeline**

PEXGOL is a very resistant material for abrasion. However, we usually do not have information regarding the expected annual abrasion rate YR (expressed in mm per year) and this value can be obtained usually by an appropriate testing facility who deals with slurry transportation.

#### **Please note:**

During the N years of service the stand-alone PEXGOL pipe is anticipated to lose up to 30% from the wall thickness due to abrasion .

The liner is anticipated to lose all the wall thickness.

## 1. The following information is needed for the calculation:

- 1.1 The expected annual abrasion rate YR
- 1.2 The critical velocity: The critical velocity VC has to be determined, usually also by an appropriate testing facility (probably the same one).
- 1.3 The required flow rate Q to be run through the pipe.
- 1.4 The designed lifetime N (expressed in years) of the pipeline.

## 2. Calculations

- 2.1 Calculate the pipe's ID according to the flow rate Q and the critical velocity VC. The pipe's ID is actually the Maximum allowable ID in the pipe after N years of service with the influence of abrasion.
- 2.2 Calculate IN-ID (the initial ID of the pipe) according to:  $IN-ID = ID - 2 \times N \times YR$
- 2.3 Calculate the inlet pressure in the line based on the ID
- 2.4 For a stand-alone PEXGOL pipe, calculate the OD of the pipe taking into account the relevant working temperature of the pipeline.
- 2.5 Calculate the upstream parts of the line which can be designed with the same ID and a smaller OD in order to make a cost effective design with a reduced working pressure.

Chart 9.1: Class 10 (SDR 16.2)

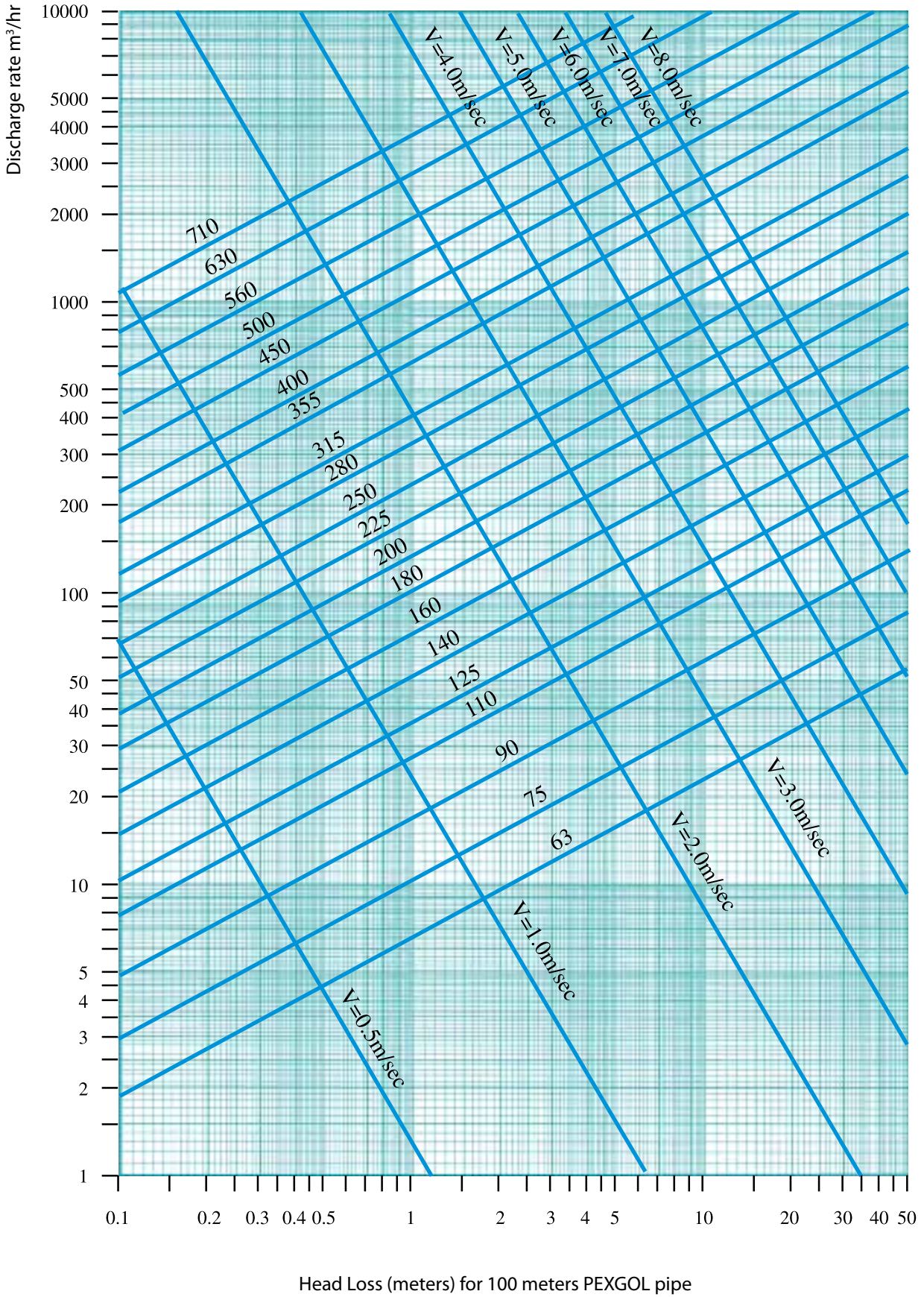


Chart 9.2: Class 12 (SDR 13.6)

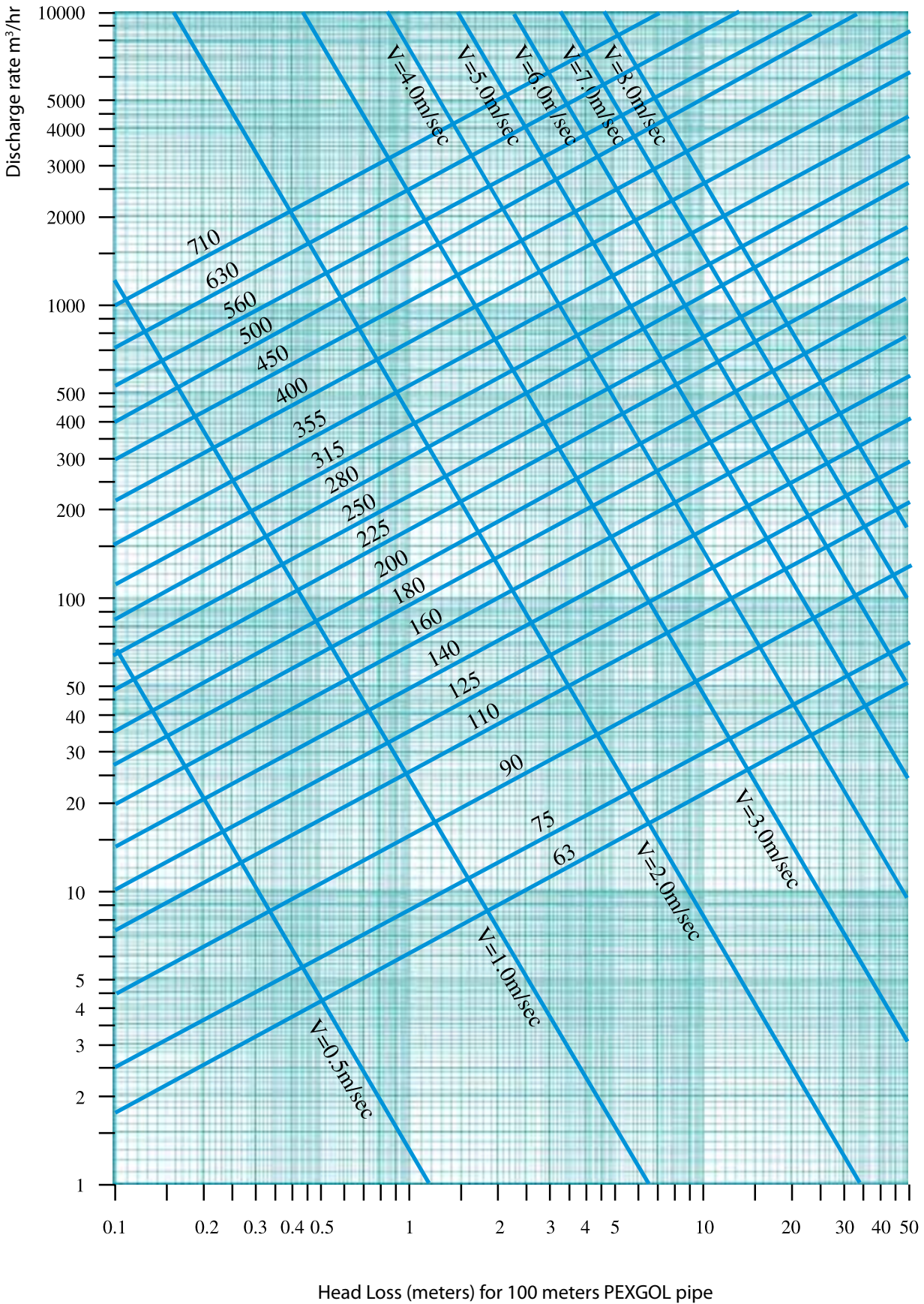


Chart 9.3: Class 15 (SDR 11)

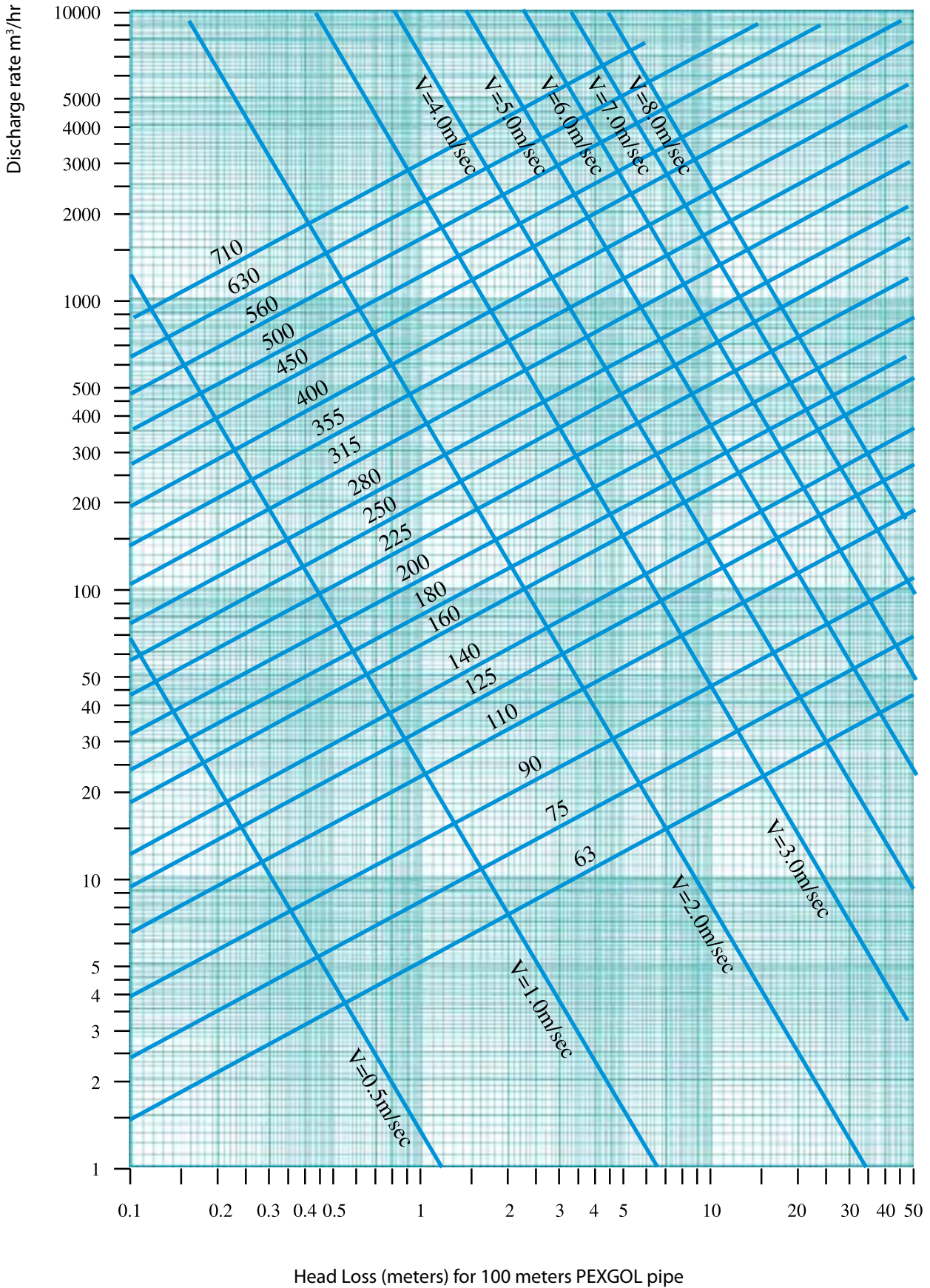




Chart 9.4: Class 19 (SDR 9)

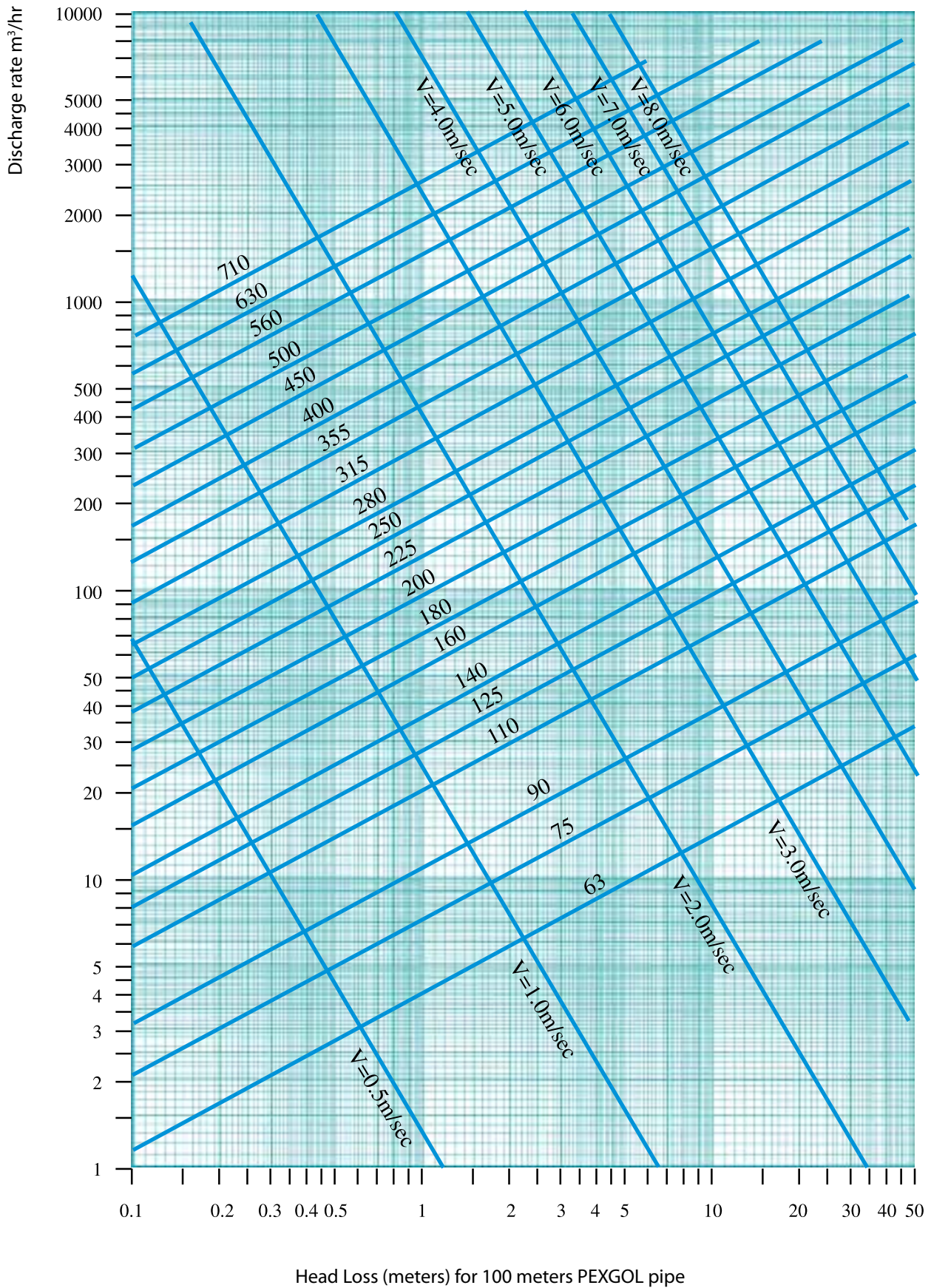
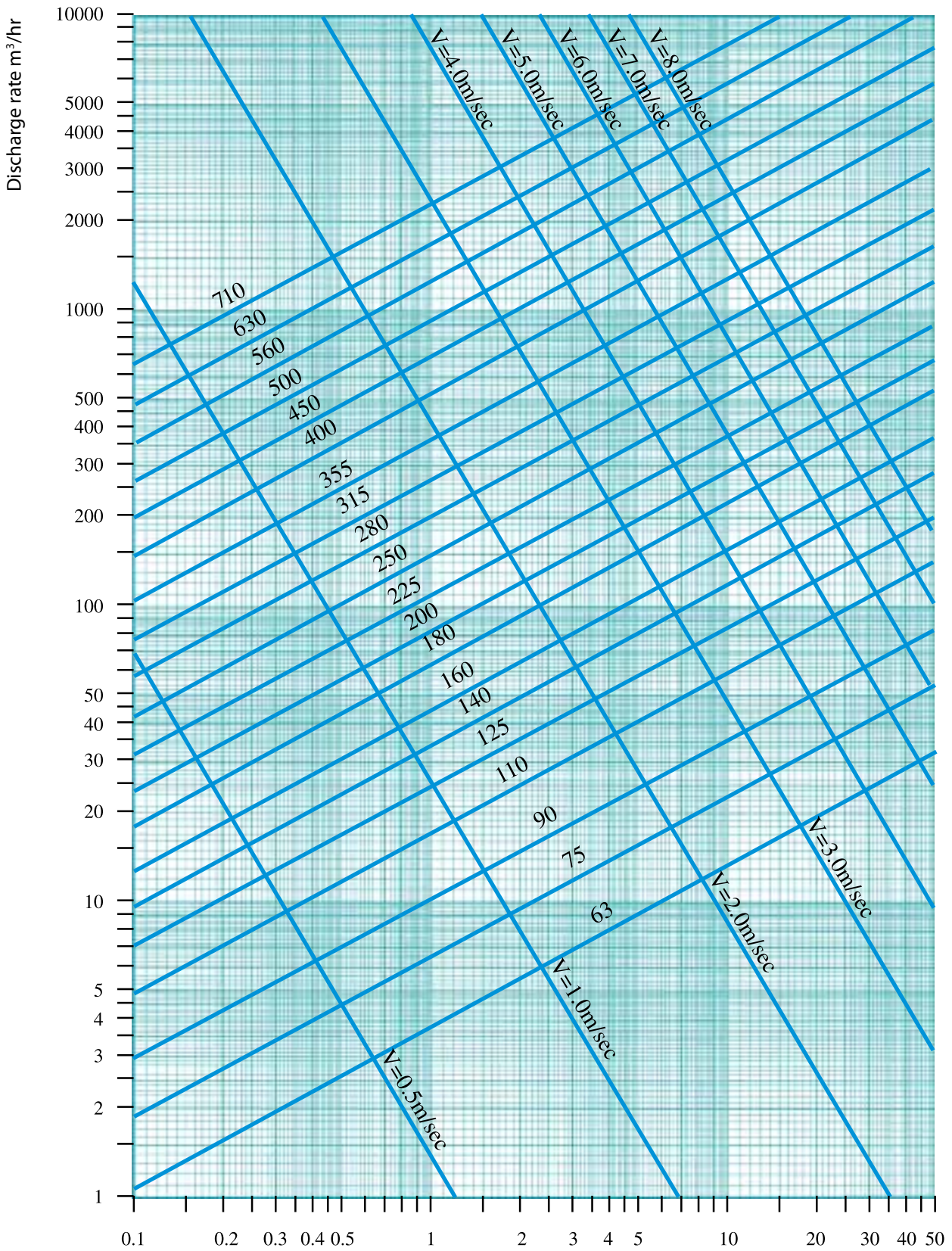


Chart 9.5: Class 24 (SDR 7.4)



Head Loss (meters) for 100 meters PEXGOL pipe

Chart 9.6: Class 24 (SDR 7.4) and Class 15 (SDR 11)

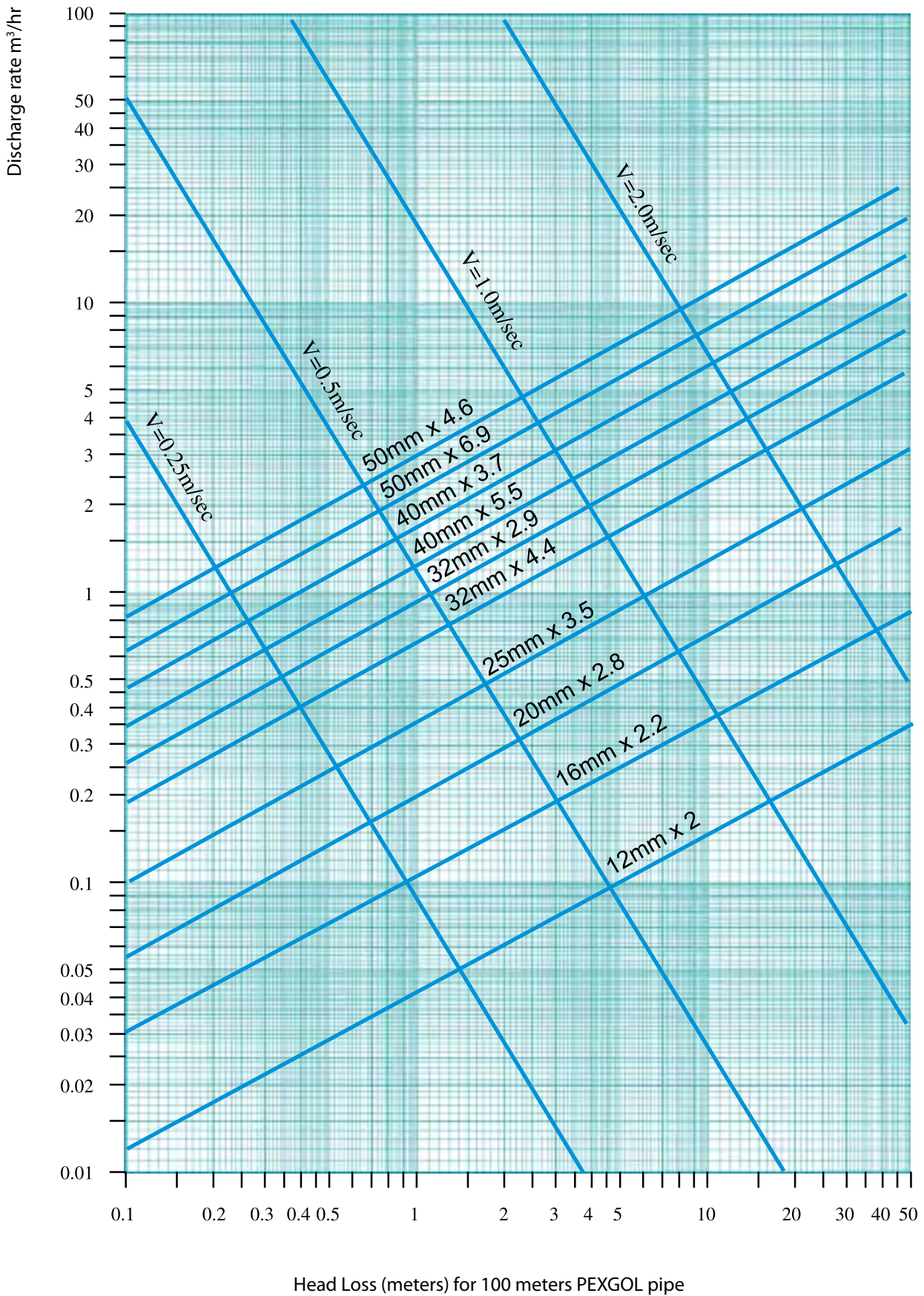
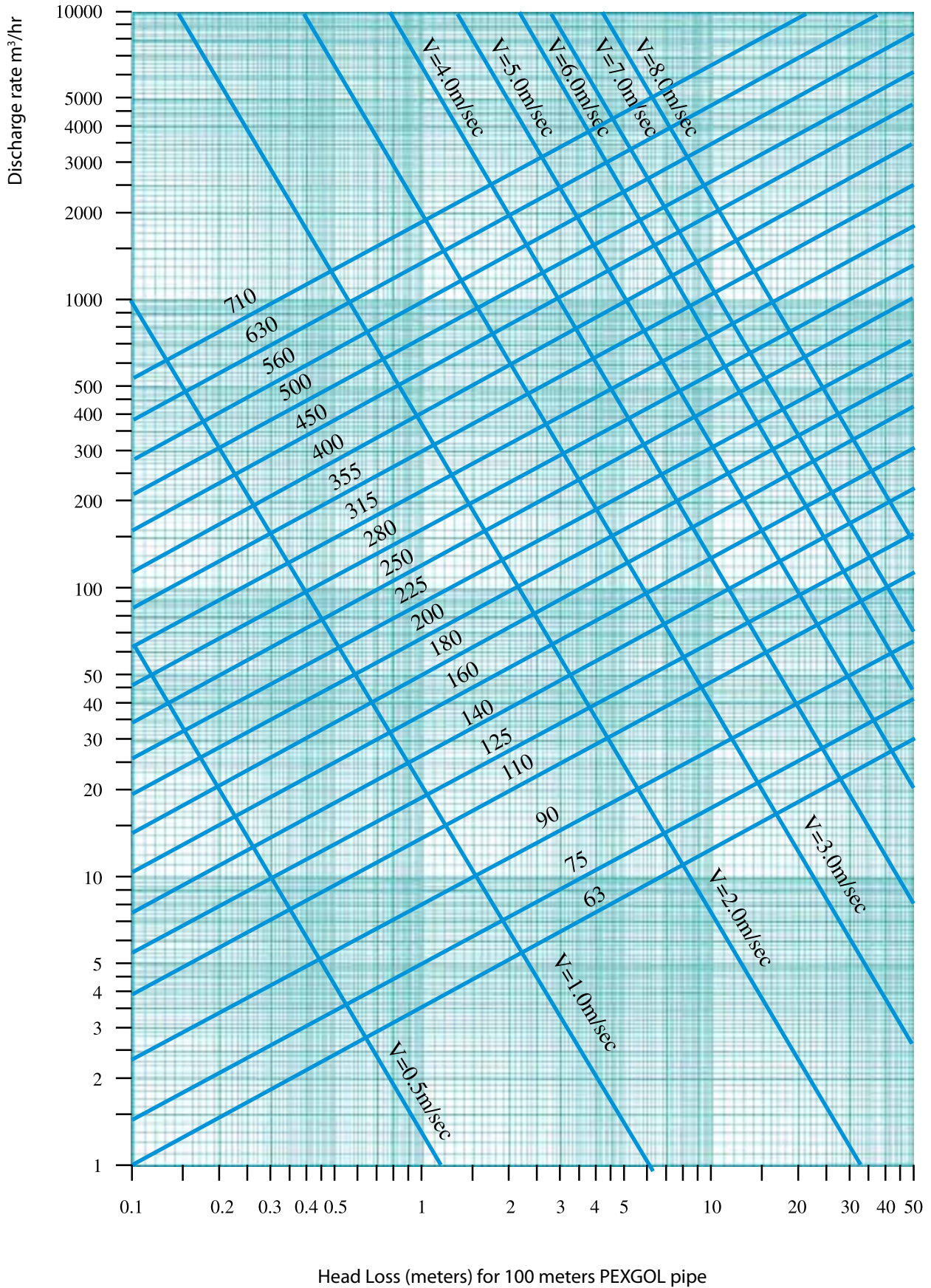


Chart 9.7: Class 30 (SDR 6)



## **The values of Hazen – Williams coefficient**

The values of the Head losses in the charts were calculated using the Hazen – Williams formula with Hazen – Williams coefficient  $C=155$

## **Reduction factors for higher temperatures**

The values of the Head losses in the charts are correct for 20 °C  
For different temperatures you can use the following reduction factors:

10°C - 1.03

20°C - 1.00

30°C - 0.98

40°C - 0.93

50°C - 0.91

60°C - 0.88

70°C - 0.85

80°C - 0.83

90°C - 0.81

## **Calculating PEXGOL pipes for Dewatering pipelines or Boreholes**

PEXGOL pipes can be used as Riser pipes for Dewatering pipelines or Boreholes .

For energy-saving reasons we recommend choosing a PEXGOL pipe with Head losses which does not exceed  $J=5\%$  and preferably lower.

However, please note that designing these pipes is not straightforward due to the complex three-dimensional stress regime in these applications.

Golan's Technical Department will calculate the pipes for you upon receiving the filled-up Borehole questionnaire (see supplement on page 78)

## Water hammer

Water hammer is a series of pressure pulsations, of varying magnitude, above and below the normal pressure of the liquid in the pipe. The amplitude and periodicity depends on the extinguished velocity of the liquid, as well as the size, length and material of the pipeline. Shock results from these pulsations when any liquid, flowing with a certain velocity, is stopped in a short period of time. The pressure increase, when flow is stopped, is independent of the working pressure of the system. The surge pressure, in any pipeline, occurs when the total discharge is stopped in a period of time, equal or less than the time required for the induced pressure wave to travel from the point of valve closure to the inlet end of the line and return. This time is:

$$t = \frac{2L}{a}$$

where:

t = Time for pressure wave to travel the length of the pipe and return (sec.)

L = Length of pipe line (m)

a = Velocity of pressure wave (m/sec)

When the liquid in the pipe is water, the velocity of the pressure wave "a" is determined by the following equation:

$$a = \frac{1440}{\sqrt{1 + 2.11 \times 10^8 \frac{D}{Ee}}}$$

where:

a = Velocity of pressure wave (m/sec.)

d = Inside diameter of pipe (m)

e = Thickness of pipe wall (m)

E = Modulus of elasticity of pipe material (kg/m<sup>2</sup>)

The surge pressure caused by water hammer is determined by the following equation:

$$p = \frac{1000 \times aV}{g}$$

Where:

p = Surge pressure (kg/m<sup>2</sup>)

a = Velocity of pressure wave (m/sec)

V = Velocity of water stopped (m/sec)

g = Acceleration caused by gravity (9.81 m/sec<sup>2</sup>)

Pressure caused by water hammer can be minimized by increasing closure times of valves to a value greater than 2L/a. For example, when the closure time is 10 times 2L/a, the pressure can surge to the range of 10%-20% of the surge caused by closure in a time equal to or less than 2L/a.

Because of the flexibility and resilience of PEXGOL pipes, the surge pressures caused by the water hammer are reduced. A PEXGOL pipe can withstand an occasional pressure (surge pressure + working pressure) up to 2.5 times the design pressure in the relevant temperature.

The value of E the modulus of elasticity of PEXGOL pipes is much lower than the value of E for steel pipes, concrete pipes or asbestos-cement pipes. Since the velocity of the pressure wave is related to -E, the velocity decreases as the value of E is lower.

The following examples show the pressure surges caused by the water hammer for various pipes. In all following examples, the velocity of water is 1.5 m/sec:

a) Steel pipe 6" dia. 4.76 mm wall thickness:

(E = 2.1 x 10<sup>10</sup> kg/m<sup>2</sup>)

$$a = \frac{1440}{\sqrt{1 + 2.11 \times 10^8 \times \frac{0.158}{2.1 \times 10^{10} \times 4.76 \times 10^{-3}}}} = 1416 \text{ m/sec}$$

$$P = \frac{1000 \times 1416 \times 1.5}{9.81} = 216513 \text{ kg/m}^2 = 21.65 \text{ kg/cm}^2$$

b) Asbestos Cement pipe 150 mm dia. class "24"

(E = 2.5 x 10<sup>9</sup> kg/m<sup>2</sup>)

$$a = \frac{1440}{\sqrt{1 + 2.11 \times 10^8 \times \frac{0.15}{2.5 \times 10^9 \times 15 \times 10^{-3}}}} = 1060 \text{ m/sec}$$

$$P = \frac{1000 \times 1060 \times 1.5}{9.81} = 16,2000 \text{ kg/m}^2 = 16.2 \text{ kg/cm}^2$$

c) PEXGOL pipe 160 mm dia. class "24"

(E = 0.9 x 10<sup>8</sup> kg/m<sup>2</sup> at 20°C)

$$a = \frac{1440}{\sqrt{1 + 2.11 \times 10^8 \times \frac{0.116}{0.9 \times 10^8 \times 21.9 \times 10^{-3}}}} = 393 \text{ m/sec}$$

$$P = \frac{1000 \times 393 \times 1.5}{9.81} = 60,090 \text{ kg/m}^2 = 6 \text{ kg/cm}^2$$

In this case, the maximum pressure caused by the water hammer in steel pipes is three times higher than the maximum pressure in PEXGOL pipes.

Table No. 10.1: **Surge pressures in PEXGOL pipes**

Pipe Class	SDR	a	Surge pressure p
10	16.2	246	3.7 bar
12	13.6	272	4.1 bar
15	11.0	306	4.6 bar
19	9.0	345	5.2 bar
24	7.4	389	5.8 bar
30	6.0	447	6.7 bar

V = 1.5 m/sec

## Vacuum / suction pipelines

Under-pressure (vacuum) can develop in the following cases:

1. When a pipe is installed in vacuum-feeding pipelines.
2. When a pipe is installed in a steep inclination, causing rapid free flow.
3. Extreme temperature changes of the transported liquid.

The amount of vacuum that a PEXGOL pipe can withstand depends on the pipe's SDR. A pipe with sufficient wall thickness must be selected in order to resist the collapsing forces generated by the vacuum.

Table 9 shows maximum rates of vacuum supported by PEXGOL pipes of different classes:

Maximum rates of vacuum values recommended for PEXGOL pipes laid above ground:

Table No. 11.1: **Service under full vacuum**

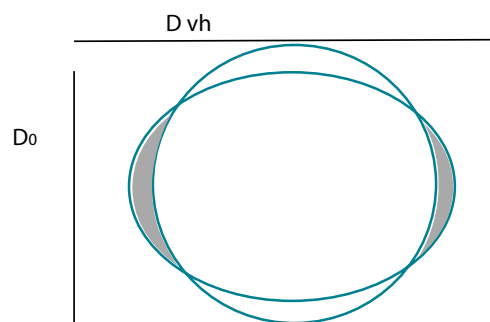
Service Duration				Temp.	Pipe Rating
Year 50	Year 1	Month 1	Day 1		
Tested for full vacuum conditions				20°C	Class 24 SDR 7
				80°C	Class 15 SDR 11
0.8	0.9			20°C	Class 12 SDR 13.6
0.8				60°C	
0.6	0.65	0.75		20°C	Class 10 SDR 16.2
				60°C	

## PEXGOL pipe class 10 is not recommended for use under full vacuum conditions.

If a PEXGOL pipe collapses it shows an oval deformation which increases progressively.

We emphasize that when a PEXGOL pipe collapses due to vacuum it can be returned to its original round shape by applying a brief internal pressure at high temperature. The following drawing shows a above-ground situation schematic of PEXGOL pipe under vacuum.

The pipes cross-section is slightly flattened because of the vacuum inside the pipe.



## PEXGOL pipe laying on the ground in a vacuum condition

### Above ground PEXGOL pipe under vacuum

When selecting PEXGOL pipes for vacuum conditions above the ground, it is recommended to use the following criterion: When  $D_vH/D_o$  is below 1.2, a PEXGOL pipe laid above ground is considered safe against vacuum failure.

### Underground PEXGOL Pipe

Vacuum, which is a negative pressure, creates hoop stresses in the pipe wall which are combined with the external pressures of the soil. In extreme cases these stresses can cause the pipe to collapse. Therefore, when a vacuum PEXGOL pipe is installed underground, the vacuum stresses have to be added to the total static and dynamic loads exerted by the soil, and all the stresses must be considered. In this case, ensure that the soil around the pipe is compacted!

When designing a vacuum pipeline at recommended vacuum conditions, please contact our engineer for consultation regarding installation of vacuum breakers.



### Abrasion resistance

Transporting solid materials by fluids (in the form of a slurry) is commonly used in industry, mining and in many piping systems. In most cases, the flow is kept turbulent to avoid sedimentation.

Abrasion is the result of removal of material by flowing media from the inner surface of the pipe.

The rate of abrasion for various slurries is determined by many factors such as:

- Flow rate
- Density of the particles
- Size distribution of the particles
- Hardness and angularity of the particles
- Temperature Viscosity of the liquid

Abrasion resistance is one of the most important characteristics of PEXGOL pipes.

PEXGOLs' excellent abrasion resistance is a result of the unique structure of crosslinked polyethylene, making the pipe material especially tough and resilient, and generally able to resist abrasion better than metal pipes. The ability of the pipe material to absorb the kinetic energy of the hard particles inside the slurry, and its resistance to deformation, make PEXGOL pipes extraordinary abrasion resistant conduits.

Unavoidable scratches in PEXGOL pipes cause no damage.

Results of tests performed on pipes after being subjected to scratches as deep as 20% of the pipe wall show that no damage is caused to the pipe during intensive pressure tests. The crosslinked molecular structure accounts for the insensitivity of PEXGOL pipes to scratches as well as their resistance to slow-crack-growth. The restraining action of the adjacent molecular chains of the crosslinked network absorb the energy of the "tearing" forces.

PEXGOL pipes abrasion resistance was tested and approved in laboratory tests as well as in on-site conditions.

PEXGOL pipes were installed at the Dead Sea Works instead of steel pipes, which had to be replaced every year. PEXGOL pipes have been at work since 1985, and it has not yet been necessary to replace them.

In South African gold mines, PEXGOL pipes were installed in backfillines, working at a very high line velocity, transferring highly abrasive material for many years without failure.

In Israel's Dead Sea Works, 450 mm PEXGOL pipes have been installed since 1990. These pipes are connected to dredgers which "harvest" the salt particles.

Non-crosslinked PE pipes which were installed in these lines failed after a few months.

Technical test reports concerning abrasion resistance of PEXGOL pipes are available on request.

### Instructions for underground installation of PEXGOL pipes

The following table shows the minimum required trench width for PEXGOL pipes.

Table No. 13.1: **Trench width**

Outside pipe diameter	Minimum trench width (mm)
90	250
110	250
125	265
140	280
160	300
200	400
225	400
280	450
315	550
355	650
450	750
500	850
630	1000

The width can be increased to allow more comfortable work in the trench.

The minimum recommendation depth of the trench is 60cm (to prevent mechanical damage of the pipe).

For a route change (for example a 90° angle) it is recommended to dig the trench with a suitable radius.

See Bending radius in PEXGOL pipes, page 31.

### Sand bedding of the trench and backfilling

The unique properties of PEXGOL pipes allow considerable saving in costs related to sand bedding, compacting and backfilling:

**Excellent scratch resistance** – enables laying the pipes in trenches with no sand bedding; if sand bedding is required, the trench should be filled with sand 10 cm above the pipe.

**Backfilling the trench** using the earth originally removed from the trench (in accordance with ISO 14531, Part 4); if corrosive soil is used to cover PEXGOL pipes that are connected with metal fittings, the fittings should be covered by sand, not by the corrosive soil.

**High ring stiffness** – no need to compact the soil to improve the pipe's pressure rating.

**Installation below a road or a pavement** with no need for a protective sleeve; in this case, use controlled compacting of the soil/ground, according to the designer's instructions, when covering the pipe to prevent the ground sinking.

In order to reduce energy losses it is recommended to insulate the pipe when underground PEXGOL pipes, for hot water transportation are buried underground.

## **Above ground Installation**

Above-ground installation of PEXGOL pipes is advantageous in the following cases:

- If Slurry lines are frequently relocated.
- Installation through marshes or areas which are difficult to access.
- Quick installation of temporary pipe lines.

It is recommended that expansion and contraction, due to temperature variations, should be considered in the design and installation of PEXGOL pipes above the ground. The coefficient of expansion of PEXGOL pipes is high compared to steel pipes, but the forces generated by thermal stresses are much lower for PEXGOL pipes.

The reason for this is mainly the low modulus of elasticity and the fact that the PEXGOL pipes feature stress relaxation. PEXGOL pipes installed above ground might increase in length as a result of temperature increases and tend to undergo "snaking".

Longitudinal elongation and contraction of the pipe is not uniform since the coefficient of friction between the pipe and the ground varies. However, the toughness and the exceptional abrasion resistance of PEXGOL pipes enable the pipes to move across the soil without affecting strength or service life.

## **Above ground installation instructions for PEXGOL pipes**

PEXGOL pipes laid above the ground should be installed in a slightly curved configuration and not in a straight line to avoid thermal stresses, which helps prevent the pipe from pulling out of its fittings when the temperature drops and the pipe tends to contract.

## **Maintaining PEXGOL pipeline in a straight line**

If a straight pipeline is required, then anchoring the pipeline at intervals is a good method of limiting and controlling thermal expansion and contraction of the pipeline.

The smaller the distance between the fixpoints, the smaller the theoretic increase in pipe length. As a result lateral deflections will decrease and the pipeline will be straight.

## **PEXGOL horizontally supported pipelines**

Horizontally supported pipes are subject to vertical deflections between supports due to the weight of the pipe and the transported materials, and also due to thermal deflection. Golan recommends minimizing the deflection in order to avoid high stress values inside the pipe wall. Choosing proper distance between supports helps to minimize thermal deflections.

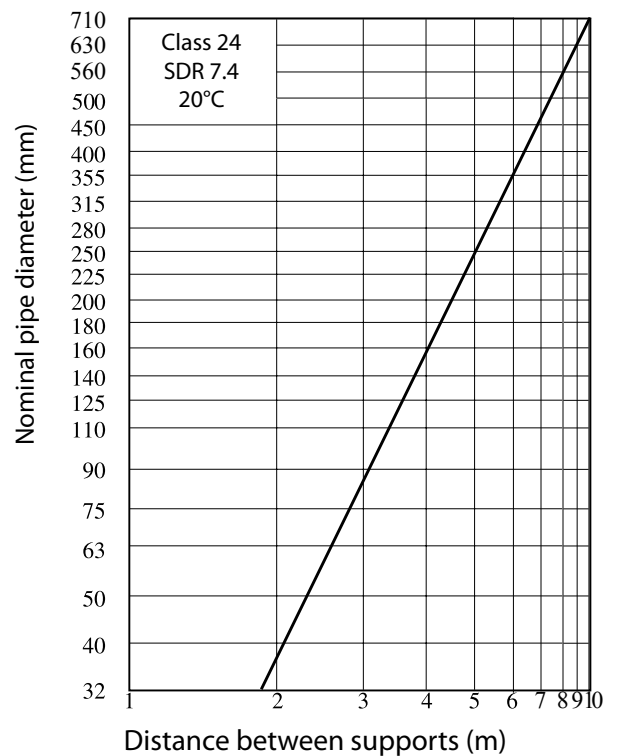
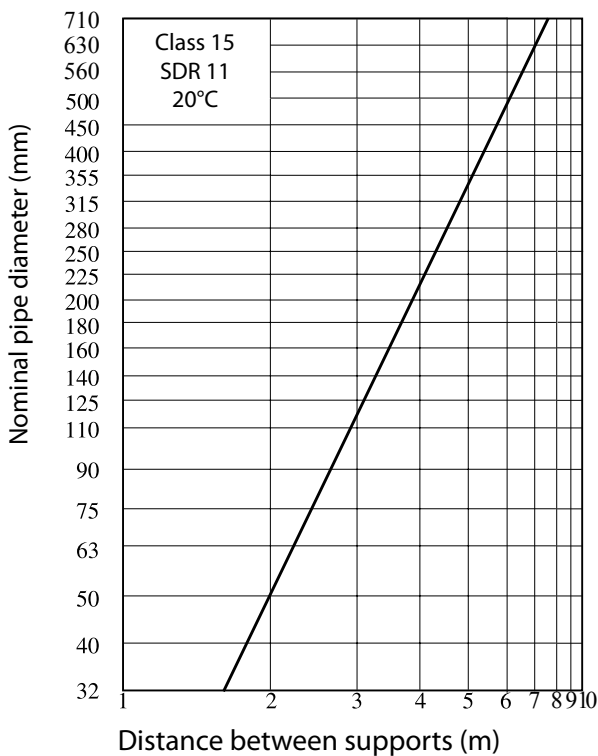
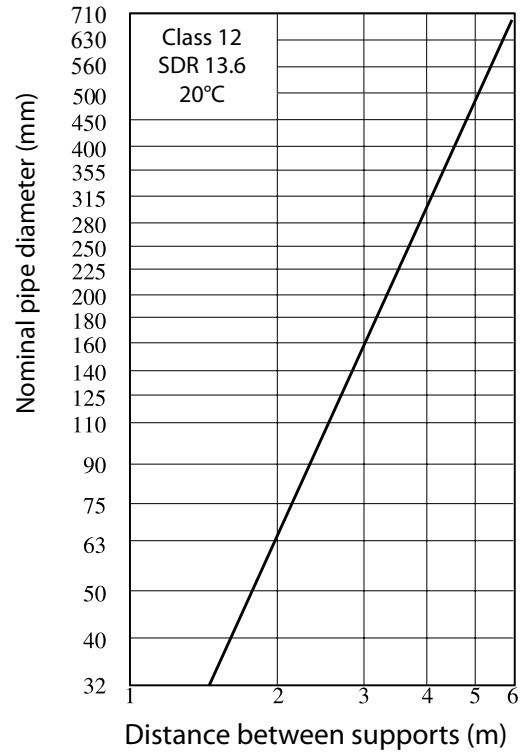
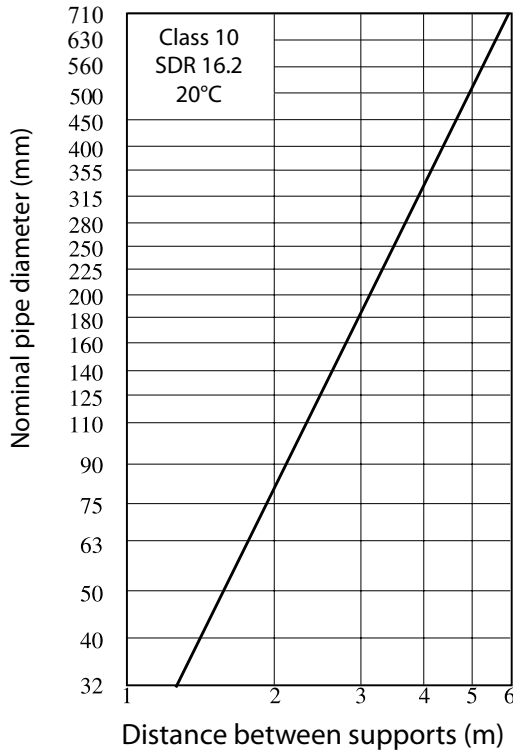
## Pipe supports

The following figures give the recommended distance between supports for various SDRs and pipe diameters, at 20°C.

For higher temperatures shorter distances are recommended and the values shown in the figures should be multiplied by the following values:

For 60°C : 0.91; For 80°C: 0.83.

Chart 17.1: Class 24 (SDR 7.4) and Class 15 (SDR 11)



### PEXGOL pipe behaviour at high temperature

PEXGOL pipes have a tendency to elongate considerably when exposed to sunlight due to a high thermal expansion coefficient which is typical for plastic pipes. With rising temperature the elastic modulus of the pipe decreases and so the developing stress is not high. When placing the PEXGOL pipe over pipe bridges, the thermal expansion is reduced by the use of suitable fixtures so that the pipe will develop internal stresses which do not cause any damage. There is no need to use expansion joints!

### PEXGOL pipes at low temperature

When the ambient temperature drops below 20°C, the tendency to axial contraction could create axial stresses in the pipe. These stresses are absorbed by the pipe without causing damage (stress relaxation). Minimum service temperature is -50°C.

### Determining the maximum distance between two guiding clamps

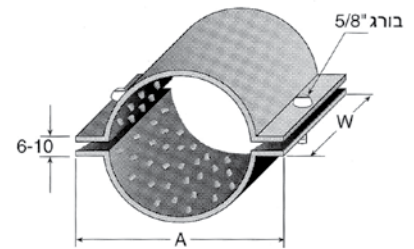
The distance between adjacent clamps may be calculated according to the following formula:  $L = 63.5 \times D$ , where L is the distance (in mm) between the clamps. D = outside pipe diameter (in mm). The formula was written taking into consideration the increase of ambient temperature from 20°C to 40°C, causing warming up of the pipe to 60°C because of its black color. The formula allows for a maximum sideward deflection of 50 mm between one Fixpoint and the other. In case the supports are not continuous, the calculated distance can be rounded off so that it will fit to the bridge. See "Horizontally Supported Pipelines".

### Fixpoint Clamps

If the pipe is to be fixed at a Fixpoint, then a Fixpoint Clamp (FPC) should be used. The FPC is made of steel with internal gripping teeth made of 316L stainless steel. The FPC is painted with a base paint that you can weld on. The lower part of the clamp can be welded to the bridge (before installing the pipe) or connected by screws. The distance between one adjacent pipe to the other is determined according to the width of the FPCs; (see table)

Table No. 18.1: Dimension Table of FIXPOINT Clamps

Cat. No.	Pipe Diameter (mm)	Length W (mm)	Width A (mm)	Weight (kg)
66206302	63	40	185	1.11
66207525	75	40	195	1.17
66209003	90	40	210	1.25
66211004	110	50	230	1.67
66212505	125	50	250	1.86
66214006	140	50	260	1.94
66216006	160	50	280	2.05
66220008	200	60	320	3.61
66222508	225	80	350	5.12
66225010	250	80	370	5.46
66228010	280	80	400	5.97
66231512	315	80	435	6.46
66235514	355	100	475	8.84
66240016	400	100	520	9.79
66245018	450	100	570	10.80
66250020	500	100	620	11.85
66263024	630	100	754	14.45



### Max. force at the Fixpoint clamps

The max. force at the Fixpoint clamp depends on the pipe's O.D. and wall thickness.

The value of the force in kg can be calculated according to the following formula:

$$F = 24.5 \times W$$

where W is the weight of the pipe (kg/m) taken from tables 4.1-4.6 on pages 7-8.

### Side Deflection

Large side deflection might be expected large in the event of a malfunction, but there is no risk of possible damage due to one pipe "leaning" on its neighbor or rubbing against it.

### Guiding Clamps for PEXGOL Pipes

The PEXGOL pipe's tendency to "snake" can be reduced by putting bars on both sides of the pipe in order to limit sideward deflection.

Alternatively, using guiding clamps (GC), which are conventional clamps (FPC) without the internal gripping teeth, is recommended. The pipe can freely slide through in the axial direction but not sideways.

### Protecting end couplings and other fittings

To ensure the pull-out resistance of curtain fittings, lay the pipe not perfectly straight, but with some surplus length (slack). In case of short pipes (up to about 10 meters), or in case of installations on pipe bridges (where it may be difficult to leave slack in the pipe), there should be a fixpoint before and after every fitting.

This applies to some of the fittings (see designing guide lines). It is not necessary to have fixpoints before and after electrofusion fittings.

If the pipe is installed in a vertical position and common fixpoint clamps cannot be used, the fitting should be protected by a fixpoint bridge. (See table no. 19.1).

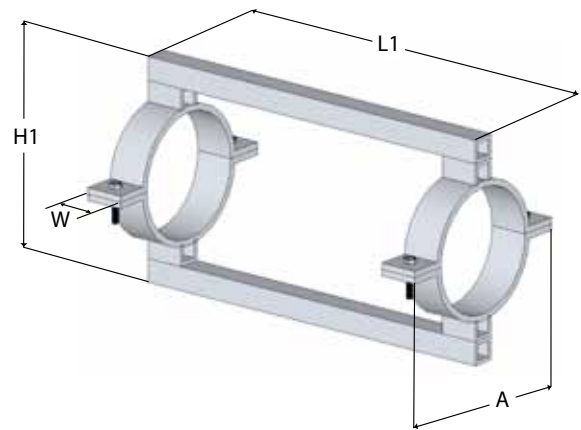


Table No. 19.1: Fixpoint bridge for PEXGOL pipes

Cat. no.	Pipe Dia. (mm)	Clamp width W	Clamp size A	Bolt size	Total length L1	Height H1	Weight
301063	63	40	185	" ½	260	290	6.14
301075	75	40	195	" ½	270	300	6.32
301090	90	40	210	" ½	320	350	7.31
301110	110	50	230	" 5/8	360	380	8.86
301125	125	50	250	" 5/8	360	380	8.83
301140	140	50	260	" 5/8	380	480	10.14
301160	160	50	280	" 5/8	380	480	10.11
301200	200	60	320	"3/4	420	450	13.09
301225	225	80	350	"3/4	460	500	19.20
301250	250	80	370	"3/4	510	560	18.25
301280	280	80	400	"3/4	520	560	19.01
301315	315	80	435	"3/4	580	650	21.14
301355	355	100	475	" 1	650	700	26.64
301400	400	100	520	" 1	750	750	29.47
301450	450	100	570	" 1	750	800	31.48
301500	500	100	620	1"	800	850	34.03
301630	630	100	754	1 "	800	950	38.87

### Natural bending radius in PEXGOL pipes

In order to create turns with PEXGOL pipes laid inside trenches, above the ground or over pipe bridges, the pipe may be bent according to table 20.1.

This kind of pipeline design, which takes advantage of the natural flexibility of the pipe can reduce the number of connections and lower head losses.

### Designing of PEXGOL Pipes with "natural" bends

When designing such a line it is recommended to consult with our field service personal. Please keep in mind that for bending the pipe on site, suitable facilities are required and for inserting the pipe into the construction, enough space is required as well as a possibility to exert bending moments of the pipe.

Table 20.1 states the minimum recommended bending radii for PEXGOL pipe of class 10.

If possible, design with larger radii in order to facilitate pipe bending on site by decreasing the forces required for bending of the pipe.

### Bending the Pipes

The pipes should be bent by means of a suitable device, e.g. a winch or a lever. You should not forget that the pipe is quite rigid and considerable force is required for bending and fixing it.

For example: 2 tons for 110 pipe and 5 tons for 280 pipe. Please exercise caution!

Bending should be done carefully in order to avoid "knuckles". For best results it is recommended to prepare a continuous support for the pipe (having the radii of the pipe to be bent) and then to bend the pipe against it.

### Route change of PEXGOL pipes inside trenches

For a route change in buried pipes it is recommended to dig the trench with the minimum natural bending radius stated in table 20.1.

### "NATURAL" elbows on pipe bridges

The pipe should be fixed with Fixpoint clamps before and after each elbow.

For pipe diameters of 280 and higher, the elbow should be supported in the centre in addition to the two aforementioned Fixpoints.

For class 15 and class 24 pipes, smaller bending radii are possible.

For additional details please contact the PEXGOL Pipes Service Dept.

Table No. 20.1: Natural bending Radius

Pipe OD	Natural bending Radius
110	8D
125	10D
140	10D
160	10D
225	10D
250	12D
280	12D
315	16D
355	16D
400	20D
450	20D
500	24D
630	28D

### Installing a Natural- bended PEXGOL pipes

When designing and installing Pexgol pipes in natural bends ,special care should be exercised in order to prevent excessive bending moments from being exerted upon the end-connectors due to forced installation.

This is relevant for both mechanical and Electrofusion fittings.

The installation is complicated since it is difficult to calculate in advance the exact length of the pipe and therefore it is necessary to perform On-site adaptation (Field –weld).

The proper installation procedure is:

1. The longer arm of the Natural bend is more flexible than the shorter arm and therefore always choose it as the pipe-end whose length should be adjusted.
2. Install the fitting onto the end of the shorter arm.
3. Connect the shorter arm to the existing counter-flange
4. If necessary - install a fixpoint clamp before the fitting to protect it during bending.
  - 4.1 If the fitting is an Electrofusion fitting you have to wait three (3x) cooling times before making the next step.
5. Make the adjustment of the length of the longer arm.
6. Cut the length and install the fitting.
  - 6.1 If the fitting is an Electrofusion fitting with a stub-end (flared end ) connection you should perform the welding when the flared end is free (not connected to the counter-flange). You can connect the flared end & flange to the counter-flange only after three (3x) cooling times has passed.
  - 6.2 If the fitting is an Electrofusion fitting which connects the longer arm to another Pexgol or PE pipe ,you should install a Temporary Fixpoint bridge before the welding in order to protect the Electrofusion fitting during welding.
 

You can dismantle the Temporary Fixpoint bridge only after three (3x) cooling times has passed.

## Prefabricated Elbows

Prefabricated elbows are produced from PEXGOL pipes of all classes according to a proprietary process. Standard elbows are available in the following configurations and the corresponding Cat. Numbers:

- 90° R=3XD- Cat. No. 9119030
- 45° R=3XD- Cat. No. 9114530
- 90° R=1.5XD- Cat. No. 9119015
- 45° R=1.5XD- Cat. No. 9114515

PEXGOL with flared-ends can be ordered in any length between the minimum and maximum values listed in table 21.1, dim.A. Prefabricated elbows with plain-ends can be ordered in minimum lengths according to dim.B.

Each 'leg' can be ordered with plain ends or with flared ends with or without flanges. The length of each 'leg' can be different.

To order the PEXGOL elbows see the order form on our website: [www.pexgol.com/support](http://www.pexgol.com/support)

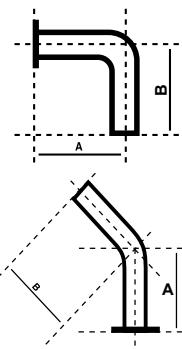
The weight of the elbow is calculated by adding the A or B values of the legs, dividing them by 1,000 (in order to get the total length of the elbow in meters) and then multiplying by the weight per meter of the pipe according to the pipe dimensions tables.

Table No. 21.1: **Dimensions of PEXGOL Elbows**

Pipe OD (mm)	R=1.5D						R=3D					
	90° Elbow		45° Elbow		90° Elbow		45° Elbow		90° Elbow		45° Elbow	
	dim.A (mm)	dim.B (mm)	dim.A (mm)	dim.B (mm)	dim.A (mm)	dim.B (mm)	dim.A (mm)	dim.B (mm)	dim.A (mm)	dim.B (mm)	dim.A (mm)	dim.B (mm)
	Min	Max	Min	Min	Max	Min	Min	Max	Min	Min	Max	Min
50	255	500	150	210	400	100	330	600	230	240	500	140
63	280	500	180	225	450	120	380	650	280	260	500	160
75	310	600	210	235	450	130	420	700	320	280	500	180
90	330	600	240	250	350	155	465	700	375	305	500	215
110	385	700	300	270	350	190	530	750	445	335	500	235
125	400	600	320	280	400	200	575	800	500	350	450	270
140	430	700	350	295	400	210	625	900	545	375	500	295
160	450	750	370	300	400	225	690	920	620	410	600	335
200	500	800	500	350	550	350	800	1100	800	450	620	450
225	600	800	600	400	600	400	900	1250	900	500	800	500
250	650	850	650	450	700	450	1000	1200	1000	550	800	550
280	750	950	750	480	700	480	1100	1330	1100	650	950	650
315	850	1000	850	550	800	550	1250	1500	1250	700	1100	700
355	1000	1200	1000	650	900	650	1400	1600	1400	800	1100	800
400	1080	1300	1080	700	1000	700	1600	1800	1600	900	1100	900
450	1200	1400	1200	800	1100	800	1900	1900	1900	1000	1150	1000
500	1350	1500	1350	850	1200	850	2000	2000	2000	1100	1100	1100
630	1650	1900	1650	1100	1300	1100	2400	2500	2400	1450	1700	1450

### Notes:

- Length of Elbow includes also a straight section which makes connection to the elbow easier.
- The dim.A is the length of the elbow with a flared end & flange.
- Elbows with a plain end (for electrofusion or mechanical connector) can be ordered with a shorter length according to dim.B
- Elbows with longer dimensions A or B can be specially ordered (after coordination with Golan Plastic Products).
- Larger or smaller radii elbows may be specially ordered.
- Elbows with angles which are not according to standard may be requested by special order.





## Flared end Connectors

The ends of the PEXGOL pipe are heated and then flared by a proprietary process, performed at Golan plastic products. The final pipe-end is similar to a stub end.

The loose flange is usually mounted over the pipe before the flaring process. Alternatively, split flanges that can be mounted later, can be supplied. Plastic coated flanges are available on request.

The pipes can be ordered in lengths according to customers specifications or in standard lengths that may fit into 20 or 40 ft containers.

For the minimum length (L) of PEXGOL stub-ends see table 22.1

To order the PEXGOL flared ends see the order form on our website: [www.pexgol.com/support](http://www.pexgol.com/support)

Table No.22.1: **Minimum length (L) for PEXGOL stub-end**

PIPE DIA.	L
32	85
40	85
50	104
63	120
75	130
90	140
110	160
125	182
140	180
160	180
180	198
200	200
225	200
250	215
280	228
315	238
355	255
400	285
450	320
500	350
560	380
630	400



## Connecting PEXGOL pipes with flared ends

When connecting two flared ends together or connecting a pipe with a flared end to a Flanged fitting, no gasket is needed! No retorquing is necessary in the flared ends of PEXGOL pipes!

The flared-end connection is suitable for both hot and cold media.

Special Fixpoint clamps should be used as before and after the flared ends, see table 18.1.

In case of sub zero temperatures, special care should be exercised to prevent pulling-out of the flared end from the flanges.

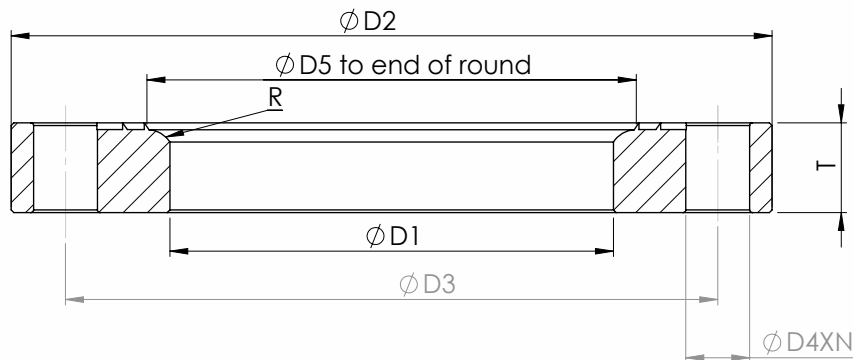


Table No.22.2: Dimensions of Flanges according to ASA 150

Cat. No.	Pipe diameter (mm)	Flange dimension (inch)	Bolt circle diameter (mm)	O.D	Wall thickness	End of radius	Radius (mm)	Inside diameter (mm)	Bolt hole diameter	No. of bolts	bolt size (in)	Weight (kg)
			D3	D2	T	D5	R	D1	D4	N		
64805015	50	1.5	98	127	17	62	6	52	16	4	5/8	1.4
64806302	63	2	118	152	19	77	7	65	22	4	5/8	2.3
64807525	75	2.5	140	178	22	91	8	78	19	4	5/8	3.5
64809003	90	3	150	190	24	106	8	93	22	4	5/8	4.1
64811004	110	4	190	228	24	130	10	116	19	8	5/8	5.8
64812505	125	5	216	254	24	145	10	131	23.5	8	3/4	7.1
64814006	140	6	240	279	25	160	10	146	23.5	8	3/4	8.9
64816006	160	6	240	279	25	180	10	167	23.5	8	3/4	7.8
64820008	200	8	297.5	343	28	230	15	210	23.5	8	3/4	12.9
64822508	225	8	297.5	343	28	255	15	236	23.5	8	3/4	10.9
64825010	250	10	362	406	30	284	17	262	25	12	7/8	18.2
64828010	280	10	362	406	30	314	17	293	25	12	7/8	14.9
64831512	315	12	432	482	32	355	20	331	25	12	7/8	24.7
64835514	355	14	475	533	35	395	20	371	30	12	1	32.2
64840016	400	16	540	597	36	444	22	417	30	16	1	41.3
64845018	450	18	577.6	635	40	494	22	467	32	16	1 1/8	46.5
64850020	500	20	635	698	43	550	25	518	32	20	1 1/8	59.1
64863024	630	24	749	813	48	690	30	652	35	20	1 1/4	71.1

## PEXGOL short sections with 2 flared ends

The following table lists the lengths of short flared ends PEXGOL sections.

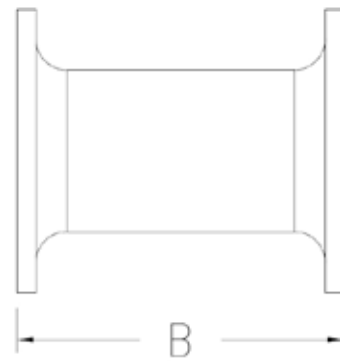
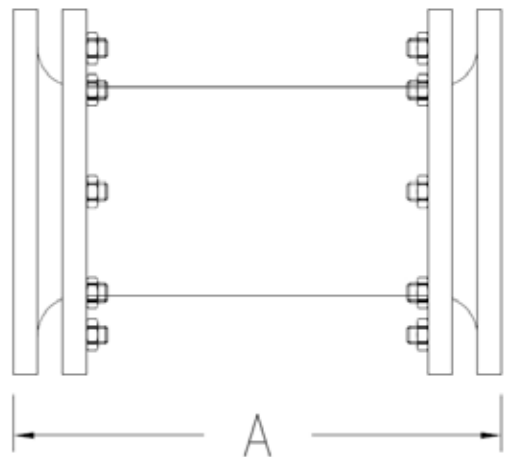
The A length is relevant for fitting which are supplied with regular flanges.

The shorter B length is applicable for fitting which are supplied with split flanges which that can be mounted after the fitting is produced.

To order the PEXGOL short sections see the order form on our website: [www.pexgol.com/support](http://www.pexgol.com/support)

Table No. 23.1: Dimensions of PEXGOL Spacers

PEXGOL O.D.	Minimum length of a flanged PEXGOL pipe with full S.O. flanges	Minimum length of a PEXGOL pipe with split S.O. flange
	A	B
90	210	165
110	215	165
160	225	175
200	290	230
225	290	230
250	355	290
280	340	280
315	380	320
355	355	285
400	395	320
450	410	330
500	440	350
630	--	380



## Extra-thin PEXGOL spacers

PEXGOL spacers can be supplied in any width up to 50 mm.  
 Spacers without drilled holes are currently available for flanges up to 14".  
 Spacers with drilled holes are currently available for flanges up to 12".  
 Larger sizes for flanges up to 24" upon request.

To order the extra-thin PEXGOL spacers see the order form on our website: [www.pexgol.com/support](http://www.pexgol.com/support)



Cat No. 65900035

## PEXGOL spigot reducers

Table No.24 shows the dimensions of standard spigot reducers .

The sizes in the table are only a partial list and other sizes can be ordered on request.

When using the Spigot reducers to connect them with electrofusion couplers, the end user can reduce the L1 or L2 dimensions.

To order the PEXGOL spigot reducers see the order form on our website: [www.peggol.com/support](http://www.peggol.com/support)

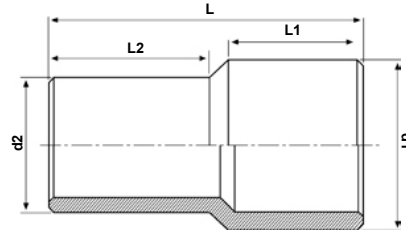


Table No. 24: **Dimensions of PEXGOL spigot reducers**

Cat.No.	Size d1 x d2	Size L	Size L1	Size L2	Weight (kg)		
					Class 10	Class 15	Class 24
RED75x63	75x63	208	102	93	0.21	0.30	0.43
RED90x75	90x75	232	114	102	0.34	0.49	0.70
RED90x63	90x63	236	114	93	0.35	0.49	0.71
RED110x90	110x90	253	117	114	0.55	0.79	1.14
RED110x75	110x75	257	117	102	0.56	0.80	1.16
RED110x63	110x63	261	117	93	0.57	0.81	1.17
RED125x110	125x110	260	127	117	0.73	1.04	1.48
RED125x90	125x90	279	127	114	0.78	1.12	1.59
RED140x125	140x125	275	132	127	0.98	1.38	1.98
RED140x110	140x110	281	132	117	1.00	1.41	2.03
RED160x140	160x140	286	132	132	1.32	1.88	2.68
RED160x125	160x125	303	138	127	1.40	2.00	2.85
RED160x110	160x110	309	138	117	1.43	2.04	2.90
RED200x160	200x160	338	157	138	2.45	3.46	4.97
RED200x110	200x110	371	157	117	2.68	3.80	5.46
RED225x200	225x200	354	170	157	3.23	4.60	6.58
RED225x160	225x160	378	170	138	3.45	4.92	7.03
RED250x225	250x225	376	179	170	4.25	6.02	8.74
RED250x200	250x200	390	179	157	4.41	6.24	9.07
RED250x160	250x160	414	179	138	4.68	6.63	9.63
RED280x250	280x250	405	194	179	5.72	8.15	15.57
RED280x225	280x225	423	194	170	5.98	8.51	16.26
RED315x280	315x280	437	205	194	7.82	11.14	18.87
RED315x250	315x250	454	205	179	8.13	11.58	19.62
RED355x315	355x315	472	224	205	10.70	15.25	23.00
RED355x280	355x280	499	224	194	11.31	16.12	24.30
RED400x355	400x355	522	249	224	15.02	21.44	28.58
RED400x315	400x315	546	249	205	15.72	22.43	29.91
RED450x400	450x400	578	275	249	21.10	30.17	36.76
RED450x355	450x355	602	275	224	21.96	31.40	38.26
RED500x450	500x450	631	302	275	28.40	40.70	43.22
RED500x400	500x400	659	302	249	29.66	42.51	45.14
RED630x500	630x500	782	340	302	55.94	79.49	67.52
RED630x450	630x450	809	340	275	57.87	82.24	69.85

## **PEXGOL Spigot reducers with flared ends and Flanges**

PEXGOL Spigot reducers are supplied with flared ends, with or without flanges.

If supplied without flanges, use split flanges that can be installed later by the end user.

The split flanges can be supplied by Golan or by the end user.

## **PEXGOL special reducers/adaptors**

Golan supplies special reducers for individual projects. For example:

- Reducers to match the inside diameter of PEXGOL pipes to steel pipes or pipes made from other construction materials.
- Adaptors for PEXGOL pipes with the same ID and different OD

To order the PEXGOL special reducers/adaptors see the order form on our website: [www.pexgol.com/support](http://www.pexgol.com/support)

## **PEXGOL instrument tees**

PEXGOL Instrument tees of all sizes can be ordered as custom-made items.

The inlet is made of metal stainless steel or other corrosive resistant metal can be specified on request.

The inlet is available as 3/4" or 1/2" female thread.

The inlet is available as 1", 3/4" or 1/2" male thread.

To order the PEXGOL instrument tees see the order form on our website: [www.pexgol.com/support](http://www.pexgol.com/support)



Cat No. 65900040



Cat No. 65900045

## PLASSON Pex2Pex Electrofusion Fittings

### Electrofusion fittings for high temperature working conditions:

In addition to the mechanical fittings, the PEXGOL system offers also a welding solution.

The items with the brand name PLASSON Pex2Pex, are suitable for PEXGOL pipes class 15 SDR11 in all the temperature and pressure ranges of this pipe class.

### Special high temperature Electrofusion couplers:

When higher working pressures or pipe dimensions are needed, for which PLASSON Pex2Pex couplers are not available, Golan offers special high temperature electrofusion couplers. Please consult us.

### Electrofusion fittings for low temperature working conditions:

See PEXGOL Infrastructure manual.

Prior to using PLASSON Pex2Pex fittings for the first time, please consult us regarding local training.

Table No. 26.1: PLASSON Pex2Pex Coupler

Cat. No.	Pipe	D	L	L1	Weight (Kg)
480100050	50	68	100	48.5	0.143
480100063	63	82	118	57	0.22
480100075	75	97	125	61	0.33
480100090	90	115	145	70.7	0.53
480100110	110	139	161	79	0.82
480100125	125	155	169	83	1.00
480100160	160	196	192	94.7	1.77

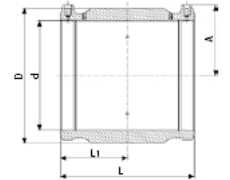


Table No. 26.2: PLASSON Pex2Pex 90° Elbow

Cat. No.	Pipe d	D	L	L1	Weight (Kg)
480500075	75	96	149.5	60.7	0.50
480500090	90	110.5	201.5	70	0.84
480500110	110	140	234	71	1.52
480500125	125	163.1	271	81	2.33

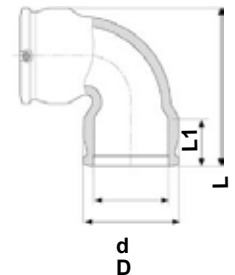


Table No. 26.3: PLASSON Pex2Pex tee's

Cat. No.	Nominal diameter	D1	D2	L	L1	L2	A	Weight (Kg)
480400050	50	68	68	139	48.5	48.5	155	0.374
480400063	63	82	82	166	57.5	57.3	188	0.598
480400110	110	142.5	138.5	327.5	71.5	79	296	2.386
480400125	125	163	154.5	380	85	83	326	3.838

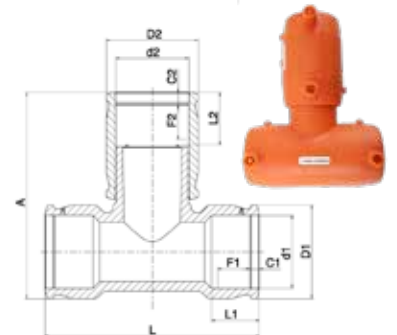
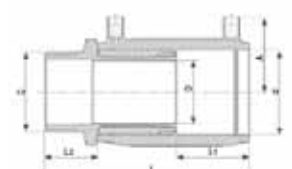


Table No. 26.4: PLASSON Pex2Pex Brass Connector

Cat. No.	Pipe d	G	D	L	L1	Weight (Kg)
482100050015	50	1.5"	38	136	48.5	0.53
482100063020	63	2"	48	160	57	0.9
482100075020	75	2"	59	166	61	1.3
482100075025	75	2 1/2"	59	171	61	1.5



## Pex lined fittings



This specification covers materials, manufacturing, testing, inspection and packaging standards for standard and custom made Pex-lined fitting system.

Pex- lined steel fittings consist of a steel flanged fitting lined with thick black Pex coating which extends over the full face of the flanges.

This type of fitting can be used as a standard fitting (Tee, elbow, reducer etc. as ).Non-standard items can be specified as well ,subject to approval by Golan's technical department.

### Materials of construction

All materials used shall be traceable to origin and records shall be maintained for a minimum of three years. When specified, material and/or test certificates shall be supplied.

### Pex lining

Pex lining shall be made from resin conforming to the requirements of materials as defined in ASTM specification D1998-04.

The lining shall be made from virgin resin meeting the requirements of ASTM D1998-04.

When tested in accordance with ASTM D638, the minimum tensile strength shall be 23 N/mm<sup>2</sup> and the minimum elongation shall be 300%.

### Fittings

Fabricated fittings shall be manufactured from the materials stated above.

Cast fittings shall be manufactured from the following:  
**Ductile Iron** – ASTM A395, BS2789 grade 420/12 or DIN 1693 Part 1 GGG40.

**Cast steel** – ASTM A216 WCB or equivalent.

Flanges and welding - neck collars shall be forged steel to ASTM A105 N.

Slip on welding collars shall be steel plate to BS1501-161-430A, DIN 17100 grades RSt 37-2 or NF

A 35-501 grade E24, EN 10025 or equivalent.

### Fabrication standards

Qualification of welding procedures, welders and welding operators shall be in accordance with section IX of the ASME Boiler and Pressure Vessel Code or BS 4870 : Part 1 and BS 4871:

Part 1, DIN 8560 or EN-288-3.

All welds shall be visually examined and assessed in accordance with ASME B31.3 or relevant code.

### Dimensional standards

Flanged cast steel fittings shall be in accordance with ANSI B16.5 Class 150.

Flanged Ductile Iron fittings shall be in accordance with ANSI B16.42 Class 150.

Fabricated fittings shall be in accordance with the dimensions shown in Engiplas manual.

Pipe diameters and wall thicknesses shall be in accordance with the dimensions on tables 4.1-4.6 on pages 7-8.

Flanges for pipe and fittings shall be in accordance with ANSI B16.5 Class 150.

Flanges shall be slip on welding, socket welding or welding neck types.

Loose backing flanges shall be suitable for use with welding collars.

All relevant dimensions and tolerances shall be in accordance with ANSI B16.5 Class 150.

Threaded bolt holes are not permitted except for reducing flanges. Threaded bolt holes in reducing flanges shall be UNC unless specified otherwise.

Welding collars for use with loose backing flanges shall be slip on welding, socket welding or welding neck type.

The diameters and thicknesses shall be as given in dimension table 26.  
 The outside diameters shall be as given in dimension table 26.  
 The outside diameter of instrument tee bodies shall be the same as lined space  
 The lining on the faces of flanges shall have uniform thickness and shall not be less than 80% of the actual wall thickness.

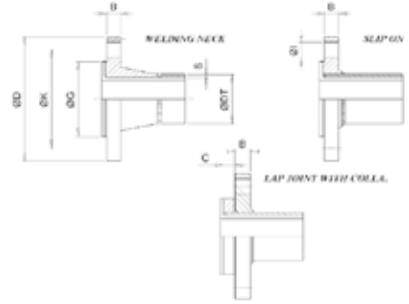


Table No. 27.1: **Dimension table**

Nom	DT	D	G	I	B	C	S
Size	Mm	mm	mm	n X i	mm	mm	mm
1"	33,5	108	50,8	4X15,7	14,2	12	3.38
1 1/4"	42,2	117,3	63,5	4X15,7	15,7	12	3.56
1 1/2"	48,3	127	73,2	4X19,1	17,5	12	3.68
2"	60,5	152,4	91,9	4X19,1	19,1	14	3.91
2 1/2"	73,2	177,85	104,6	4X19,1	22,4	14	5.16
3"	88,9	190,5	127,0	4X19,1	23,9	16	5.49
3 1/2"	101,6	215,9	139,7	8X19,1	23,9	16	5.74
4"	114,3	228,6	157,2	8X22,4	23,9	16	6.02
5"	141,3	254	185,7	8X22,4	23,9	18	6.55
6"	168,4	279,4	215,9	8X22,4	25,4	18	7.11
8"	219,2	342,9	269,7	8X22,4	28,4	20	8.18
10"	273,1	406,4	323,9	12X25,4	30,2	22	9.27
12"	323,9	482,6	381,0	12X25,4	31,8	22	9.53
14"	355,6	533,4	412,8	12X25,4	35,1	25	9.53
16"	406,4	596,9	469,9	12X28,4	36,6	25	9.53
18"	457,2	635	533,4	16X31,8	39,6	25	9.53
20"	508	698,5	584,2	20X31,8	42,9	25	9.53
24"	609,6	812,8	269,2	20X35,1	47,8	25	9.53

### Construction of Flanged fittings

Completed fittings shall be one piece construction. Flanges shall be fixed. The preparation and assembly of welded branch connections shall be in accordance with BS 2633 or ASME B31.3.

Loose flanges are available on request.

### Attachment of flanges and collars

The attachment of flanges and collars shall be by both back fillet and bore welds.  
 The transition from the bore to the flanged face shall incorporate a radius to prevent undue stressing of the liner.

### Fabrication dimensional tolerances

Tolerances for flanges and fittings shall be in accordance with the relevant standards.

### Fabricated pipework shall be in accordance with the following tolerances:

- **Squareness of flanges.** Square to the axis of the pipe or fitting to within 0.05mm per 25mm measured across the face.
- **Flange faces.** Faces shall not be uneven or concave. Convexity from the bore to the periphery shall not exceed 0.4mm per 25mm width of face.
- **Flange drilling.** PCD +/- 1.5mm. c/c of bolt holes +/- 0.8mm. Eccentricity between PCD and RFD up to 2-1/2" +/- 0.8mm, 3" and greater +/- 1.5mm.
- **Bolt holes.** Bolt holes shall be off centers and equally spaced about the centerline to an accuracy of 1.5mm.
- **Linear and angular dimensions.** Linear dimensions +/- 1.5mm Angular dimensions +/- 0.25 Degrees.



### Internal finish of housings

The interior surfaces and flange faces shall be clean and free of sharp corners, burrs, rust, scale, weld spatter or other protrusions that could adversely affect the lining.

### Lining

The method of lining and the fit of the lining shall ensure that the lining is capable of withstanding the temperature, pressure and vacuum ratings of the system. All interference fit linings in straight pipes shall be normalized prior to flaring.

Completed linings shall show no evidence of pinholes, porosity, cracks or bad workmanship. Sealing surfaces shall be free of surface defects that could impair sealing effectiveness. Scratches, dents, nicks or tool marks on the sealing face shall not be deeper than 0.15mm. Any of these defect types less than 0.15mm but extending across the face shall cause the product to be rejected. Blind flanges shall have linings firmly attached.

### Production testing

For each batch, at least one representative sample of each nominal size of fittings shall be selected and tests carried out to determine mechanical properties and SG. Where samples do not comply with the requirements stated in this specification, each tube in the batch shall have samples cut from each end and the samples shall be subjected to the same tests.

Any sample not meeting the specified requirements shall lead to rejection of the whole tube.

The outside diameter and wall thickness shall be measured. Tubes not complying with the standard shall be rejected.

Cracks found at the ends of tubes shall be cut off along with at least 50mm of adjacent material.

When specified, each liner tube shall be subjected to a flattening test. Each length of tube shall be passed through a pre-set gap between two powered rollers. The gap shall be set at 50% of the outside diameter of the tube. The tube shall then be rotated about the longitudinal axis through 90° and then passed back through the roller gap.

The tube shall be examined for cracks and any cracks along with at least 50mm of adjacent material shall be cut out.

### Hydrostatic pressure test

Hydrostatic pressure test is carried out at 16 Barg water in air. Any evidence of leakage shall be cause for rejection.

**Electrostatic test.** Electrostatic testing shall be carried out at a minimum voltage of 20,000 V. The full surface of every lining shall be tested. Any pinholes shall be cause for rejection.

**Final examination.** Each item shall be examined visually. Following satisfactory completion, the outside edge of the flange shall be stamped with a letter "I" to indicate compliance.

### External finish

The outside surface of all pipe and fittings shall be finished as follows.

Shotblast SA 2-1/2 and coat with one coat zinc phosphate, zinc epoxy or zinc silicate primer. After painting, bolt holes and vents which become blocked shall be cleared. Marking and identification: The following information shall be marked permanently on each pipe and fitting either by casting into the body or by hard stamping the flange edge in letters at least 6mm high:

- Manufacturer's sign
- Lining material

### Packaging

All flanges shall be fitted with protective covers. These covers shall only be removed just prior to installation.

Fittings shall be fitted with medium density fiberboard blanks as above or alternatively, snap on proprietary plastic blanks may be used.

### Performance

All lined fittings shall be capable of meeting the temperature, pressure, and vacuum ratings stated in the Lined fittings manual.

### Service limitations

For positive and negative pressure limitations versus temperature, see tables 27.2 and 27.3.

Service temperature limits, subject to compatibility with the fluid being handled are:

- Pex - minus 20° to +85°C

When Lined fittings are exposed to very low temperatures (less than minus 20°C) consideration must be given as to the suitability of the material used for the housings. See section below for further information.

Table No. 27.2: **Pressure / temp. rating**

Temperature	Pressure			
	ANSI 150#	ANSI 300#		
	PSI	BAR	PSI	BAR
20° C	250	17.2	450	31.0
50° C	244	17	425	29.3
100° C	235	16	390	26.9

- Table 27.2 - The pressure ratings for ANSI 150# and PN16 dimensioned fittings are based on ratings in ANSI B 16.5.
- The pressure ratings for ANSI 300# dimensioned fittings are based on the rating in ANSI B 16.5 300#, down rated to compensate for the decrease in mechanical properties at elevated temperatures of the lining materials.

Table No. 27.3: **Vacum / temp. rating**

Liner	Temp	Diameter											
		25	40	50	80	100	150	200	250	300	350	400	
Pex	20° C	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
	50° C	Full	Full	Full	Full	Full	Full	Full					
	80° C	Full	Full	Full	Full	Full							

### System design and supports

Pipe systems should be adequately supported in order to avoid excessive deflection of flanged joints, and supports should be installed preferably close to flanges. The requirement for adequate support is critical in areas of high levels of concentration of valves and fittings.

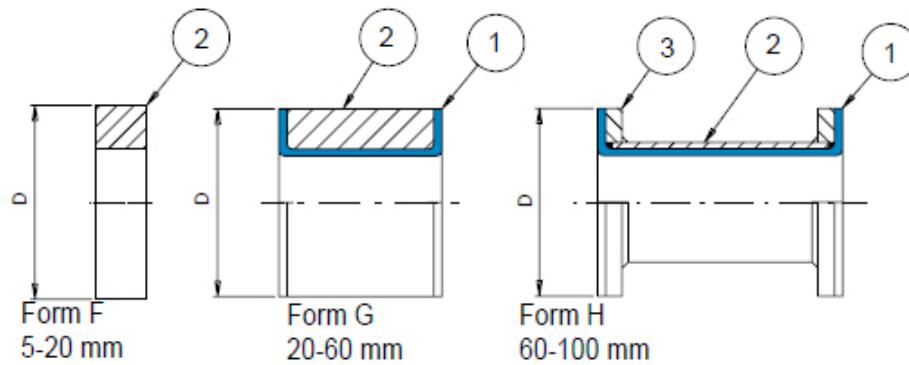
Butterfly valves are usually designed for straight metallic or thermoplastic systems, with the diameter of the vane being defined as a function of the inner diameter of the pipe system in question. The inner diameter of lined steel pipe is considerably smaller than the actual steel pipe, and inner diameters of thermoplastic pipes tend to be considerably smaller due to their heavy wall thickness. For these reasons some interference between the inner liner of a lined pipe and the valve vane may be experienced.

The designer should consider this possibility early in the selection process for pipe systems and valves, and if required, incorporate adequate conical spacers between the flanges of plastic fittings and the valve.

### Installation and maintenance instructions for lined fittings

- Lined products must not be welded, brazed or torch cut since this will damage the lining.
- The material should also be handled with due care and attention, avoiding all mechanical shocks.
- All flanges are covered to protect them from damage during shipment, storage and handling on site. Should covers be removed for inspection purposes prior to installation, they should be replaced immediately after the inspection of each item is completed.
- When jointing PEX lined pipe and lined fittings together it is generally unnecessary to use gaskets between the sealing faces.
- Under normal conditions, covers should only be removed immediately prior to installation. As gaskets are often not required, utmost attention should be made to avoid scratching or otherwise damaging the lining on flange faces.
- In case of leakage sealing faces of both components should be inspected for groves or chips. Groves or nicks not deeper than approximately 15% of the flare thickness can be removed with a fine grade abrasive paper.

**Solid And Lined Spacers**



**Materials**

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

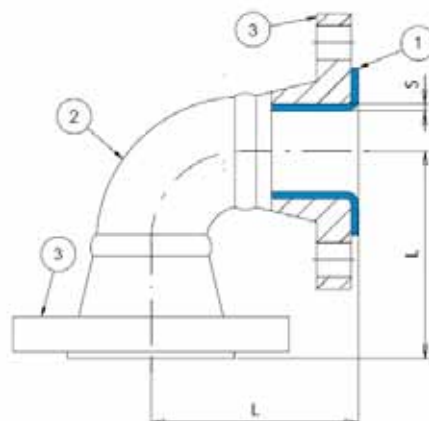
Table No. 27.4: **ANSI B16.5 - Class 150#**

Cat No.	DN Inch	L mm
Pex-SPC-15025	1"	55
Pex-SPC-15032	1 1/4"	68
Pex-SPC-15038	1 1/2"	75
Pex-SPC-15050	2"	95
Pex-SPC-15062	2 1/2"	108
Pex-SPC-15080	3"	130
Pex-SPC-150100	4"	162
Pex-SPC-150125	5"	190
Pex-SPC-150150	6"	218
Pex-SPC-150200	8"	273
Pex-SPC-150250	10"	336
Pex-SPC-150300	12"	406
Pex-SPC-150350	14"	447
Pex-SPC-150400	16"	511
Pex-SPC-150450	18"	546
Pex-SPC-150500	20"	603
Pex-SPC-150600	24"	714

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Elbows 90°



### Materials

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

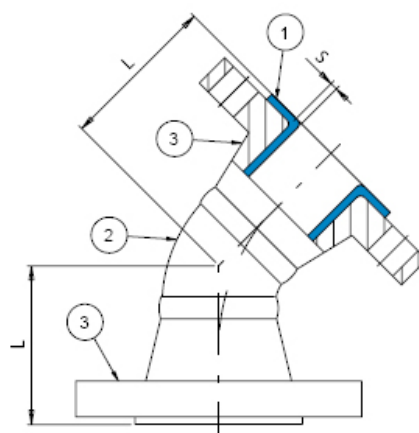
Table No. 27.5: ANSI B16.5 - Class 150#

Cat No.	DN Inch	L mm	Pex Lining Thickness	Weight
Pex-LE90-15025	1"	89	3.0	3.1
Pex-LE90-15032	1 1/4"	95	3.0	4.0
Pex-LE90-15038	1 1/2"	102	3.0	4.5
Pex-LE90-15050	2"	114	3.5	6.5
Pex-LE90-15063	2 1/2"	127	3.5	9.0
Pex-LE90-15080	3"	140	4.0	12.0
Pex-LE90-150100	4"	165	4.0	19.0
Pex-LE90-150125	5"	190	4.0	22.0
Pex-LE90-150150	6"	203	6.0	34.0
Pex-LE90-150200	8"	229	6.0	57.0
Pex-LE90-150250	10"	279	6.0	82.0
Pex-LE90-150300	12"	305	7.0	115.0
Pex-LE90-150350	14"	546	7.0	150.0
Pex-LE90-150400	16"	610	7.0	192.0
Pex-LE90-150450	18"	673	7.0	225.0
Pex-LE90-150500	20"	737	7.0	280.0
Pex-LE90-150600	24"	864	7.0	395.0

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Elbows 45°



## Materials

1 - Lining Pex ASTM D1998-04

2 - St 37.0 - DIN 1629

3 - Body St 37.0 - DIN 1629

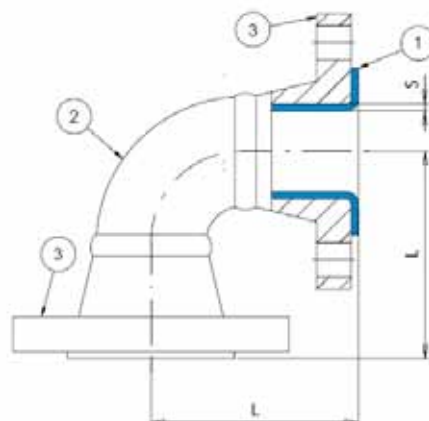
Table No. 27.6: ANSI B16.5 - Class 150#

Cat No.	DN Inch	L mm	Pex Lining Thickness	Weight
Pex-LE45-15025	1"	45	3.0	3.0
Pex-LE45-15032	1 1/4"	51	3.0	4.0
Pex-LE45-15038	1 1/2"	57	3.0	6.0
Pex-LE45-15050	2"	64	3.5	9.0
Pex-LE45-15063	2 1/2"	76	3.5	13.0
Pex-LE45-15080	3"	76	4.0	15.0
Pex-LE45-150100	4"	102	4.0	20.0
Pex-LE45-150125	5"	114	4.0	26.0
Pex-LE45-150150	6"	127	6.0	33.0
Pex-LE45-150200	8"	140	6.0	54.0
Pex-LE45-150250	10"	165	6.0	75.0
Pex-LE45-150300	12"	190	7.0	110.0
Pex-LE45-150350	14"	190	7.0	117.0
Pex-LE45-150400	16"	203	7.0	145.0
Pex-LE45-150450	18"	216	7.0	165.0
Pex-LE45-150500	20"	241	7.0	210.0
Pex-LE45-150600	24"	279	7.0	290.0

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Elbows 60°



### Materials

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

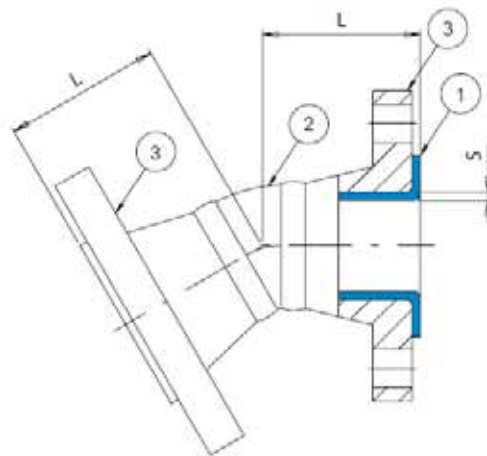
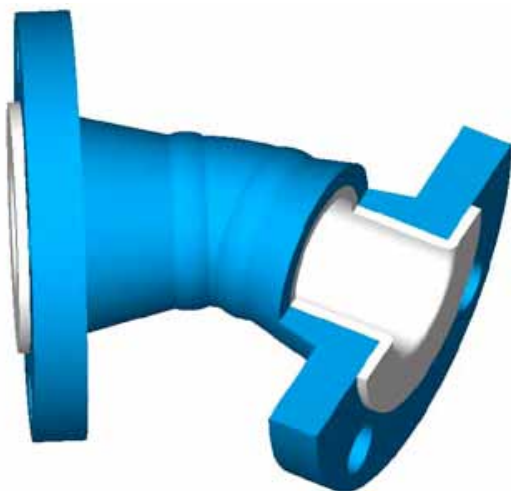
Table No. 27.7: **ANSI B16.5 - Class 150#**

Cat No.	DN Inch	L mm	Pex Lining Thickness	Weight
Pex-LE60-15025	1"	45	3.0	2.7
Pex-LE60-15032	1 1/4"	51	3.0	3.6
Pex-LE60-15038	1 1/2"	57	3.0	5.4
Pex-LE60-15050	2"	64	3.5	8.1
Pex-LE60-15063	2 1/2"	76	3.5	11.7
Pex-LE60-15080	3"	76	4.0	13.5
Pex-LE60-150100	4"	102	4.0	18.0
Pex-LE60-150125	5"	114	4.0	20.5
Pex-LE60-150150	6"	127	6.0	26.1
Pex-LE60-150200	8"	140	6.0	42.7
Pex-LE60-150250	10"	165	6.0	59.3
Pex-LE60-150300	12"	190	7.0	86.9
Pex-LE60-150350	14"	190	7.0	92.4
Pex-LE60-150400	16"	203	7.0	114.6
Pex-LE60-150450	18"	216	7.0	130.4
Pex-LE60-150500	20"	241	7.0	165.9
Pex-LE60-150600	24"	279	7.0	229.1

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Elbows 30°



## Materials

1 - Lining Pex ASTM D1998-04

2 - St 37.0 - DIN 1629

3 - Body St 37.0 - DIN 1629

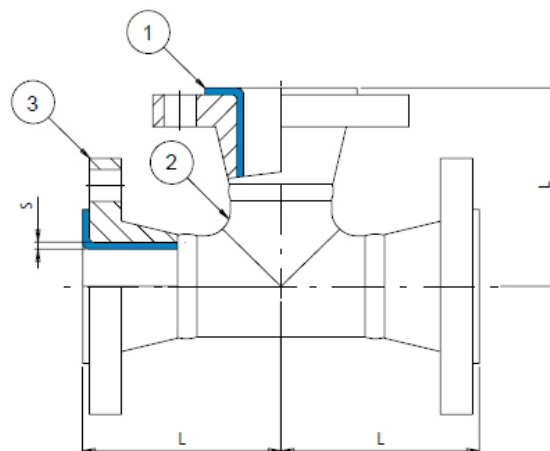
Table No. 27.8: ANSI B16.5 - Class 150#

Cat No.	DN Inch	L mm	Pex Lining Thickness	Weight
Pex-LE30-15025	1"	45	3.0	2.7
Pex-LE30-15032	1 1/4"	51	3.0	3.6
Pex-LE30-15038	1 1/2"	57	3.0	5.4
Pex-LE30-15050	2"	64	3.5	8.1
Pex-LE30-15063	2 1/2"	76	3.5	11.7
Pex-LE30-15080	3"	76	4.0	13.5
Pex-LE30-150100	4"	102	4.0	16.0
Pex-LE30-150125	5"	114	4.0	20.8
Pex-LE30-150150	6"	127	6.0	26.4
Pex-LE30-150200	8"	140	6.0	43.2
Pex-LE30-150250	10"	165	6.0	56.3
Pex-LE30-150300	12"	190	7.0	82.5
Pex-LE30-150350	14"	190	7.0	87.8
Pex-LE30-150400	16"	203	7.0	108.8
Pex-LE30-150450	18"	216	7.0	123.8
Pex-LE30-150500	20"	241	7.0	157.5
Pex-LE30-150600	24"	279	7.0	217.5

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Equal Tee



### Materials

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

Table No. 27.9: ANSI B16.5 - Class 150#

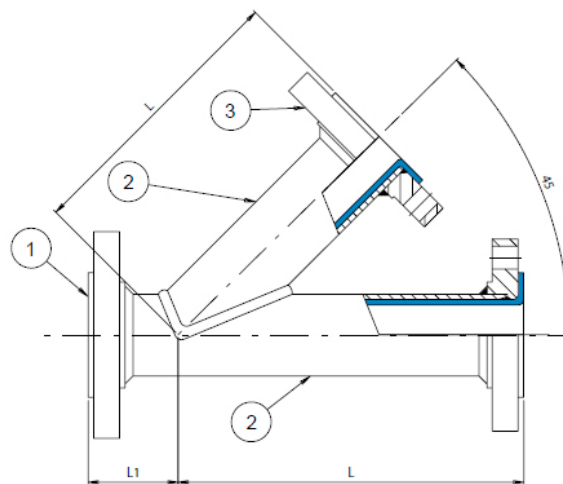
Cat No.	DN Inch	L mm	Pex Lining Thickness	Weight
Pex-LET-15025	1"	89	3.0	3.5
Pex-LET-15032	1 1/4"	95	3.0	4.6
Pex-LET-15038	1 1/2"	102	3.0	6.5
Pex-LET-15050	2"	114	3.5	10.0
Pex-LET-15063	2 1/2"	127	3.5	13.7
Pex-LET-15080	3"	140	4.0	21.0
Pex-LET-150100	4"	165	4.5	36.0
Pex-LET-150125	5"	190	4.5	43.0
Pex-LET-150150	6"	203	6.0	49.0
Pex-LET-150200	8"	229	6.0	75.0
Pex-LET-150250	10"	279	6.0	113.0
Pex-LET-150300	12"	305	7.0	153.0
Pex-LET-150350	14"	356	7.0	197.0
Pex-LET-150400	16"	381	7.0	263.0
Pex-LET-150450	18"	419	7.0	303.0
LET-150500	20"	457	7.0	330.0
LET-150600	24"	559	7.0	397.0

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)



## Lined Lateral Tee



## Materials

1 - Lining Pex ASTM D1998-04

2 - St 37.0 - DIN 1629

3 - Body St 37.0 - DIN 1629

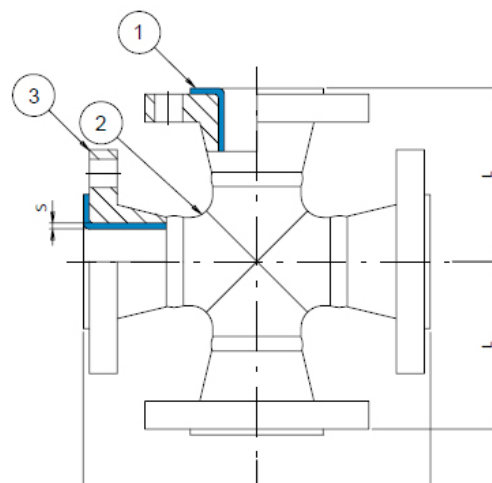
Table No. 27.10: ANSI B16.5 - Class 150#

Cat No.	DN Inch	L mm	L1 mm	Pex Lining Thickness mm	Weight kg
Pex-LLT-15025	1"	146	45	3.0	4.0 7.0
Pex-LLT-15038	1 1/2"	178	51	3.0	9.0
Pex-LLT-15050	2"	203	64	3.5	19.5
Pex-LLT-15080	3"	254	76	4.0	36.0
Pex-LLT-150100	4"	305	76	4.5	53.0
Pex-LLT-150150	6"	368	89	6.0	80.0
Pex-LLT-150200	8"	445	115	6.0	13.0

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Equal Cross



### Materials

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

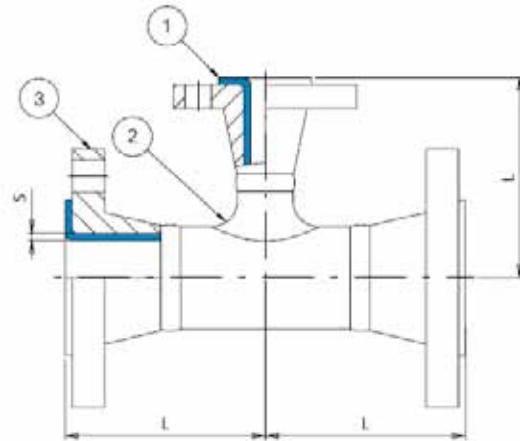
Table No. 27.11: **ANSI B16.5 - Class 150#**

Cat No.	DN Inch	L mm	Pex Lining Thickness	Weight
Pex-LC-15025	1"	89	3.0	5.5
Pex-LC-15032	1 1/4"	95	3.0	6.5
Pex-LC-15038	1 1/2"	102	3.0	8.2
Pex-LC-15050	2"	114	3.5	13.6
Pex-LC-15063	2 1/2"	127	3.5	16.5
Pex-LC-15080	3"	140	4.0	23.6
Pex-LC-150100	4"	165	4.5	33.0
Pex-LC-150125	5"	190	4.5	43.0
Pex-LC-150150	6"	203	6.0	52.3
Pex-LC-150200	8"	229	6.0	86.3
Pex-LC-150250	10"	279	6.0	124.0
Pex-LC-150300	12"	305	7.0	169.0
Pex-LC-150350	14"	356	7.0	300.0
Pex-LC-150400	16"	381	7.0	372.0
Pex-LC-150450	18"	419	7.0	427.0
Pex-LC-150500	20"	457	7.0	547.0
Pex-LC-150600	24"	559	7.0	713.0

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Reducing Tee



## Materials

1 - Lining Pex ASTM D1998-04

2 - St 37.0 - DIN 1629

3 - Body St 37.0 - DIN 1629

Table No. 27.12: **ANSI B16.5 - Class 150#**

Cat No.	DN Inch	DN2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LRT-15032-19	1 1/4"	3/4"	95	x	5.3
Pex-LRT-15032-25		1"		3.0	5.5
Pex-LRT-15062-19	2 1/2"	3/4"	127	x	5.3
Pex-LRT-15062-25		1"		3.0	5.5
Pex-LRT-150100-25	5"	1"	190	4.5 / 3	19.0
Pex-LRT-150100-38		1.5"			19.8
Pex-LRT-150100-50		2"			21.5
Pex-LRT-150100-80		3"			23.5
Pex-LRT-15038-19	1 1/2"	3/4"	102	x	5.3
Pex-LRT-15038-25		1"		3.0	5.5
Pex-LRT-15050-25	2"	1"	114	3.0	7.9
Pex-LRT-15050-38		1.5"			9.4

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Reducing Tee

Cat No.	DN Inch	DN2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LRT-15080-25	3"	1"	140	4.0 / 3	13.8
Pex-LRT-15080-38		1 1/2"			14.0
Pex-LRT-15080-50		2"			15.0
Pex-LRT-150100-25	4"	1"	165	4.5 / 3	19.0
Pex-LRT-150100-38		1 1/2"			19.8
Pex-LRT-150100-50		2"			21.5
Pex-LRT-150100-80		3"			23.5
Pex-LRT-150150-25	6"	1"	203	4.5 / 3	28.2
Pex-LRT-150150-38		1 1/2"			30.7
Pex-LRT-150150-50		2"			32.0
Pex-LRT-150150-80		3"			35.2
Pex-LRT-150150-100		4"			37.0
Pex-LRT-150200-25	8"	1"	229	6.0 / 3	42.5
Pex-LRT-150200-38		1 1/2"			45.6
Pex-LRT-150200-50		2"			47.0
Pex-LRT-150200-80		3"			54.0
Pex-LRT-150200-100		4"			57.0
Pex-LRT-150200-150		6"		63.0	
Pex-LRT-150250-25	10"	1"	280	6.0 / 3	64.6
Pex-LRT-150250-38		1 1/2"			66.3
Pex-LRT-150250-50		2"			68.3
Pex-LRT-150250-80		3"			75.3
Pex-LRT-150250-100		4"			79.3
Pex-LRT-150250-150		6"		83.0	
Pex-LRT-150250-200		8"		94.0	
Pex-LRT-150300-25		12"		1"	305
Pex-LRT-150300-38	1 1/2"		133.0		
Pex-LRT-150300-50	2"		136.0		
Pex-LRT-150300-80	3"		146.0		
Pex-LRT-150300-100	4"		152.0		
Pex-LRT-150300-150	6"		165.0		
Pex-LRT-150300-200	8"		219.0		
Pex-LRT-150300-250	10"		223.0		

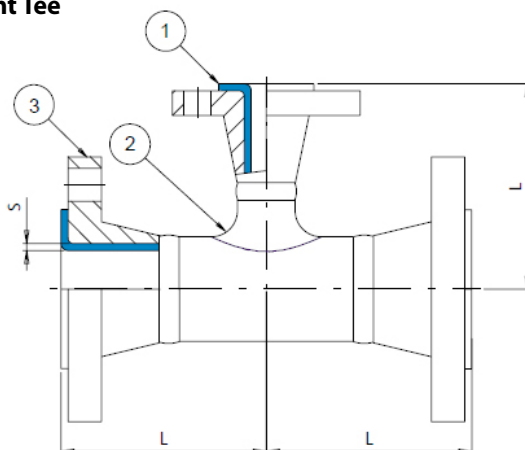
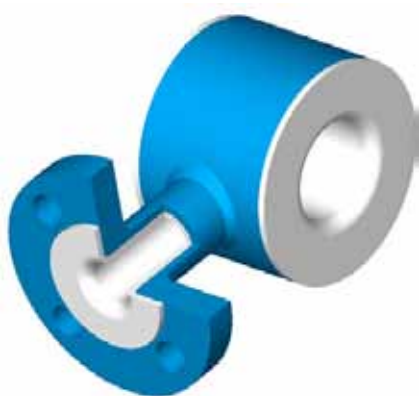
### Lined Reducing Tee

Cat No.	DN Inch	DN2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LRT-150350-25	14"	1"	356	6.0 / 3	169.0
Pex-LRT-150350-38		1 1/2"			173.0
Pex-LRT-150350-38		2"			175.0
Pex-LRT-150350-50		3"			186.0
Pex-LRT-150350-80		4"			191.0
Pex-LRT-150350-100		6"		204.0	
Pex-LRT-150350-150		8"		293.0	
Pex-LRT-150350-200		10"		299.0	
Pex-LRT-150350-300		12"		307.0	
Pex-LRT-150400-25		16"		1"	305
Pex-LRT-150400-38	1 1/2"		231.0		
Pex-LRT-150400-50	2"		233.0		
Pex-LRT-150400-80	3"		244.0		
Pex-LRT-150400-100	4"		250.0		
Pex-LRT-150400-150	6"		263.0		
Pex-LRT-150400-200	8"		291.0		
Pex-LRT-150400-250	10"		355.0		
Pex-LRT-150400-300	12"		359.0		
Pex-LRT-150400-350	14"		373.0		
Pex-LRT-150450-25	18"	1"	419	6.0 / 3	303.0
Pex-LRT-150450-38		1 1/2"			307.0
Pex-LRT-150450-50		2"			309.0
Pex-LRT-150450-80		3"			319.0
Pex-LRT-150450-100		4"			323.0
Pex-LRT-150450-150		6"		338.0	
Pex-LRT-150450-200		8"		372.0	
Pex-LRT-150450-250		10"		443.0	
Pex-LRT-150450-300		12"		455.0	
Pex-LRT-150450-350		14"		465.0	
Pex-LRT-150450-400	16"	473.0			

## Lined Reducing Tee

Cat No.	DN Inch	DN2 Inch	L mm	Pex Lining Thickness	Weight			
Pex-LRT-150500-25	20"	1"	457	6.0 / 3	279.0			
Pex-LRT-150500-38		1 1/2"			283.0			
Pex-LRT-150500-50		2"			286.0			
Pex-LRT-150500-80		3"			294.0			
Pex-LRT-150500-100		4"			299.0			
Pex-LRT-150500-150		6"		6.0	313.0			
Pex-LRT-150500-200		8"		6.0	343.0			
Pex-LRT-150500-250		10"		7.0	413.0			
Pex-LRT-150500-300		12"			421.0			
Pex-LRT-150500-350		14"			429.0			
Pex-LRT-150500-400		16"			439.0			
Pex-LRT-150500-450		18"			447.0			
Pex-LRT-150600-25		24"			1"	500	6.0 / 3	363.0
Pex-LRT-150600-38					1 1/2"			367.0
Pex-LRT-150600-500	2"		370.0					
Pex-LRT-150600-80	3"		377.0					
Pex-LRT-150600-100	4"		383.0					
Pex-LRT-150600-150	6"		6.0	396.0				
Pex-LRT-150600-200	8"		6.0	427.0				
Pex-LRT-150600-250	10"		7.0	533.0				
Pex-LRT-150600-300	12"			543.0				
Pex-LRT-150600-350	14"			553.0				
Pex-LRT-150600-400	16"			567.0				
Pex-LRT-150600-450	18"			577.0				
Pex-LRT-150600-500	20"			589.0				

## Lined Instrument Tee



## Materials

1 - Lining Pex ASTM D1998-04

2 - St 37.0 - DIN 1629

3 - Body St 37.0 - DIN 1629

Table No. 27.19: **ANSI B16.5 - Class 150#**

Cat No.	DN 1 Inch	DN 2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LIT-15025-25	1"	1"	50	4.0	2.2
Pex-LIT-15032-25	1 1/4"	1"	50	4.0	2.5
Pex-LIT-15038-12	1 1/2"	1/2"	50	4.0	2.4
Pex-LIT-15038-19		3/4"			2.6
Pex-LIT-15038-25		1"			2.8
Pex-LIT-15038-38		1 1/2"	75		4.4
Pex-LIT-15050-25	2"	1"	50	4.0	3.6
Pex-LIT-15050-38		1 1/2"	75		6.2
Pex-LIT-15050-50		2"	90		8.1
Pex-LIT-15062-25	2 1/2"	1"	50	4.0	3.9
Pex-LIT-15062-38		1 1/2"	75		7.2
Pex-LIT-15062-50		2"	90		9.8

Standard Version: Two fixed flanges available on request:

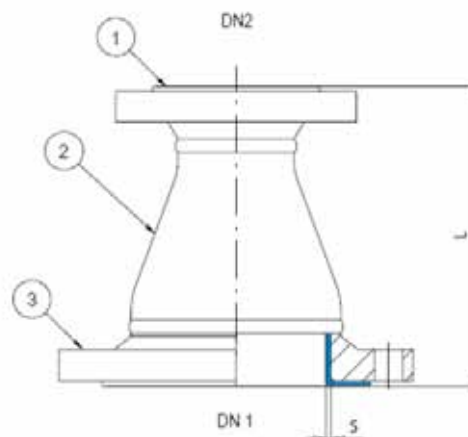
- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Instrument Tee

Cat No.	DN 1 Inch	DN 2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LIT-15080-25	3"	1"	50	4.0	4.7
Pex-LIT-15080-38		1 1/2"	75		8.3
Pex-LIT-15080-50		2"	90		12.6
Pex-LIT-150100-25	4"	1"	50	4.0	5.9
Pex-LIT-150100-38		1 1/2"	75		8.9
Pex-LIT-150100-50		2"	90		16.0
Pex-LIT-150100-80		3"	130		24.5
Pex-LIT-150150-25	6"	1"	50	4.0	8.2
Pex-LIT-150150-38		1 1/2"	75		14.7
Pex-LIT-150150-50		2"	90		21.8
Pex-LIT-150150-80		3"	130		30.1
Pex-LIT-150200-25	8"	1"	50	4.0	10.5
Pex-LIT-150200-38		1 1/2"	75		17.8
Pex-LIT-150200-50		2"	90		23.3
Pex-LIT-150200-80		3"	130		33.3
Pex-LIT-150100-25	10"	1"	50	4.0	13.7
Pex-LIT-150100-38		1 1/2"	75		23.3
Pex-LIT-150100-50		2"	90		26.0
Pex-LIT-150100-80		3"	160		36.7
Pex-LIT-150100-25	12"	1"	50	4.0	43.0
Pex-LIT-150100-38		1 1/2"	75		55.5
Pex-LIT-150100-50		2"	90		62.0
Pex-LIT-150100-80		3"	160		69.0
Pex-LIT-150100-25	14"	1"	50	4.0	53.1
Pex-LIT-150100-38		1 1/2"	75		66.5
Pex-LIT-150100-50		2"	90		73.7
Pex-LIT-150100-80		3"	160		103.0
Pex-LIT-150100-25	16"	1"	90	4.0	59.0
Pex-LIT-150100-38		1 1/2"	110		74.0
Pex-LIT-150100-50		2"	120		83.0
Pex-LIT-150100-80		3"	160		116.7
Pex-LIT-150100-25	18"	1"	90	4.0	68.5
Pex-LIT-150100-38		1 1/2"	110		90.5
Pex-LIT-150100-50		2"	120		93.7
Pex-LIT-150100-80		3"	160		129.7
Pex-LIT-150100-19	20"		90	4.0	X
Pex-LIT-150100-25		1"			72.0
Pex-LIT-150100-38		1 1/2"	110		89.7
Pex-LIT-150100-50		2"	120		100.0
Pex-LIT-150100-80		3"	160		137.0
Pex-LIT-150100-25	24"	1"	90	4.0	79.1
Pex-LIT-150100-38		1 1/2"	110		94.5
Pex-LIT-150100-50		2"	120		107.5
Pex-LIT-150100-80		3"	160		150.0



## Lined Concentric Reducer



## Materials

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

Table No. 27.24: ANSI B16.5 - Class 150#

Cat No.	DN 1 Inch	DN 2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LCR-15032-25	1 1/4"	1"	114	3.0	3.0
Pex-LCR-15038-19	1 1/2"		114	X	3.1
Pex-LCR-15038-25		1"		3.0	3.3
Pex-LCR-15050-25	2"	1"	127	3.0	4.1
Pex-LCR-15050-38		1 1/2"			4.8
Pex-LCR-15062-25	2 1/2"	1"	140	3.0	5.8
Pex-LCR-15062-50		2"			6.9
Pex-LCR-15080-25	3"	1"	152	4.0 / 3	6.7
Pex-LCR-15080-38		1 1/2"			6.2
Pex-LCR-15080-50		2"			6.9
Pex-LCR-150100-25	4"	1"	178	4.0 / 3	9.9
Pex-LCR-150100-38		1 1/2"			9.3
Pex-LCR-150100-50		2"			9.8
Pex-LCR-150100-80		3"			12.4

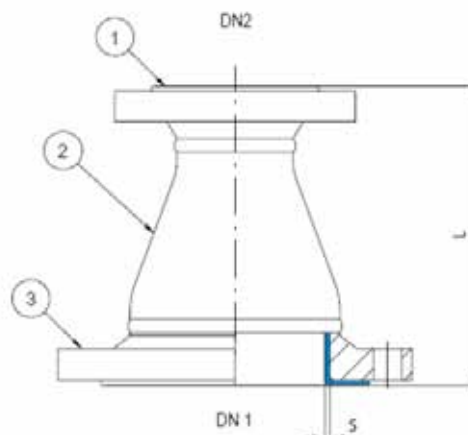
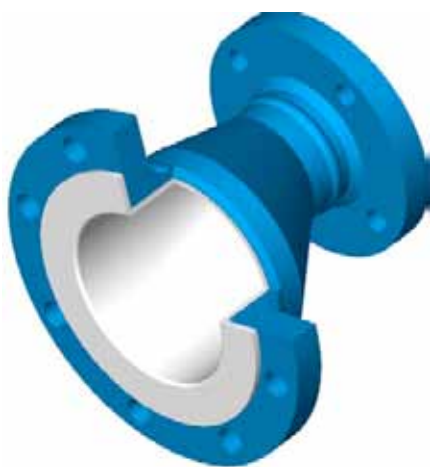
Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Concentric Reducer

Cat No.	DN 1 Inch	DN 2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LCR-150125-50	5"	2"	203	4.5 / 3.5	10.5
Pex-LCR-150125-80		3"			12.7
Pex-LCR-150125-100		4"			15.0
Pex-LCR-150150-25	6"	1"	229	4.5 / 3.0 5.0 / 4.0	18.9
Pex-LCR-150150-50		2"			19.9
Pex-LCR-150150-80		3"			17.4
Pex-LCR-150150-100		4"			18.3
Pex-LCR-150200-100	8"	4"	279	6.0	22.0
Pex-LCR-150200-150		6"			25.3
Pex-LCR-150250-100	10"	4"	305	6.0	33.0
Pex-LCR-150250-150		6"			37.5
Pex-LCR-150250-200		8"			44.7
Pex-LCR-150300-150	12"	6"	356	7.0	45.9
Pex-LCR-150300-200		8"			47.8
Pex-LCR-150300-250		10"			52.5
Pex-LCR-150350-200	14"	8"	406	7.0	69.0
Pex-LCR-150350-250		10"			73.5
Pex-LCR-150350-300		12"			80.0
Pex-LCR-150400-250	16"	10"	457	7.0	98.0
Pex-LCR-150400-300		12"			105.0
Pex-LCR-150400-350		14"			115.0
Pex-LCR-150450-300	18"	12"	483	7.0	135.0
Pex-LCR-150450-350		14"			148.0
Pex-LCR-150450-400		16"			157.0
Pex-LCR-150500-300	20"	12"	508	7.0	185.0
Pex-LCR-150500-350		14"			198.0
Pex-LCR-150500-400		16"			210.0
Pex-LCR-150500-450		18"			218.0
Pex-LCR-150600-400	24"	16"	610	7.0	272.0
Pex-LCR-150600-450		18"			282.0
Pex-LCR-150600-500		20"			291.0

## Lined Excentric Reducer



## Materials

- 1 - Lining Pex ASTM D1998-04
- 2 - St 37.0 - DIN 1629
- 3 - Body St 37.0 - DIN 1629

Table No. 27.27: ANSI B16.5 - Class 150#

Pex-Cat No.	DN 1 Inch	DN 2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LECR-15038-25	1 1/2"	1"	114	3.0	3.0
Pex-LECR-15050-25	2"	1"	127	3.0	4.0
Pex-LECR-15050-38		1 1/2"			4.3
Pex-LECR-15080-25	3"	1"	152	4.0 / 3	6.7
Pex-LECR-15080-38		1 1/2"			6.2
Pex-LECR-15080-50		2"			6.9
Pex-LECR-150100-38	4"	1 1/2"	178	4.5 / 3.5	9.3
Pex-LECR-150100-50		2"			9.8
Pex-LECR-150100-80		3"			12.4
Pex-LECR-150150-50	6"	2"	229	5.0 / 4.0	15.6
Pex-LECR-150150-80		3"			17.0
Pex-LECR-150150-100		4"			18.7
Pex-LECR-150200-100	8"	4"	279	6.0	22.0
Pex-LECR-150200-150		6"			28.0

Standard Version: Two fixed flanges available on request:

- One or Two loosed flanges
- ANSI B16.5 Class 300 flanges
- Stainless steel body and flanges 304/316
- Different Lengths (L)

## Lined Excentric Reducer

Pex-Cat No.	DN 1 Inch	DN 2 Inch	L mm	Pex Lining Thickness	Weight
Pex-LECR-150250-100	10"	4"	305	6.0	33.0
Pex-LECR-150250-150		6"			37.5
Pex-LECR-150250-200		8"			44.7
Pex-LECR-150300-150	12"	6"	356	7.0	45.9
Pex-LECR-150300-200		8"			47.8
Pex-LECR-150300-250		10"			52.5
Pex-LECR-150350-200	14"	8"	406	7.0	69.0
Pex-LECR-150350-250		10"			73.5
Pex-LECR-150350-300		12"			80.0
Pex-LECR-150400-250	16"	10"	457	7.0	98.0
Pex-LECR-150400-300		12"			105.0
Pex-LECR-150400-350		14"			115.0
Pex-LECR-150450-300	18"	12"	483	7.0	135.0
Pex-LECR-150450-350		14"			148.0
Pex-LECR-150450-400		16"			157.0
Pex-LECR-150500-300	20"	12"	508	7.0	185.0
Pex-LECR-150500-350		14"			198.0
Pex-LECR-150500-400		16"			210.0
Pex-LECR-150500-450		18"			218.0
Pex-LECR-150600-500	24"	20"	610	7.0	291.0

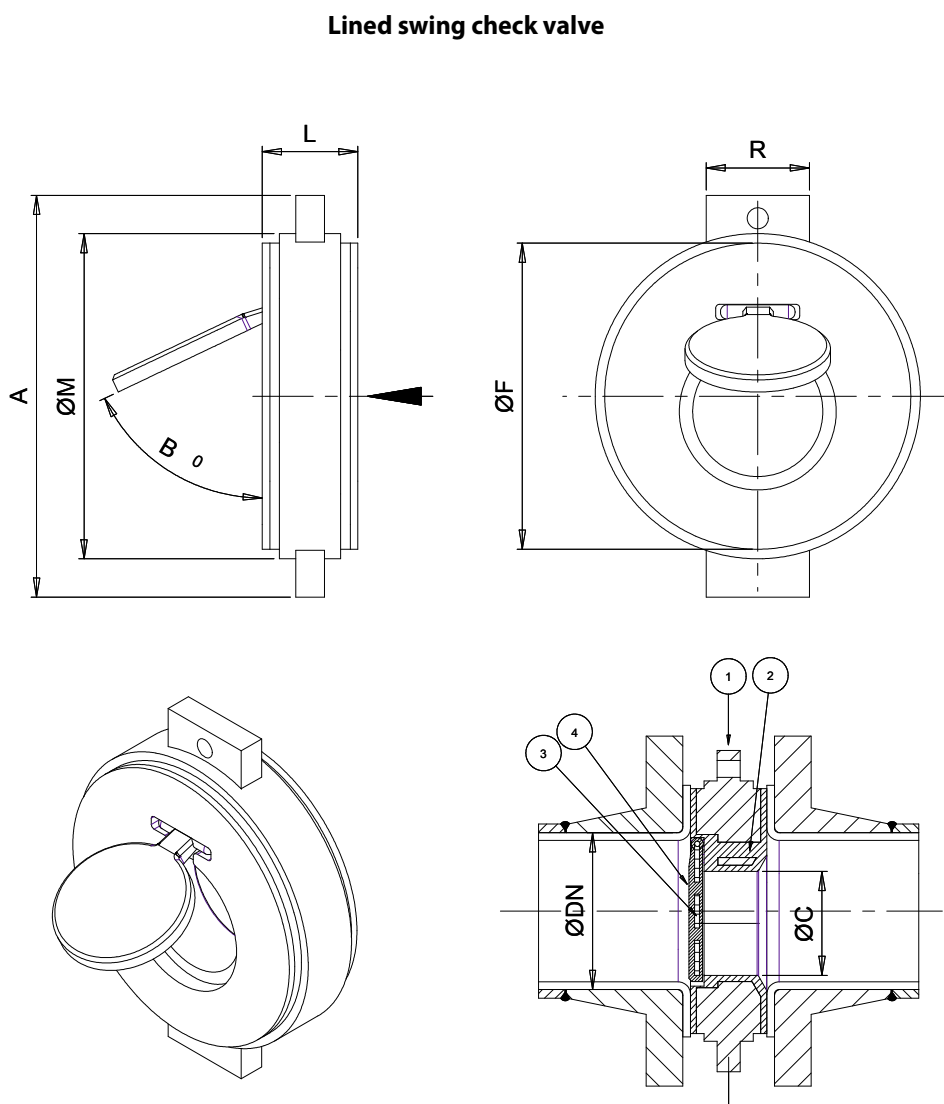


Table No. 27.30

DN	L	C	A	M	B	R
50	43	26	140	100	62	65
80	46	45	170	135	65	85
100	52	65	208	170	65	55
150	56	104	270	220	65	70
200	60	145	320	275	65	90
250	68	185	400	335	65	70
300	78	230	470	405	65	95
350	78	252	510	445	65	95
400	102	300	575	510	65	95

In order to adjust the ID of the Swing Check Valve to the ID of the PEXGOL pipe, you can order the PEXGOL special reducers/adaptors cat.no.65900040 (see page 38) in Custom-made dimensions. Please consult.

## Flanged Coupler for PEXGOL pipes

Available sizes from diameters 63mm to 630mm.

The couplers can be used for the full range of temperatures and pressures, same as the PEXGOL pipes. PEXGOL flanged couplers consist of either two halves or four quarters depending on the pipe size.

The body of the coupler is made of spheroidal cast iron GGG40 (ASTM A-536).

Installing the coupler is easy!

The coupler is placed around the pipe and fastened by screws. The inner surface of the coupler has special stainless steel teeth.

These teeth penetrate into the pipe wall during tightening of the coupler and provide good anchoring onto the pipe, preventing the pipe from pulling out from the fitting.

Before final torquing of the nuts, turn the coupler around the pipe until it is aligned with the opposite flange.

The sealing gasket seals between the coupler and the pipe, and also between the coupler and the opposite flange. The gasket is designed so that the coupler does not come into contact with the liquid flowing through the pipe.

The standard gasket is made of EPDM; other materials can be supplied according to special order.

The flange has oval holes designed to fit most International standards; see table.



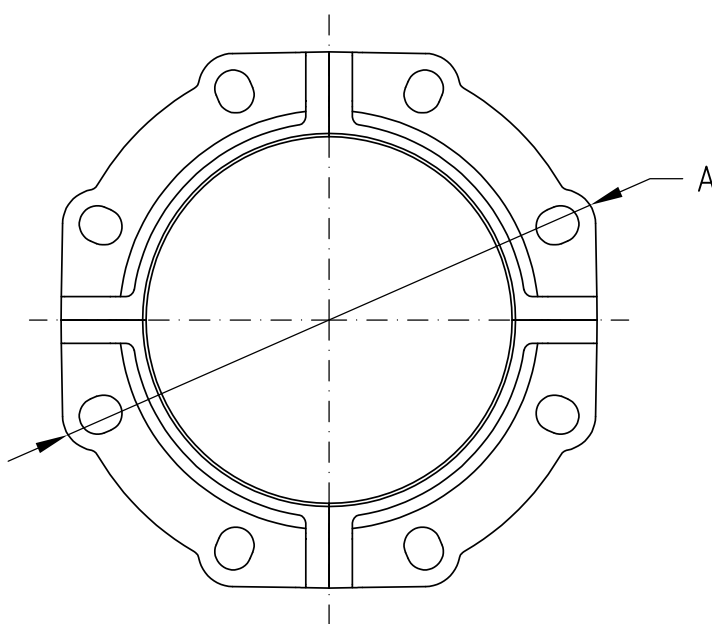
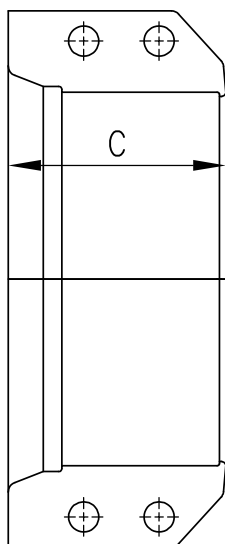
Table No. 28.1: **Compatibility with International Flange Standards**

Cat. No.	pipe OD (mm)	Nominal diameter		DIN			ANSI			BSTD
		DN (mm)	Inch	2632	2633	2634	125	150	300	
				10	16	25				
50806320	63	50	2	V	V	V	V	V	V	-
50807525	75	65	2 1/2	V	V	-	V	V	-	-
50809030	90	80	3	V	V	V	V	V	V	-
50811040	110	100	4	V	V	V	V	V	V	V
50816060	160	150	6	V	V	-	V	V	-	V
50820080	200	200	8	V	-	-	V	V	-	V
50822580	225	200	8	V	V	-	V	V	-	V
50825010	250	250	10	V	V	-	V	V	-	-
50928010	280 ASA		10	-	V	-	V	V	-	-
50828010	280 BS	250		-	-	-	-	-	-	V
50831512	315	300	12	-	V	-	V	V	-	V
50835514	355	350	14	-	-	-	V	V	-	V
50840016	400	400	16	-	-	-	V	V	-	-
50845018	450	450	18	-	-	-	V	V	-	-
50850020	500	500	20	V	V	-	V	V	-	-
50863024	630	630	24	-	-	-	V	V	-	-

Table No. 28.2: **General Dimensions of flanged couplers**

Cat. No.	outside diameter of pipe (mm)	Nominal diameter		A	C	Bolt size (in)	Bolt length (mm)*	No.of bolts	Weight No.
		DN	Inch						
50806320	63	50	2	165	70	5/8	50	4	2.7
50807525	75	65	2 1/2	185	80	5/8	50	4	2.5
50809030	90	80	3	208	96	5/8	50	4	4.0
50811040	110	100	4	242	110	5/8	50	8	6.5
50816060	160	150	6	285	120	3/4	60	8	11.2
50820080	200	200	8	348	130	3/4	60	8	13.0
50822580	225	200	8	344	130	3/4	60	8	12.4
50825010	250	250	10	410	150	7/8	70	12	17.0
50928010	280 ASA		10	405	160	7/8	70	12	20.0
50828010	280 BS	250		405	160	7/8	70	8	20.0
50831512	315	300	12	475	180	7/8	70	12	27.7
50835514	355	350	14	535	200	1	75	12	40.0
50840016	400	400	16	600	215	1	75	16	55.0
50845018	450	450	18	635	235	1 1/8	100	16	65.0
50850020	500	500	20	715	280	1 1/8	100	20	75.0
50863024	630	630	24	840	280	1 1/4	100	20	75.0

\* For connecting to flanged couplers



## Branch-Off Saddles

“Branch-off” saddles are designed for side outlets of a maximum diameter equaling half of the main pipe’s diameter. They are made from plastic or metal.

PEXGOL pipes can be used with plastic saddles such as PLASSON saddles or electrofusion saddles, with restrictions regarding the allowable temperature and pressure range, according to Golan’s recommendations for PEXGOL pipe connections.

Golan’s metal saddles are suitable for the full temperature and pressure ranges of PEXGOL pipes. Brass saddles with threaded outlets are used for pipes from 32mm up to 160mm diameter (see the instructions page for the installation of saddles).

For diameters bigger than 110mm, stainless steel saddles with threaded or flanged outlets (according to standard requirements) are available.

All metal saddles are suitable for use in piping that conveys drinking water.

Saddles with internal rubber lining at the flange outlet are available for corrosive materials that might damage the stainless steel saddles. Golan supplies these saddles on special request.

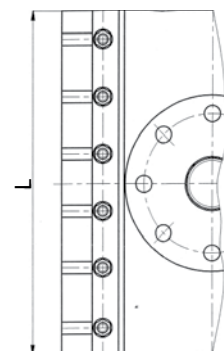
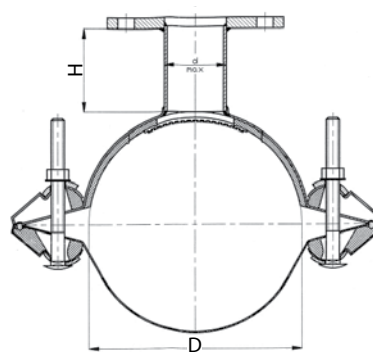




Table No. 29.1: Dimensions of PEXGOL Stainless Steel  
Branch - Off Saddles ASA 150 Flanged Outlet

Cat No.	OD [D] and flange	H (mm)	L (mm)	Weight (kg)
46811002	110*2"	120	225	5.5
46811003	110*3"	120	225	6.3
468916002	160*2"	120	300	7.0
46816003	160*3"	120	300	9.0
46816004	160*4"	120	300	9.5
46820002	200*2"	120	375	14.0
46820003	200*3"	120	375	15.0
46820004	200*4"	120	375	15.0
46822502	225*2"	120	375	15.0
46822503	225*3"	120	375	15.6
46822504	225*4"	120	375	16.0
46822506	225*6"	150	375	19.0
46825002	250*2"	120	450	16.0
46825003	250*3"	120	450	17.0
46825004	250*4"	120	450	18.0
46825006	250*6"	150	450	20.0
46928002	280*2"	120	450	17.0
46928003	280*3"	120	450	18.0
46928004	280*4"	120	450	20.0
46828006	280*6"	150	450	23.0
46831502	315*2"	120	450	18.0
46831503	315*3"	120	450	20.0
46831504	315*4"	120	450	21.0
46831506	315*6"	150	450	23.0
46831508	315*8"	150	450	28.0
46835502	355*2"	120	450	19.0
46835503	355*3"	120	450	21.0
46835504	355*4"	120	450	22.0
46835506	355*6"	150	450	25.0
46835508	355*8"	150	450	29.0
46840003	400*3"	120	525	23.0
46840004	400*4"	120	525	23.0
46840006	400*6"	150	525	26.0
46840008	400*8"	150	525	30.0
46845003	450*3"	120	525	24.0
46845004	"450x4	120	525	24.0
46845006	"450x6	150	525	27.0
46845008	"450x8	150	525	31.0
46850003	"500x3	120	525	26.0
46850004	"500x4	120	525	26.0
46850006	"500x6	150	525	28.0
46850008	"500x8	150	525	32.0
46863003	"630x3	120	525	29.0
46863004	"630x4	120	525	30.0
46863006	"630x6	150	525	32.0
46863008	"630x8	150	525	36.0

### Performing pressure tests in PEXGOL water supply lines

1. Test purpose: Final check for pipe and fittings to ensure there are no leakages.
2. Test procedure:
  - 2.1 On the day before the test, the pipeline can be filled up with water at the maximum working pressure of the pipeline.
  - 2.2 On the day of the test, check the pipeline visually, especially around the fittings.
3. Attention!
  - 3.1 Metal fittings (flanged couplings, branch-off saddles) should be temporarily covered, to prevent excessive heat buildup due to exposure to sunlight.
  - 3.2 For installation above the ground, lower test pressures (according to the table) must be used, as the pipe may be heat up due to exposure to sunlight.
  - 3.3 Changes in the pipeline topography (which could create higher local pressure due to a water column) should be considered and the test pressure should be reduced accordingly.
4. Pressure testing:
  - 4.1 Bring up the pressure to the test pressure (see table) and then close the feeding line.
  - 4.2 As the pipe is flexible and tends to increase its diameter under pressure, the line pressure decreases to 10-20% of the test pressure.
  - 4.3 The line pressure should be increased again, up to the test pressure.
  - 4.4 With each cycle of pressure reduction and repressurization the pressure is expected to decrease less.
5. After 3-4 cycles, the pressure should be rapidly lowered to 75% of the working pressure by letting water out of the line.
- 6.1 After closing the valve, the pressure should increase as the result of the tendency of the pipe to decrease its volume.
- 6.2 If the pressure decreases instead of increases investigate for the reason for pressure loss, for example, leakages at the fittings.

Table No. 30.1: **Test pressures**

Pipe class	Test pressure	
	Underground	Above ground
10	12	7
12	14	8.5
15	18	11
24	29	17

### Repair Instructions of PEXGOL pipe in water lines. Diameters: 63mm to 500mm

PEXGOL pipes may be damaged as a result of uncaredful digging.

1. Small hole, up to 5 cm diameter:
  - 1.1 Uncover the pipe, 2 meters along the pipe and 0.5 meter below the pipe.
  - 1.2 Carefully clean the soil from the pipe and make ensure no scratches extend beyond the repair area.
  - 1.3 Use a repair fitting, supplied by Golan or a branch-off saddle.
2. Large hole need
  - 2.1 Uncover the pipe, 3 meters along the pipe, 0.5 meters below the pipe.
  - 2.2 Cut out the section of the pipe with the hole and replace with a new section.
  - 2.3 In most cases the maximum length of the section to replace does not exceed 1 meter in length.
  - 2.4 The new section will be connected by:
    - 2.4.1 Two electrofusion repair couplers.
    - 2.4.2 Four golan flanged couplers.
    - 2.4.3 Two PLASSON mechanical couplers (for pipes up to 160mm).
3. Only technicians trained by Golan's field service personnel are authorized to perform the repair.
4. Stop water flow using of common squeeze-off techniques.

## Chemical Resistance

The PEXGOL Chemical Resistance List is based on information included in the professional literature. The list is only intended as a guide.

Changes in the composition of the medium or special working conditions could lead to deviations. Consult the experts of Golan Plastic Products in each specific case.

## CHEMICAL RESISTANCE test for PEXGOL pipes

1. The following procedure is an initial test for the chemical resistance of PEXGOL pipes.
  - 1.1. Each combination of service conditions (service temperature, chemical concentration) constitutes a different case.

However, for the same pipeline, the worst case is usually the highest temperature and the highest concentration.
2. The tested items are DUMBBELLS (also called "dogbones" or "coupons") made from PEXGOL pipes.
3.
  - 3.1. The dumbbells are immersed in the same material transported through the pipeline (same chemical composition and same temperature) for a period of 4 weeks.
  - 3.2. After 2 weeks, 10 dumbbells are removed and stored.
  - 3.3 After an additional 2 weeks, the other 10 dumbbells are removed.
  - 3.4. The two groups of dumbbells are packed separately and the packages are marked appropriately to identify the removal and storage conditions.
  - 3.5. The packages are to be sent to Golan for tensile testing.

## Classification

- A. Resistant. Can be used within the working pressures.
- B. Conditionally resistant. Restrictions must be made as regards pressures.
- C. Conditionally resistant. Can be used within pressures up to 60% of the working pressures.
- D. Conditionally resistant. Can be used within pressures up to 20% of the working pressures.
- U. Not recommended.

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Accumulator Acid	A	A	A	
Acetaldehyde 40%	A	A		B
Acetaldehyde 100%	U			
Acetamide	A	A	A	
Acetic Acid 05%	A	A		
Acetic Acid 10%	A	A		
Acetic Acid 20%	A	A		
Acetic Acid 50%	A	A		
Acetic Acid 60%	A	A		
Acetic Acid 80%	A	A		
Acetic Acid Ethyl Ester	A	A		
Acetic Anhydride	A	D		
Acetoacetic Acid	A			
Acetone	C			
Acetophenone			B	
Acetyl Bromide	U			
Acetyl Chloride			B	
Acetylene	A	A	A	
Acetylene Dichloride	see Dichloro-ethylene			
Acid mixture H2SO4-HNO3-H2O	U			
Acid mixture H2SO4-H3PO4-H2O		B		
Acrylic emulsions	A			
Acroline dispersion	A			
Acroline solution	B			
Acronal	C			
Acrylonitrile	A	A	A	
Acrylic Acid	A	A		
Adipic Acid	A	A	A	
Air	A	A	A	
Aktivin	A	A		
Alcohol	see Ethylalcohol			
Aliphatic Esters	A	A	A	
Allyl Acetate	A	C		
Allyl Alcohol 7%	A	A	A	U
Allyl Alcohol 95%	A			
Allyl Aldehyde	see Acroline			
Allyl Chloride	C	U		
Alum	A	A	A	B
Aluminium Acetate	A	A	A	
Aluminium Chloride	A	A	A	
Aluminium Fluoride	A	A	A	
Aluminium Hydroxide	A	A	A	
Aluminium Metaphosphate	A	A		
Aluminium Nitrate sol.	A	A	A	
Aluminium Phosphate	A	A	A	
Aluminium Potassium Phosphate	A	A	A	
Aluminium Potassium Sulphate	A	A	A	A
Aluminium Sodium Sulphate sol.	A	A	A	

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Aluminium Sulphate	A	A	A	
Amino Acids	A	A		B
Aminoacetic Acid	B	B		
Ammonia Aqueous	A	A	A	
Ammonia, dry gas	A	A	A	
Ammoniacal Liquor	A	A		
Ammonium Acetate	A	A	A	
Ammonium Aluminium Sulphate	A	A		
Ammonium Bromide	B	B		
Ammonium Carbonate	A	A	A	
Ammonium Chloride	A	A	A	
Ammonium Fluoride 20%	A	A	A	
Ammonium Hydrogen Carbonate	A	A	A	
Ammonium Hydrogen Sulphide	A	A	A	
Ammonium Hydroxide	A	A	A	
Ammonium Metaphosphate	A	A	A	
Ammonium Molybdate	A		B	
Ammonium Nitrate	A	A	A	
Ammonium Persulphate	A	A	A	
Ammonium Phosphate	A	A	A	
Ammonium Sulfide	A	A	A	
Ammonium Sulphate	A	A	A	
Ammonium Sulphocyanide	A			
Ammonium Thiocyanate	A	A	A	
Amyl Acetate	A	A		
Amyl Alcohol	A	A	A	
Amyl Chloride	U	A		
Amyl Methyl Carbinol	B	A	A	
Amyl Naphthaline	B	C		
Amyl Phthalate	A	B	A	
Aniline Hydrochloride	D			
Aniline Sulphate	U			
Aniline, coloured	see Aniline	A	A	
Aniline, pure	A	A		
Aniline, water soluble	B	A	A	U
Animal Fats	A	A	A	
Animal Oils	B	B	B	
Anis Oil	B	U		
Aniseed Oil	C	U	A	B
Anisole	see Cyclohexanone	A	A	
Antifreeze solution	A	A	A	
Antimony Pentachloride	A	A	A	
Antimony Trichloride	A	A	A	
Anthraquinone Sulphonic Acid	A	A		
Aqua regia	U	A	A	
Aromatic Acids	A	A	A	
Aromatic Hydrocarbons	U	A	z	
Arsenic	B	B	A	A
Arsenic Acid 80%	A	A	A	

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Arsenic Acid Anhydride	A	A	A	
Arsenic Salts	A	A		B
Arsenic Trichloride	U			
Ascorbic Acid	A	A	A	
Asphalt	A	C		
ASTM Oil no. 1	A	A	A	
ASTM Oil no. 2	A	A	A	
ASTM Oil no. 3	A	A	A	
Atropine Sulphate	A	A		
Barium Carbonate	A	A	A	
Barium Chloride	A	A	A	
Barium Hydrosulphide, Bone Oil		B		
Barium Hydroxide	A	A	A	
Barium Salts	A	A		
Barium Sulphate	A	A	A	
Barium Sulphide	A	A	A	
Battery Acid	A	B	B	
Beater Glues	A	A	A	
Beer Colours	A	A	A	
Beer, trading quality	A			
Beet Juice	A	A		
Benzaldehyde 0.1%			C	
Benzaldehyde 100%	A	C		
Benzaldehyde Oxime 2%	A			
Benzaldoxime	see Benzaldehyde Oxime			
Benzene (Benzole)	D	U	A	
Benzene Carbonic Acid	see Bensoic Acid	A		
Benzene Dicarboxic Acid	see Phthalic Acid	A	A	
Benzene Sulphonic Acid	A		B	
Benzoic Acid	A	A	B	
Benzole Carbon Acid	see Bensoic Acid	A		
Benzole Dicarboxic Acid	see Phthalic Acid			
Benzole Sulphonic Acid	U	A	A	
Benzyl Acetate	B	C		
Benzyl Alcohol	A	A	B	
Benzyl Benzoate		B		
Benzyl Chloride	A			
Bichromate Sulfuric Acid	B	U		
Bismuth Carbonate	A	A	A	B
Bisulfite	see Sodium Bisulfite	A	A	
Bitumen	A	C	A	
Black Liquor	B	B	A	
Bleach	D	U	A	
Bleach Lye 10%	B	B		
Bloodstream Salt, red	see Potassium Ferricyanide	A	A	
Bloodstream Salt, yellow	see Potassium Ferricyanid	A	A	
Bone Oil	A	A	A	
Bonewax	A		U	A
Borax	see Sodium Tetraborate	A	A	
Boric Acid	A	A	A	
Boric Acid Methyl Ester	B	U		
Boric Copper Sulphate	A			
Boric Trifluoride	A			
BoronTrifluoride	A	D		
Brake Fluids	A	A	A	
Brandy	A			
Brines, saturated	A	A		
Brom Oil	A		B	
Bromate Solution	A	A		

Compound	Chemical Resistance			
	40°C	60°C	80°C	
Bromoethane	U	A	A	
Bromic Acid	A	A	A	B
Bromine Vapours, low conc.	B			
Bromine Water	U	A	A	
Bromine, Liquid	U	C		
Bromochloromethane	U	A	A	
Butadiene 50%	A	A	A	
Butadiene 100%		B	A	
Butane (gas)	U	A		
Butanediol up to 10%	A	A	A	
Butanediol up to 100%	B	A	A	
Butanetriol	A	A		
Butanol 100%	A	A	A	
Butanone	A	U		
Butene	U	A	A	
Butoxyl	A	C	A	
Butter	A		B	
Butter Acid	C	A	A	
Butter Acid in water, conc.	C	A	A	
Butter Acid in water, sol. 20%	C			
Butyl Acetate	A	B	C	
Butyl Acrylate	A	B	C	
Butyl Alcohol	see Butanol	C		
Butyl Aldehyde	A		B	
Butyl Benzyl Phthalate	A	A		
Butyl Carbinol			B	
Butyl Cellulose solution	U	A		
Butyl Phenol	U	A	A	
Butyl Stearate	A	A	A	
Butylene	see Butene	A	B	
Butylene Glycol	see Butanediol	A		
Butyric Acid	C	D		
Cadmium Salts	A	A	A	
Caffeine Citrate	B	B		
Calcium Acetate	A	A	A	
Calcium Bisulphide	A	B		
Calcium Bisulphite	A	A	A	
Calcium Bromide 50%	A	A		
Calcium Bromide 80%	A	A	A	B
Calcium Carbide	A	A	A	
Calcium Carbonate (Soda)	A	A	A	
Calcium Chlorate	A	A	A	
Calcium Chloride	A	A	A	B
Calcium Hydrosulphite	B	B		
containing SO2	A	A	A	
Calcium Hydroxide	A	A	A	
Calcium Hypochlorite	A	A	A	
Calcium Nitrate	A	A	A	A
Calcium Oxide	A	A	A	
Calcium Phosphate	A	A	A	
Calcium Sulphate	A	A	A	
Calcium Sulphide			B	
Calcium Water	A			
Camphor	C			
Cane Sugar	A	A	A	
Cane Sugar Juice	A	A	A	
Carbamide 33%	A	A	A	
Carbazole	A	A	B	
Carbolic Acid	A	B		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Carbolic Acid (Phenol)	A	A		
Carbolineum	A	C		
Carbon Bisulfide	U			
Carbon Dioxide	A	A	A	
Carbon Dioxide damp	A	A	A	U
Carbon Dioxide dry	A	A	A	A
Carbon Disulphide		D	U	
Carbon Monoxide - lamp gas	A	A	A	
Carbon Tetrachloride		D	U	
Carbonic Acid H <sub>2</sub> CO <sub>3</sub>	A	A		
Carnbevox	A			
Carrot Juice	A	A		
Castor Oil	A	B		
Caustic Potash	A	A		
Caustic Soda	see Sodium Hydroxide			
Cedar Leaf Oil	D			
Cedar Wood Oil	D			
Cellulose dissolver	aa Ethylene Glycol Monoethyl Ether			
Cetyl Alcohol	A	A	B	
Chalk	A	A	A	
Cheese Enzyme	A	A	A	
Chloral Hydrate	A	A	A	
Chloramine	A	A	A	
Chloramine T	see Paratoulene Sulpho- Chlor			
Chloride Acid	see Hydrochloric Acid			
Chlorine water 10 PPM	A	A		
Chlorine water sturated	A		B	
Chlorine, damp gas	C	U		
Chlorine, dry gas	B		U	
Chlorine, liquid	U			
Chloro Acetic Acid Ethyl Ester	A	A		
Chloro Acetic Acid Methyl Ester	A	A		
Chloro Carbonic Acid	A	C		
Chloroacetic Acid 85%	B	B		
Chloroacetic Acid 98%	B			U
Chloroacetic Acid 100%		B		
Chlorobenzene	D	U		
Chlorocalcium (in H <sub>2</sub> O)	A	A	A	
Chloroethane	see Ethyl Chloride			
Chloroethanol	A	A	A	
Chloroethyl Alcohol	see Chloroethanol			
Chloroethyl Phosphate	A	A		
Chloroform	D	U		
Chloromethane	see Methyl Chloride			
Chloropicrin	U			
Chloropropane	see Glycerine Chlorhydrin			
Chlorosulfonic Acid	U			
Chrome Alum	A	A	A	
Chrome Anode Mud	A	A		
Chrome Mercury	B			
Chromic Acid 50%	A	A	A	
Chromic Acid 80%	A		B	
Chromic Acid Anhydride	see Chromium Trioxide			
Chromium Oxide	see Chromium Trioxide			
Chromium Salts	A			
Chromium Trioxide 20%	A	A	A	
Chromium Trioxide 50%			B	

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Chromium Trioxide 80%	A			
Chromo Sulfuric Acid	A	U		
Cider	A	B		
Cinnamon	B	C		
Cinnamon Oil	D			
Cis - Oxime	see Benzaldehyde Oxime			
Citric Acid	A			
Citronella	B	D		
Citrus Juices	A	A		
Cloves	C	C		
Coal Tar	D	U		
Cobalt Chloride	A	A	A	
Coca Cola	A	A		
Coca Cola Syrup	A	B		
Cocanut Oil Alcohols	B	C		
Cocoa Fat	A	A	A	
Cocoa Fat Alcohol	A	A	A	
Coconut Oil	A	B		
Cod Liver Oil	B	C		
Coffee	A			
Cognac	A			
Colanut, concentrated	A	A	A	
Cooking Salt	see Sodium Chloride			
Copper Acetate			B	
Copper Chloride (cupric)	A	A	A	
Copper Chloride (cuprous)	A	A	A	
Copper Cyanide	A	A	A	
Copper Fluoride	A	A	A	
Copper Nitrate	A	A	A	
Copper Salts	A	A		
Copper Sulphate	A	A	A	
Corn Oil	A	A	A	
Corn Syrup	A	A		
Cotton Seed Oil	A	B	C	
Coumarone Resins	A	A		
Cranberry Sauce	B	B		
Creosote	A	B		
Cresol 100%	A	C		
Cresol diluted	A	C		
Crop Protection Agent	A	A		
Croton Aldehyde	A	C		
Crude Oil	A	B	C	D
Cupric Salts	A			
Cuprous Chloride, saturated	B	B		
Cuprous Oxide	B	B		
Cyanides	A	A	A	
Cyclanone	A	A		
Cyclohexane	C	D		
Cyclohexanol	A			
Cyclohexanone	D	U		
Cyclohexyl Alcohol	A	B		
DDT	A	A		
Decahydro Naphthalene	B	C		
Decalin	A	C		
Defoamer	A	C		
Denatured Spirit	see Methyl Alcohol			
Deodorants	A	A		
Detergents	A	B		
Dextrine	A	A	A	
Dextrose	A	A	A	A

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Diacetone	A	A	A	
Diacetone Alcohol	A			
Diammonium Salts	A	A	A	
Diazo Salts	A	A		
Dibenzyl Ether			B	
Dibromoethane	D	U		
Dibutyl Ether	B	D		
Dibutyl Phthalate	B	C		
Dibutyl Sebacate	A	B	B	
Dichloroacetic Acid	A	A	A	
Dichloroacetic Acid Methylene Ester	A	A	A	
Dichlorobenzene	C	U		
Dichloroethane	see Ethyl Chloride			
Dichloroethylene	U			
Dichloromethane	see Methyl Chloride			
Dicyclohexamine			B	
Diesel Fuel	A			
Diesel Oil	A	B	C	
Diethylene Glycol Monobutylene	A			
Diethyl Benzene				B
Diethyl Ether	see Ethyl Ether			
Diethyl Ketone	B	C		
Diethyl Phthalate	A			
Diethylamine			B	
Diethylene Dioxide	see Dioxane			
Diethylene Glycol	A	A		
Diglycolic Acid	A	A	A	
Dihexyl Phthalate	A	A	A	
Diisobutylene			B	
Diisopropyl Ether	B	U		
Diisopropyl Ketone	A	A	A	
Dimethyl Amine	C	U		
Dimethyl Aniline			B	
Dimethyl Benzole	see Xylol			
Dimethyl Formamide	A	B		
Dimethyl Ketone	see Acetone			
Dimethyl Phthalate	A	A	A	
Dimethyl Sulphoxide	A	A		
Diocetyl Phthalate	B	C		
Diocetyl Sebacate			B	
Dioxalane			B	
Dioxane	A	B	C	
Dioxyethyl Ether	see Diethylene Glycol			
Diphenyl			B	
Diphenyl Amine	A	C		
Diphenyl Oxide	B	C		
Dishwash Detergents	A	A	B	
Disodium Phosphate	A	A		
Disodium Sulphate	A	A		
Dispersions	A			
Dodecylbenzene Sulfonic Acid	A	C		
Dop (Diethylhexyl Phthalate)	A	C		
Edible Oil	A			
Electrolyte 10%	A	A	A	
Elementine normal conc.	A	A	A	A
Emulsions, Photographic	A	A	A	
Engine Oils	A	C		
Ephetin	A	A		
Epichlorohydrin	A	A	B	

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Epoxy Ethane	see Ethylene Oxide			
Epsom Salts	A	A		
Essential Oils	C	U		
Esteric Oils	B	B	B	
Ethanal	see Acetaldehyde			
Ethandiol	see Ethylene Glycol			
Ethane	A	A		
Ethane Diamine	see Ethylene Diamine			
Ethanol	see Ethyl Alcohol			
Ethanolamine	A	A	B	
Ethers	C	D	U	
Ethoxyethane	see Ethyl Ether			
Ethyl Acetate	A	B	C	
Ethyl Alcohol	A	A	A	B
Denaturated with 2% Toluol plus Acetic Acid, quality use	A			
Ethyl Benzene	D	U		
Ethyl Benzoate	B			
Ethyl Carbitol			B	
Ethyl Cellulose			B	
Ethyl Chloride	C	U		
Ethyl Dibromide	C	U		
Ethyl Ether	C	D	U	
Ethyl Formate			B	
Ethyl Glycol			B	
Ethyl Methyl Ketone	see Butanone			
Ethyl Oxalate	A	A	A	
Ethyl Pentachloro Benzene	U			
Ethyl Salicylate	B			
Ethyl Silicate	A	A	A	
Ethyl Valeriate	A			
Ethylamine	A	A	A	
Ethylene	A	B		
Ethylene Chlorhydrin	U			
Ethylene Chloride	U			
Ethylene Diamine	A	A		
Ethylene Diamine Tetraacetic Acid	A	A		
Ethylene Dichloride	D	U		
Ethylene Glycol 100% trading quality	A	A	A	B
Ethylene Glycol Monoethyl Ether	A			
Ethylene Oxide, gaseous	A	A		
Ethylene Oxide, liquid	U			
Ethylene Trichloride	D			
Ethylhexyl Alcohol	A	B		
"Eugenol"	B			
Euron B	B	B		
Euron G	A	A		
Fatty Acid	A	B	C	
Fatty Acid Amides	A	C		
Fatty Alcohols	A	C		
Fatty Oils	A	C		
Ferric Chloride	see Iron Chloride			
Ferric Nitrate	see Iron Nitrate			
Ferrous Ammonium Citrate	A	B		
Ferrous Chloride	A	B		
Ferrous Sulphate Fe SO4	A	A		
Fertilizer Salts	A	A	A	B
Fir Wool Oil	A	C		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Fish Oil	A	A	A	
Fish Solubles	B			
Fluoboric Acid	A	B		
Fluorbenzene	U			
Fluorides	A	A	A	
Fluorine, liquid	C			
Fluorine (solution)	U			
Fluosilicic Acid 25%	A	C		
Formaldehyde 40%	A	A		
Formaldehyde, diluted	A	A	A	
Formamide	A	A	A	
Formic Acid	A	A	B	
Freon 12	C	U		
Freon 13	A	A	A	
Freon 21	U			
Freon 22	A	A	A	
Freon 113	A			
Freon 114	A	A	A	
Frigen(	C	U		
Fructose	A	A		
Fruit Juice	A	A	A	U
Fruit Mass (fruit pulp)	A	A	A	
Fruit Sugar	A			
Fuel Oils	A	D		
Fuming Sulphuric Acid	see Oleum			
Furan	D			
Furfural	A	C	U	
Furfural Alcohol	A	B		
Gallic Acid	A	A		
Gas Liquor	A	A		
Gas, Natural	see Natural Gas			
Gases, containing				
Carbon Dioxide,				
Carbon Acid all conc.	A	A	A	A
Chlorine all conc.	A	A	A	B
Fluorine traces	A	A	A	U
Gases, containing				
Nitrius Oxide traces	A	A	A	U
Oleum, low conc.	U			
Sulphur Dioxide 50%	A	A		
Sulphur Dioxide, low conc.	A	A	A	B
Sulphuric Acid, all conc.	A	A	A	
Gases	See "Waste Gases with..."			
Gasoline-Benzene mixture 80/20	B		C	
Gasoline, Leaded	A			
Gasoline, pure, 100 Octane	B	C		
Gasoline, Sour	A			
Gasoline, Unleaded	A			
Gelatine	A	A	A	
Genantin	A	A		
Gin	A	A		
Glaubers Salt	A	A		
Glucose	see Dextrose			
Glycerine Chlorhydrin	A	A	A	
Glycerine, Glycerol	A	A	A	
Glycerol Chloro Hydrin	A	A		
Glycine	see Glycol			
Glycois	A	A		
Glycol 10%	A	A		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Glycol Dichloride	see Ethylene Chloride			
Glycol Ester	A	A	A	
Glycolic Acid 37%	A	B		
Glycolic Acid Butyl Ester	A	A		
Glystantin(	A	A		
Grape Juice	A	A		
Grape Sugar	A	A		
Grapefruit Juice	A	A		
Grease	A			
Grisiron 8302	B	B		
Grisiron 8702	A	A		
Hair Oil/Tonic Oil	A	A		
Halothane	C	D		
Hand Lotions	A	A		
Heating Oil, Barrel Oil	A			
Heavy Emulsion	see Barium Carbonate			
Heavy Oil			B	
Heptane	B	D		
Hexachlorobenzene	A	B		
Hexadecylalcohol	A	A		
Hexane	C	D		
Hexane Triol	A	A		
Hexyl Alcohol	D			
Honey	A			
Household Cleaners	A	B		
Hydrobromic Acid 20%	A	A		
Hydrobromic Acid 50%	A	A		
Hydrochloric Acid 10%	A	A	A	U
Hydrochloric Acid 20%	A	A	B	U
Hydrochloric Acid 30%	A	A	A	U
Hydrochloric Acid 30%	A		B	U
Hydrochloric dry gas	A			
Hydrocyanic Acid	see Hydrogen Cyanide			
Hydrocyanic Acid 10%	A	C		
Hydrofluoric Acid 20%	A	C		
Hydrofluoric Acid 50%	A	C		
Hydrofluoric Acid 75%, HF	A	C		
Hydrofluosilicic Acid	A	A		
Hydrogen	A	A	A	
Hydrogen Bromide	A	A	A	
Hydrogen Chloride gas,				
dry and moist	A	A	A	
Hydrogen Cyanide	A	A	A	
Hydrogen Fluoride 40%	A	A		
Hydrogen Fluoride 70%	A			
Hydrogen Peroxide 30%	A	A	A	
Hydrogen Peroxide 50%	B			
Hydrogen Peroxide 90%	C			
Hydrogen Peroxide 100%	A	U		
Hydrogen Phosphide	A			
Hydrogen Sulphide, H2S	A			
Hydrogen Sulphide (Aq. Sol.)	A	A		
Hydrogen Sulphide, dry	A	A	A	
Hydroquinone	A	A		
Hydrosulphite	A	A		
Hydroxylamine Sulphate	A	A		
Hypochlorous Acid	A	A		
Hydraulic Fluids	A	B		
Hyrazine Hydrate	A	A		



Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Igepal	A	A	A	
Ink	A	A	A	
Iodine	A		U	
Iodine, alcoholic sol.	B			
Iodine ink	A			
Iodine-Potassium Iodide, 3%	A	A		
Iodine Solution	U			
Iodine, Tincture of	A	C		
Iron (II) Chloride	A	A	A	
Iron (II) Sulphate	A	A	A	
Iron (III) Chloride	A	A	A	A
Iron (III) Nitrate	A	A	A	
Iron (III) Sulphate	A	A	A	
Isobutyl Alcohol	A	A		
Isooctane	A	B		
Isopropanol	A	A		
Isopropyl Acetate	A	C		
Isopropyl Ether	D	U		
Jams	A	A		
Kerosene	B	C		
Kerosine	B	C		
Ketones	B	D		
Labarraques Solution	D	U		
Lacquer	U			
Lactic Acid 90%	A	A	A	
Lactose	A	A		
Lanolin	A	A	A	
Latex	A			
Lauryl Alcohol	B			
Lavender Oil			B	
Lead Acetate	A	A	A	B
Lead Arsenate	A			
Lead Nitrate	A	A	A	
Lead Sulphamate	A	A	A	
Lemon Juice	A	A		
Lemon Oil	B	U		
Lime	A	A		
Lime Chloride	A	A		
Lime Juice	B	B		
Lime Water	A	A		
Linseed Oil	A	B	C	
Liquor, Trading Quality	C	U		
Lithium Bromide	A	A		
LPG	A	A		
Lubricating Oils	A	C		
Machine Oils	A	B		
Magnesium Carbonate	A	A	A	
Magnesium Chloride	A	A	A	
Magnesium Fluosilicate	A	A		
Magnesium Hydroxide	A	A	A	
Magnesium Iodine	A	A		
Magnesium Nitrate	A	A	A	
Magnesium Salts	A	A		
Magnesium Sulphate	A	A	A	A
Maleic Acid	A	A	A	A
Malic Acid	A	A		
Manganese Sulphate	A	A	A	
Manure, liquid	A	A		
Margarine	B	C		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Marmelade	A	A	A	
Masa	A	A		
Mascara	A	A	A	
Mash	A	A		
Mayonnaise	A			
Melase spices, industrial conc.	A	A	A	
Melase, industrial conc.	A	A	A	A
Menthanol	see Menthol			
Menthol	A	C		
Mercuric Chloride	A	B		
Mercuric Cyanide	B	B		
Mercurochrome	A	A		
Mercurous Nitrate	B	B		
Mercury	A	A	A	
Mercury Salts	A	A	A	
Mesityl Oxide				B
Metallic Mordants	A	A		
Methacrylate	A	A		
Methacrylic Acid	A	A		
Methane			B	
Methane Amide	see Formamide			
Methanol	see Methyl Alcohol			
Methoxy Butanol	A	A	A	
Methoxybutyl Alcohol	A	B		
Methyl-2-Pentanone (4-)	A	A		
Methyl Acetate			B	
Methyl Alcohol	A	A	A	
Methyl Amine, 32%	A			
Methyl Bromide	see Bromethane			
Methyl Butyl Ketone	A	A	A	
Methyl Cellulose Solvent	A			
Methyl Chloride	D	U		
Methyl Ethyl Ketone	B	D		
Methyl Formate			B	
Methyl Glycol	A	A	A	
Methyl Isobutyl Ketone	A	C		
Methyl Methacrylate	A	A	B	
Methyl n-Propyl Ketone	A	B		
Methyl Oleate	A	A	A	
Methyl Phenol	see Cresol			
Methyl Pyrrolidone	A	A		
Methyl Salicate	B			
Methyl Salicylate	A	B		
Methyl Sulphate	A	A		
Methyl Sulphuric Acid up to 50%	B	B		
Methylbenzene	D	U		
Methylcyclohexane	C	D		
Methylene Chloride	C	U		
Milk	A	A	A	
Mineral Oils	B	U		
Mineral Spirits	A	C		
Mineral Water	A	A	A	
Molasses	A	A		
Mold Release	A	A		
Monochloride Acetic Acid	A	A	A	
Monochloride Acetic Acid				
Ethylester	A	A	A	
Monochloride Acetic Acid				
Methylester	A	A	A	

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Monochloro Benzene	D			
Monoethanolamine	A			
Monoethyl Ether	A	A	A	
Monomethyl Aniline	A	A	A	
Morpholine	A	A		
Motor Oil			C	
Mowith	A	A		
Mustard	A	B		
Nafta	B	U		
Naphthalene, Naphthaline	A	C		
Natural gas	A	A		
Nickel	A			
Nickel Chloride	A	B		
Nickel Nitrate	A	B		
Nickel Salts	A	A		
Nickel Sulphate	A	B		
Nicotine	A	A		
Nicotine Acid	B	B		
Nitric Acid 30%	A	A		
Nitric Acid 30-50%	B	C		
Nitric Acid 40%	B			
Nitric Acid 70%	C			
Nitric Acid 98%			U	
Nitrobenzene (Oil of Mirbane)	C	U		
Nitrocellulose	A			
Nitroethane	A		U	
Nitrogen	A	A	A	
Nitroglycerin	B	D		
Nitromethane	A		U	
Nitrotoluene	A	B		
Nitrous gases, conc.	A		U	
Nonyl Alcohol	A	A		
Octane	A	B		
Octyl Alcohol	A		B	
Octyl Cresol	B	U		
Oil	C	C		
Oil Acid			C	
Oleic Acid	A	C		
Oleic Acid (Red Oil)	U			
Oleum	U			
Oleum vapeur (SO3)	B			
Olive Oil	A	A	A	
Optical Brighteners	A	A		
Orange Extract	A	A		
Ortho-Boric Acid	see Boric Acid			
Oxalic Acid	A	B		
Oxyacetic Acid	see Glycolic Acid			
Oxybensole	see Phenol			
Oxydiethanole	see Diethylene Glycol			
Oxygen	A	A		
Oxypropionic Acid	see Lactic Acid			
Oxyrane	see Ethylene Oxide			
l-Oxytoluol	see Benzyl Alcohol			
m-Oxytoluol	see Cresol			
Ozone	C		U	
Painting Turpentine	see Thinner			
Palm Kernal Oil	A	A		
Palm Oil	B	B		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Palmatic Acid	A	A	B	
Palmityl Alcohol	A	A		
Palmolive Oil	A			
Paraffin	A	B	C	
Paraffin emulsion, trading qual.		B		
Paraffin Oil	A	A	A	
Paraformaldehyde	A	A		
Paratoluene Sulpho Chlora				
Amide Sodium 1%	A			
Peanut Butter	B	B		
Pentanol	see Amyl Alcohol			
Pentanol Acetate	see Amyl Acetate			
Pepper	B	B		
Peppermint Oil	B	D		
Perchloric Acid 10%	A	A		
Perchloric Acid 20%	A	A	A	
Perchloric Acid 50%	A	B	C	
Perchloric Acid 70%	A	D		
Perchloro Ethylene	U			
Perfumes	C	U		
Petroleum	A	B	C	
Petroleum Ether	A	D		
Petroleum Jelly	B	B		
Petroleum Spirits	C	D		
Phenol up to 90%	A	A		U
Phenolic Resins	A	A		
Phenols 100% (Carbolic Acid)	D			
Phenyl Alcohol	see Benzyl Alcohol			
Phenyl Ethane	see Ethyl Benzene			
Phenyl Ethyl Alcohol	A	A		
Phenyl Hydrazine	C	D		
Phenyl Hydrazine Hydrochloride	A	U		
Phenyl Methane	see Toluol			
Phenyl Methyl Ether	see Cyclohexanone			
Phenyl Sulfonate	A	A		
Phosgene, gas	U			
Phosphates	A	A	A	
Phosphoric Acid 80%	A	A	A	A
Phosphoric Acid 90%	A	A	A	A
Phosphoric Acid 95%	A	A		
Phosphorus Oxychloride	A	B	B	
Phosphorus Pentoxide	A	A	A	
Phosphorus Trichloride	A	B		
Phosphorus Yellow	A			
Photographic Developer	A	A		
Photographic solution, Fixer	A	A	A	
Phthalic Acid 50%	A	A	A	
Phtalic Acid Ester	A	C		
Phtalic Anhydride	B	B		
Pickling Baths	B	C		
Picric Acid 1%	A		B	
Pine Oil	B	D		
Pineapple Juice	A	A		
Pinene			B	
Plasticizers of Polyester	A	B		
Plating Solutions, Brass	A	B		
Plating Solutions, Cadmium	A	B		
Plating Solutions, Copper	A	B		
Plating Solutions, Gold	A	B		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Plating Solutions, Indium	A	B		
Plating Solutions, Iron	A	B		
Plating Solutions, Lead	A	B		
Plating Solutions, Nickel	A	B		
Plating Solutions, Rhodium	A	B		
Plating Solutions, Silver	A	B		
Plating Solutions, Tin	A	B		
Plating Solutions, Zinc	A	B		
Polyesters (Resins)	C	U		
Polyglycols	A	A		
Polysolvan O	A	A		
Potash Alum	A	A		
Potassium Acetate			B	
Potassium Bicarbonate	A	B		
Potassium Bichromate 40%	see Potassium Dichromate			
Potassium Bisulphate	A	A		
Potassium Borate 1%	A	A	A	
Potassium Bromate	A	A	A	
Potassium Bromide	A	A	A	
Potassium Carbonate	A	A	A	
Potassium Chlorate	A	A	A	
Potassium Chloride	A	A	A	
Potassium Chromate	A	A	A	
Potassium Chromium Sulphate	A	A	A	B
Potassium Cupro Cyanide	A	A	A	
Potassium Cyanide	A	A	A	
Potassium Dichromate 40%	A	A	A	
Potassium Ferricyanide	A	A	A	B
Potassium Ferrocyanide	A	B		
Potassium Fluoride	A	A	A	
Potassium Hydrogen Carbonate	A	A	A	
Potassium Hydrogen Sulphate	A	A	A	
Potassium Hydrogen Sulphite				
solution	A	A	A	
Potassium Hydroxide 50%	A	A	A	U
Potassium Hydroxide 60%	A	A	B	
Potassium Hypochlorite, solution	A		B	
Potassium Iodide, cold saturated	A	A	A	
Potassium Nitrate	A	A	A	
Potassium Orthophosphate	A	A	A	
Potassium Perborate	A	A	A	
Potassium Perchlorate 1%	A	A	A	A
Potassium Perchlorate 10%	A			
Potassium Permanganate 18%	A	A	A	
Potassium Persulfate	A			
Potassium Phosphate	A	A	A	
Potassium Salts	A			
Potassium Sulphate	A	A	A	
Potassium Sulphate, cold saturated	A	A	A	
Potassium Sulphide	A	A	A	
Potassium Sulphite	A	A		
Potassium Supersulphate	A	A	A	U
Potassium Tetracyano Cuprate	A	A		
Potassium Thiosulphate	A	A		
Propargyl Alcohol	A			
Propane Acid	see Propionic Acid			
Propane Diol	see Propylene Glycol			
Propane Triol	see Glycerine			

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Propane, gas	A	B		
Propane, liquid	B			
Propanol	A	A	A	
Propanone	see Acetone			
Propargyl Alcohol	A	B		
Propene	A	A	A	
Propionic Acid	A	A	A	
Propyl Acetate			B	
Propyl Alcohol	see Propanol			
Propylene Dichloride	U			
Propylene Glycol	A	A	A	
Propylene Oxide	A	A		
Prune Juice	A			
Pseudo Cumol/Pseudo Cumene	B	B		
Pyridine	A	B	C	
Pyrol			B	
Quinine	A	A		
Rayon Coagulating Bath	A	B		
Resorcinol	A	B		
Ricine Oil	A		B	
Rinser Loosener	A	A	A	
Road Tar	U			
Roasting Gases	A	A		
Rouge	A	A		
Rubbers Dispersions/Latex	A	A		
Sagrotan	A	B		
Salicylic Acid	A	A	A	
Salicylic Acid Methyl Ester	A	B		
Sauerkraut	A	A		
Sea Water	A	A		
Selenic Acid	A	A		
Shampoos, Shaving Lotion	A	A		
Shortening	A	B		
Silicic Acid	A	A		
Silicone Fats	A	A	A	
Silicone Oils	A	A	A	
Silver Nitrate 80%	A	A	A	B
Silver Salts, cold saturated	A	A	A	
Soap	A	A	A	
Soap Loosener	A	A	A	
Soap Solution	A	A	A	
Soda	see Sodium Carbonate			
Sodium Acetate	A	A	A	
Sodium Aluminate	A	A	A	
Sodium Aluminium Sulphate	A	A	A	
Sodium Benzoate	A	A	A	
Sodium Benzoate to 36%	A	A	A	
Sodium Bicarbonate	A	A	A	
Sodium Bisulphate	A	A	A	
Sodium Bisulphite	A	A	A	A
Sodium Borate	A	A	A	
Sodium Bromide	A	A	A	
Sodium Carbonate	A	A	A	
Sodium Chlorate	A	A	A	
Sodium Chloride	A	A	A	A
Sodium Chlorite 50%	A			
Sodium Chlorite and Bleach	A		B	
Sodium Chlorite and Water	A			
Sodium Chromate	A	A		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Sodium Cyanide	A	A	A	
Sodium Dichromate	A	A		
Sodium Dodecylbenzene				
Sulfonate	A	A		
Sodium Ferricyanide	A	A	A	
Sodium Ferrocyanide	A	A	A	
Sodium Fluoride	A	A	A	
Sodium Hexacyano Ferrate	A	A		
Sodium Hexametaphosphate	A			
Sodium Hydrogen Carbonate	A	A	A	
Sodium Hydrogen Phosphate	A	A	A	
Sodium Hydrogen Sulphite sol.	A	A	A	
Sodium Hydrosulphite 10%	A	A	A	
Sodium Hydroxide 15%	A	A		
Sodium Hydroxide 20%	A	A		
Sodium Hydroxide 30%	A	A		
Sodium Hydroxide 50%	A	A		
Sodium Hydroxide 70%	A	A		
Sodium Hydroxide Conc. (Caustic Soda)	A	A		
Sodium Hypochlorite 12%	B	D		
Sodium Hypochlorite Solution	B			
Sodium Metaphosphate	A	A	A	
Sodium Nitrate	A	A	A	
Sodium Nitrite	A	A	A	
Sodium Perborate	A	C		
Sodium Perchlorate	A	A		
Sodium Peroxide 10%	A	A	A	
Sodium Phosphate	A	A	A	
Sodium Polyacrylate (GR 894)	A	A	A	
Sodium Silicate	A	A	A	
Sodium Sulphate	A	A	A	
Sodium Sulphide	A	A	A	
Sodium Sulphite	A	A	A	
Sodium Tetraborate	A	A	A	
Sodium Thiosulphate	A	A	A	
Soya Oil	A	B		
Spermaceti	A	B		
Spindle Oil	C	D		
Spinning Oil	A		B	
Spinning-Bath Oil containing Carbon Disulphide 0.01%	A	A		
Spinning-Bath Oil containing Carbon Disulphide 0.07%	A	A		
Spot Solvents	A	A	A	
Stain Removers	C	D		
Stannic Chloride	A	A		
Stannic Salts	A			
Stannous Chloride	A	A		
Starch	A	A	A	
Starch Syrup	A	A	A	A
Steam	A	A	A	
Stearic Acid	A	A	B	
Styrene	C	U		
Succinic Acid	A	A		
Sucrose Solution	A	A	A	
Sugar	A	A		
Sulfuric Acid 98%	U			
Sulphates	A	A		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Sulphur	A	A	A	
Sulphur Dioxid, dry	A	A	A	B
wet, in water solution	A	A	A	
Sulphur Solution	A			
Sulphur Trioxide	U			
Sulphuric Acid Y50%	A	A	A	
Sulphuric Acid 70%	A		C	
Sulphuric Acid 80-90%	A	C		
Sulphuric Acid 96%				C
Sulphuric Acid 98%	U			
Sulphuric Ether	B	C		
Sulphurous Acid	A	A		
Sulphuryl Chloride	B			
Superchloric Acid	see Perchloric Acid			
Synthetic Washing Powder, home quality	A	A	A	
Tallow	A	B		
Tannic Acid	A	A		
Tannin	see Ascorbic Acid			
Tar	U			
Tartaric Acid (Dihydroxy Succinic Acid)	A	A		
Tea	B	B		
Tertiary Butyl Alcohol	A	A	A	
Tetrabromo Ethane	D	U		
Tetrachloro Ethane	D	U		
Tetraethyl Lead	A			
Tetrahydro Furane	U			
Tetrahydro Furfuryl Alcohol	A			
Tetrahydro Naphtalene	B	U		
Tetraline	see Tetrahydro Naph- talene			
Tetramethylene Oxide	see Tetrahydro Furane			
Tin Chloride	A	A		
Tin Salts	A	A	A	
Thinner	D			
Thioglycolic Acid	A	A		
Thionyl Chloride	D	U		
Thiophene	D	U		
Titanium Tetrachloride	U			
Toluene	D	U		
Tomato Juice	A	A		
Transformer Oils	A	C	D	
Tri	see Trichloro Ethylene			
Tributyle Phosphate	A	A		
Tributro Ethyl Phosphate			B	
Trichloro Acetic Acid	A		B	
Trichloro Acetic Acid 50%	A	C		
Trichloro Benzene	U			
Trichloro Ethane	C		U	
Trichloro Ethylene	U			
Trichloro Methane	see Chloroform			
Tricresyl Phosphate	A	A		
Triethanolamine	A	B		
Triethylene Glycol	A	A		
Trilom, trade quality	A	A	A	
Trimethyl Borate	U			
Trimethylbenzene	see Pseudocumol			
Trimethylol Propane	A	A		

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Trinitro Phenol	see Picric Acid			
Trinitro Toluene	U			
Trioctyl Phosphate	A	B		
Trisodium Phosphate	A	B	C	
Trybutyl Phosphate	A	A	A	
Turbine Oil			B	
Turpentine	D	U		
Tutogen U	A	A		
Tween 20	B	U		
Tween 80	B	U		
Urea	A	B		
Uric Acid	A	A		
Uric Compounds	see Carbamide			
Urine	A	A		
Urine, normal conc.	A	A	A	
Vanille Extract	A	B		
Vaseline	A	B	C	
Vaseline Oil	A		B	
Vegetable Dyes	A	A		
Vegetable Oils	B	B	B	
Vinegar	A	A	A	
Vinegar Acid Anhydride	A	A	B	U
Vinegar Acid Butyl Ester	see Butyl Acetate			
Vinegar Acid Ethyl Ester	see Ethyl Acetate			
Vinegar Ester	see Ethyl Acetate			
Vinegar, trading quality	A	A	A	
Vinyl Acetate	A	A		
Vinyl Chloride	A	A	A	
Vinyl Cyanide	see Acrylonitrile			
Viscose Spinning Solution	A	A		
Vitamine C	A	A		
Walnut Oil	A	B		
Wastegases with Acid	A	A		
Wastegases with Carbon Monoxide	A	A		
Wastegases with HCL	A	A		
Wastegases with H2SO4	A	A		
Wastegases with low sodium Dioxide	A	A		
Wastegases with traces of Hydrogen Fluoride	A	A		
Wastegases with traces of Nitrosyl Sulfuric Acid	A	A		
Water	A	A	A	A
Water Acid Mine	A			
Water Deionized	A			
Water Distilled	A			
Waterglass	A			
Waxes	A	C		
Wetting Agents	A	B		
Whey	A	A		
Whisky	see Ethyl Alcohol			

Compound	Chemical Resistance			
	40°C	60°C	80°C	100°C
Whitener	see Sodium Hypochlorite			
Wine Vinegar	see Vinegar			
Wine, red and white	A	A	A	
Wohlstone Acid	A	A	A	
Wood Glue, type Polyvinyl Acetate	B			
Wood Stains	A	C		
Wool Fat	see Lanolin			
Xylol	C		U	
Yeast	A	A	A	
Zinc Bromide	A	A		
Zinc (II) Chloride	A	A	A	B
Zinc Carbonate	A	A	A	
Zinc Hydrate	A	A	A	
Zinc Oxide	A	A	A	
Zinc Salts	A			
Zinc Sludge	A	A		
Zinc Stearate	A	A		
Zinc Sulphate	A	A	A	

# Supplements

Table No 33.1: Allowable working pressures for conveying water in Pexgol pipes, with a safety factor C = 1,25

Temperature. In °C	Years of service	Pipe series (S)					
		7.6	6.3	5	4	3.2	2.5
		Standard dimension ratio (SDR)					
		16.2	13.6	11	9	7.4	6
		Allowable working pressure (bar)					
10	1	11.80	14.20	17.90	22.50	28.30	35.66
	5	11.60	13.90	17.50	22.10	27.80	35.03
	10	11.50	13.80	17.40	21.90	27.60	34.78
	25	11.40	13.70	17.20	21.70	27.30	34.40
	50	11.30	13.60	17.10	21.50	27.10	34.15
	100	11.20	13.50	17.00	21.40	26.90	33.89
20	1	10.50	12.60	15.80	19.90	25.10	31.63
	5	10.30	12.30	15.50	19.60	24.60	31.00
	10	10.20	12.20	15.40	19.40	24.40	30.74
	25	10.10	12.10	15.20	19.20	24.20	30.49
	50	10.00	12.00	15.10	19.10	24.00	30.24
	100	9.90	11.90	15.00	18.90	23.80	29.99
30	1	9.30	11.10	14.00	17.70	22.30	28.10
	5	9.15	10.90	13.80	17.30	21.90	27.59
	10	9.05	10.80	13.70	17.20	21.70	27.34
	25	8.95	10.70	13.50	17.00	21.40	26.96
	50	8.90	10.60	13.40	16.90	21.30	26.84
	100	8.80	10.60	13.30	16.80	21.10	26.59
40	1	8.30	9.90	12.50	15.70	19.80	24.95
	5	8.10	9.70	12.20	15.40	19.40	24.44
	10	8.05	9.60	12.10	15.30	19.30	24.32
	25	8.00	9.50	12.00	15.10	19.10	24.07
	50	7.90	9.40	11.90	15.00	18.90	23.81
	100	7.80	9.40	11.80	14.90	18.70	23.56
50	1	7.40	8.80	11.10	14.00	17.70	22.30
	5	7.25	8.70	10.90	13.70	17.30	21.80
	10	7.20	8.60	10.80	13.60	17.20	21.67
	25	7.10	8.50	10.70	13.50	17.00	21.42
	50	7.00	8.40	10.60	13.40	16.80	21.17
	100	7.00	8.30	10.50	13.20	16.70	21.04
60	1	6.60	7.90	9.90	12.50	15.80	19.91
	5	6.45	7.70	9.70	12.30	15.50	19.53
	10	6.40	7.70	9.70	12.20	15.30	19.28
	25	6.35	7.60	9.50	12.00	15.20	19.15
	50	6.30	7.50	9.50	11.90	15.00	18.90
	70	1	5.90	7.10	8.90	11.20	14.10
5		5.80	6.90	8.70	11.00	13.80	17.39
10		5.75	6.80	8.60	10.90	13.70	17.26
25		5.65	6.80	8.50	10.80	13.60	17.14
50		5.60	6.70	8.50	10.70	13.40	16.88
80		1	5.30	6.30	8.00	10.00	12.70
	5	5.20	6.20	7.80	9.80	12.40	15.62
	10	5.15	6.10	7.70	9.80	12.30	15.50
	25	5.10	6.10	7.60	9.60	12.10	15.25
	50	5.10	6.10	7.50	9.50	12.00	15.12
	90	1	4.80	5.70	7.20	9.00	11.40
5		4.65	5.60	7.00	8.80	11.10	13.99
10		4.60	5.50	6.90	8.80	11.00	13.86
25		4.60	5.50	6.90	8.70	11.00	13.86
50		4.50	5.40	6.80	8.60	10.90	13.73
95		1	4.50	5.40	6.80	8.60	10.80
	5	4.40	5.30	6.60	8.40	10.60	13.36
	10	4.40	5.20	6.60	8.30	10.50	13.23
	25	4.20	5.00	6.50	8.20	10.40	13.10
	50	4.10	4.90	6.40	8.10	10.30	12.98
	110	1	4.00	4.80	6.30	8.00	10.20
5		2.60	3.15	4.00	5.00	6.25	7.88
10		2.50	3.00	3.90	4.90	6.15	7.75
25		2.50	3.00	3.85	4.80	6.00	7.56
50		2.40	2.90	3.80	4.70	5.90	7.43

**Application design questioner for Newtonians fluids in Horizontal installations**

**Company Name:** \_\_\_\_\_

<i>Please answer the following questions to the best of your knowledge</i>	
Type of transported material	
Chemical composition	
Concentration (%)	
Specific gravity (gr/cm <sup>3</sup> )	
Fluid temperature (deg.C)	
Ambient temperature (deg.C)	
Abrasive problems (Y/N)	
Required flow rate (m <sup>3</sup> / hr)	
Line length (m)	
Existing pipe outside diameter (mm)	
Existing pipe inside diameter (mm)	
Altitude differences in the line (m)	
Pump pressure (bar)	
Slurry minimum critical velocity (m/sec)	

**Application questionnaire for boreholes and dewatering**

<i>Please answer the following questions to the best of your knowledge</i>	
Minimum dynamic water level (m)	
Depth of installation (m)	
Required flow rate (cubic meters per hour)	
Outlet pressure (bar)	
Water temperature (deg.C)	
Pump pressure at closed valve (bar)	
Weight of pump (kg)	
Weight of cables (kg per meter)	
Pump weight suspended on the pipe (Y/N)	



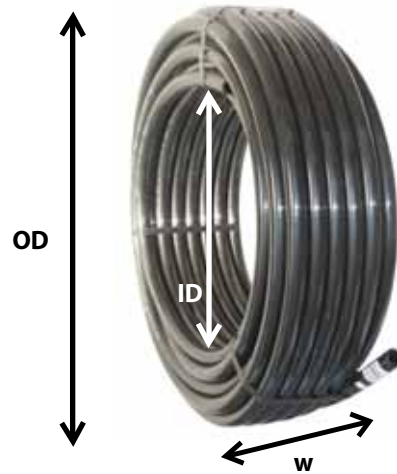


Table No. 33.2: Transportation in coils

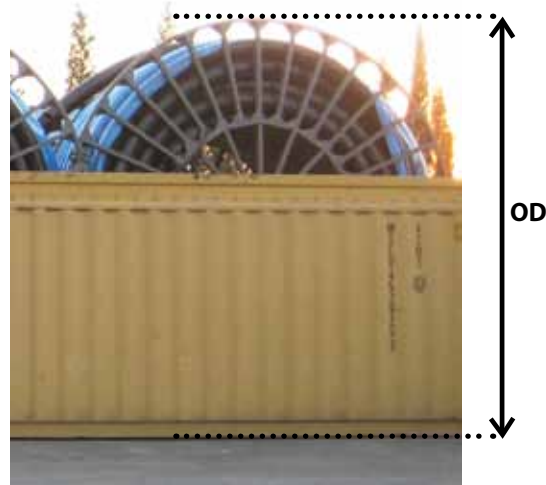
Pipe		Standard Coil (20' and 40' container)					Tall Coil (40' High Cube Container)					Total Length Per Container type		
OD	Class	Length [m]	ID[mm]	OD [mm]	W[mm]	Weight [ Kg]	Length [m]	ID [mm]	OD [mm]	W[mm]	Weight [ Kg]	20'	40'	40'HC
40	10	1,500	1,250	2,150	950	442	2,000	1,200	2,400	1,000	590	9,000	18,000	20,000
40	12	1,500	1,250	2,150	950	325	2,000	1,200	2,400	1,000	734	9,000	18,000	20,000
40	15	1,800	1,050	2,200	1,050	756	2,100	1,200	2,400	1,050	882	9,000	19,800	21,000
40	19	1,800	1,050	2,200	1,050	755	2,100	1,200	2,400	1,050	1,056	9,000	19,800	21,000
40	24	1,800	1,050	2,200	1,050	1,062	2,100	1,200	2,400	1,050	1,239	9,000	19,800	21,000
40	30	1,800	1,050	2,200	1,050	1,265	2,100	1,200	2,400	1,050	1,475	9,000	19,800	21,000
50	10	1,000	1,000	2,250	1,200	458	1,200	1,250	2,400	1,000	550	5,000	11,000	12,000
50	12	1,200	1,050	2,200	1,050	648	1,400	1,050	2,400	1,050	755	6,000	13,200	14,000
50	15	1,200	1,050	2,200	1,050	780	1,400	1,050	2,400	1,050	910	6,000	13,200	14,000
50	19	1,200	1,050	2,200	1,050	940	1,400	1,050	2,400	1,050	1,096	6,000	13,200	14,000
50	24	1,200	1,050	2,200	1,050	1,104	1,400	1,050	2,400	1,050	1,288	6,000	13,200	14,000
50	30	1,200	1,050	2,200	1,050	1,308	1,400	1,050	2,400	1,050	1,526	6,000	13,200	14,000
63	10	600	1,200	2,200	1,050	618	800	1,200	2,400	1,050	824	3,000	6,600	8,000
63	12	600	1,200	2,200	1,050	510	800	1,200	2,400	1,050	680	3,000	6,600	8,000
63	15	700	1,100	2,200	1,050	756	800	1,100	2,400	1,050	824	3,500	7,700	8,000
63	19	700	1,100	2,200	1,050	875	800	1,100	2,400	1,050	1,000	3,500	7,700	8,000
63	24	700	1,100	2,200	1,050	1,015	800	1,100	2,400	1,050	1,160	3,500	7,700	8,000
63	30	700	1,100	2,200	1,050	1,400	800	1,100	2,400	1,050	1,600	3,500	7,700	8,000
75	10	300	1,450	2,200	1,000	309	450	1,450	2,400	1,000	464	1,500	3,300	4,500
75	12	450	1,200	2,200	1,050	545	500	1,200	2,400	1,050	605	2,250	4,950	5,000
75	15	500	1,050	2,200	1,050	720	500	1,100	2,400	1,050	720	2,500	5,500	5,000
75	19	500	1,050	2,200	1,050	875	500	1,100	2,400	1,050	875	2,500	5,500	5,000
75	24	500	1,050	2,200	1,050	1,035	500	1,100	2,400	1,050	1,035	2,500	5,500	5,000
75	30	500	1,050	2,200	1,050	1,000	500	1,100	2,400	1,050	1,000	2,500	5,500	5,000
90	10	200	1,550	2,200	1,000	294	300	1,550	2,450	1,000	441	1,000	2,200	2,400
90	12	250	1,300	2,200	1,000	433	350	1,300	2,500	1,000	606	1,250	2,750	2,800
90	15	300	1,150	2,200	1,050	627	400	1,300	2,500	1,000	836	1,500	3,300	3,200
90	19	300	1,150	2,200	1,050	750	400	1,300	2,500	1,000	1,000	1,500	3,300	3,200
90	24	300	1,150	2,200	1,050	891	400	1,300	2,500	1,000	1,188	1,500	3,300	3,200
90	30	300	1,150	2,200	1,050	1,200	400	1,300	2,500	1,000	1,600	1,500	3,300	3,200

Table No. 33.2: Transportation in coils

Pipe		Short Coil (20' and 40' container)					Tall Coil (40' High Cube Container)					Total Length Per Container type		
OD	Class	Length [m]	ID[mm]	OD [mm]	W[mm]	Weight [ Kg]	Length [m]	ID [mm]	OD [mm]	W[mm]	Weight [ Kg]	20'	40'	40'HC
110	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
110	12	130	1,650	2,250	1,000	334	210	1,700	2,550	1,000	540	650	1,430	1,680
110	15	250	1,150	2,250	1,000	778	300	1,100	2,500	1,000	933	1,250	2,750	2,400
110	19	250	1,150	2,250	1,000	938	300	1,100	2,500	1,000	1,125	1,250	2,750	2,400
110	24	250	1,150	2,250	1,000	1,113	300	1,100	2,500	1,000	1,335	1,250	2,750	2,400
125	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
125	12	75	1,800	2,250	1,000	248	120	1,800	2,500	1,000	397	375	825	960
125	15	150	1,250	2,250	1,050	605	200	1,250	2,450	1,050	622	750	1,650	1,600
125	19	150	1,250	2,250	1,050	735	200	1,250	2,450	1,050	750	750	1,650	1,600
125	24	150	1,250	2,250	1,050	860	200	1,250	2,450	1,050	1,146	750	1,650	1,600
125	30	150	1,250	2,250	1,050	1,050	200	1,250	2,450	1,050	1,400	750	1,650	1,600
140	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
140	12	N/A	N/A	N/A	N/A	N/A	70	1,900	2,400	1,000	291	N/A	N/A	700
140	15	75	1,650	2,200	1,000	377	120	1,650	2,450	1,000	606	375	825	960
140	19	100	1,300	2,150	1,000	610	140	1,300	2,400	1,000	854	500	1,100	1,400
140	24	100	1,300	2,150	1,000	721	140	1,300	2,400	1,000	1,009	500	1,100	1,400
140	30	100	1,300	2,150	1,000	900	140	1,300	2,400	1,000	1,260	500	1,100	1,400
160	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
160	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
160	15	N/A	N/A	N/A	N/A	N/A	70	1,850	2,450	1,000	462	N/A	N/A	560
160	19	70	1,560	2,200	1,250	553	115	1,560	2,450	1,250	909	280	630	920
160	24	70	1,560	2,200	1,250	505	115	1,560	2,450	1,250	1,081	280	630	920
160	30	70	1,560	2,200	1,250	770	115	1,560	2,450	1,250	1,265	280	630	920

Table No. 33.3: Length of pipes on drums & Straight sections

Pipe		Class	Weight (kg/mt)	Meters on drum	BARS in 40 ft container	
OD	W.T.				11.8 mt bars in 40- ft	meters bars in 40 ft
160	9.9	10	4.62	400	175	2065
200	12.4	10	7.23	165	116	1369
225	13.9	10	9.12	81	86	1015
250	15.5	10	N/A	N/A	77	909
280	17.3	10	N/A	N/A	60	708
315	19.5	10	N/A	N/A	46	543
355	21.9	10	N/A	N/A	33	389
400	24.7	10	N/A	N/A	23	271
450	27.8	10	N/A	N/A	23	271
500	30.9	10	N/A	N/A	20	236
630	38.9	10	N/A	N/A	9	105
90	6.7	12	1.73	1700	588	6938
110	8.1	12	2.57	1200	431	5086
160	11.8	12	3.31	500	175	2065
200	14.7	12	4.15	250	116	1369
225	16.6	12	10.75	136	86	1015
250	18.4	12	13.42	66	77	909
280	20.6	12	N/A	N/A	60	708
315	23.2	12	N/A	N/A	46	542.8
355	32.2	12	N/A	N/A	33	389
400	29.4	12	N/A	N/A	23	271
450	33.1	12	N/A	N/A	23	271
500	36.7	12	N/A	N/A	20	236
90	8.2	15	2.09	2000	588	6938
110	10	15	3.11	1200	431	5086
140	12.7	15	5.02	780	248	2926
160	14.6	15	6.6	600	175	2065
200	18.1	15	10.23	286	116	1369
225	20.4	15	12.97	200	86	1015
250	22.7	15	16.05	105	77	909
280	25.4	15	20.1	67	60	708
315	28.6	15	25.46	56	46	543
355	32.2	15	N/A	N/A	33	389
200	22.4	19	12.4	385	116	1369
225	25	19	15.55	200	86	1015
315	35.2	19	30.65	100	46	543
450	50.3	19	N/A	N/A	23	271
90	12.3	24	2.97	2000	588	6938
110	15.1	24	4.45	1300	431	5086
160	21.9	24	9.4	600	175	2065
200	27.4	24	14.65	385	116	1369
225	30.8	24	18.59	260	86	1015
160	27.3	30	11	600	175	2065
200	34	30	17	385	116	1369



### Drum Dimentions

OD [mm] 3950

W [mm] 2100

Drum weight [Kg] 2000

### Transportation:

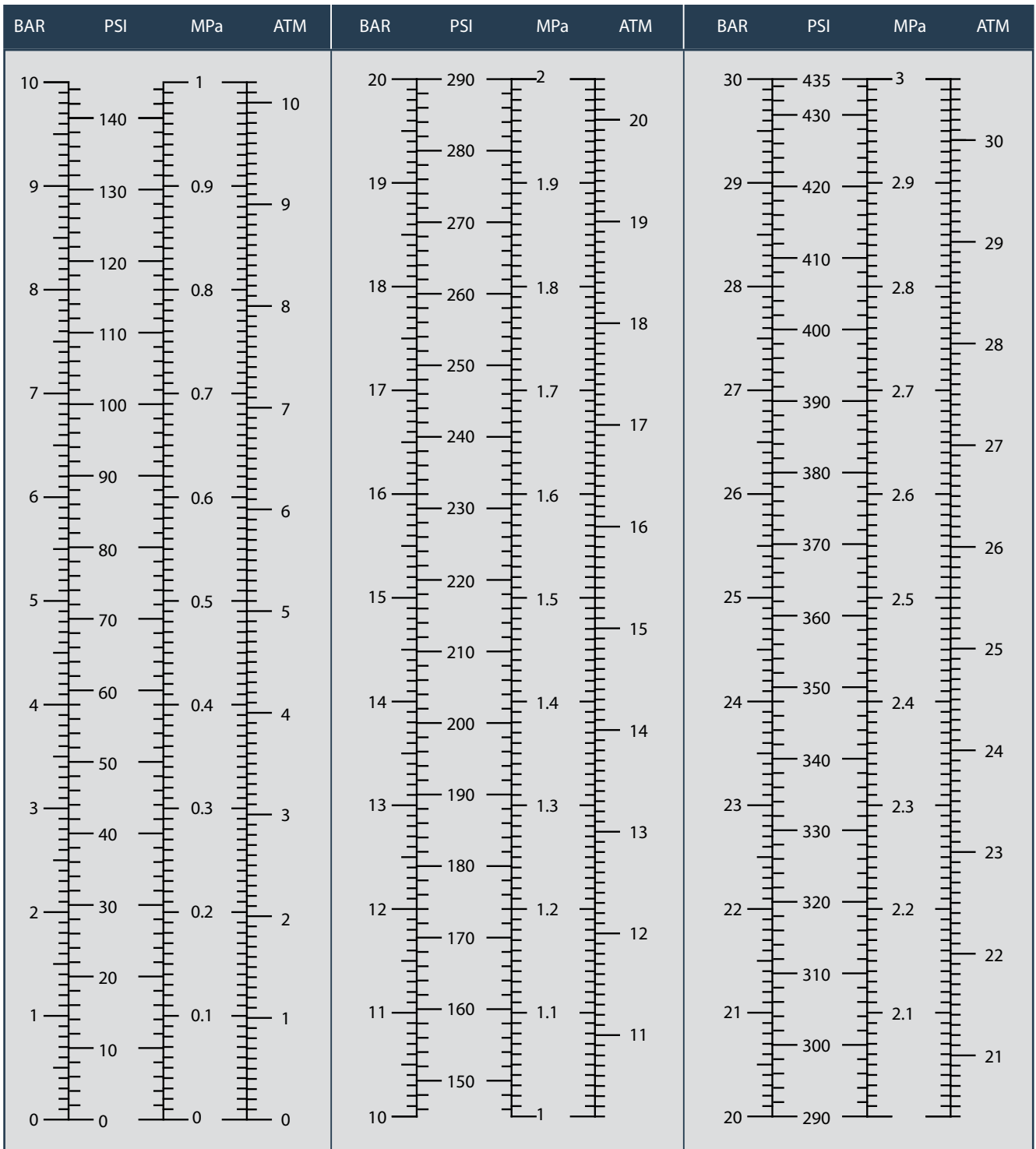
Drums: Open Top container.

3 drums per container.

Bars: 40' High Cube container

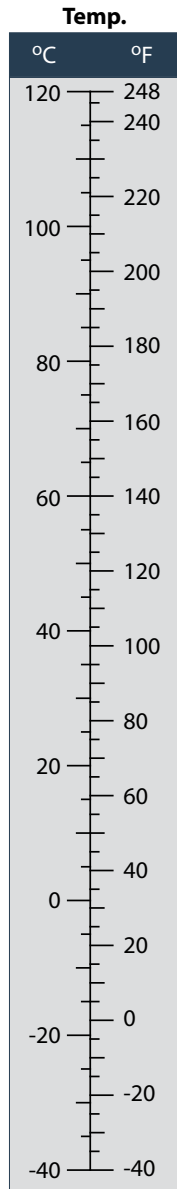
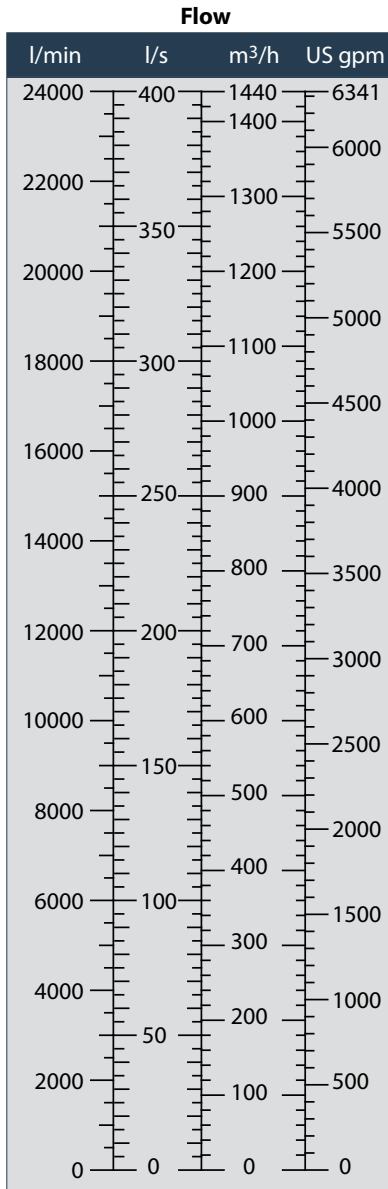
Table No. 33.5: **Conversion tables**

**Pressure**



Unit	Inch	Feet	Millimeters	Meters
inch [in]	1	0.08	25.4	0.0254
foot [ft]	12	1	304.8	0.3048
yard [yd]	36	3	914.4	0.9144
mile [mi]	63,360	5,280	1609x10 <sup>3</sup>	1,609.34
millimeters [mm]	0.039	0.47	1	1000
meters [m]	39.37	3.28084	0.001	1

# Engineering Guide



Quantity	SI (Metric) Unit	Equal US Customary Unit
Length	meter (m)	3.281 feet (ft)
	meter (m)	39.37 inches (in)
	millimeter (mm)	0.03937 inches (in)
Area	square meter (m <sup>2</sup> )	10.76 ft <sup>2</sup>
	square meter (m <sup>2</sup> )	1550 in <sup>2</sup>
	square millimeter (mm <sup>2</sup> )	0.001550 in <sup>2</sup>
Volume	cubic meter (m <sup>3</sup> )	35.31 ft <sup>3</sup>
	cubic meter (m <sup>3</sup> )	264.2 gallons (gal)
	liter	0.03531 ft <sup>3</sup>
	liter	61.02 in <sup>3</sup>
	liter	0.2642 gal
Mass	kilogram (kgm)	2.205 pounds mass (lbm)
Force	Newton (N)	0.2248 pounds force (lbf)
Pressure	Pascal (PA) or (N/M <sup>2</sup> )	1.450x10 <sup>-4</sup> lbf/in <sup>2</sup> (psi)
	MegaPascal (MPa) or N/mm <sup>2</sup>	1.450x10 <sup>2</sup> lbf/in <sup>2</sup> (psi)
	bar	14.504 lbf/in <sup>2</sup> (psi)
	kilopascal (kPa) or (kN/m <sup>2</sup> )	0.1450 lbf/in <sup>2</sup> (psi)
	kilogram-force/square centimeter (kgf/cm <sup>2</sup> ) or kilopond (kp/cm <sup>2</sup> )	14.223 lbf/in <sup>2</sup> (psi)
Enthalpy	Joule/gram (j/g)	0.4299 Btu/lbm
Temperature	Kelvin (k)	1.800° Rankine (°R)
	Kelvin (k)	1.8K-459.67=°Fahrenheit (°F)
	°Celsius (°c)	1.8°C + 32 = °F

# MINING

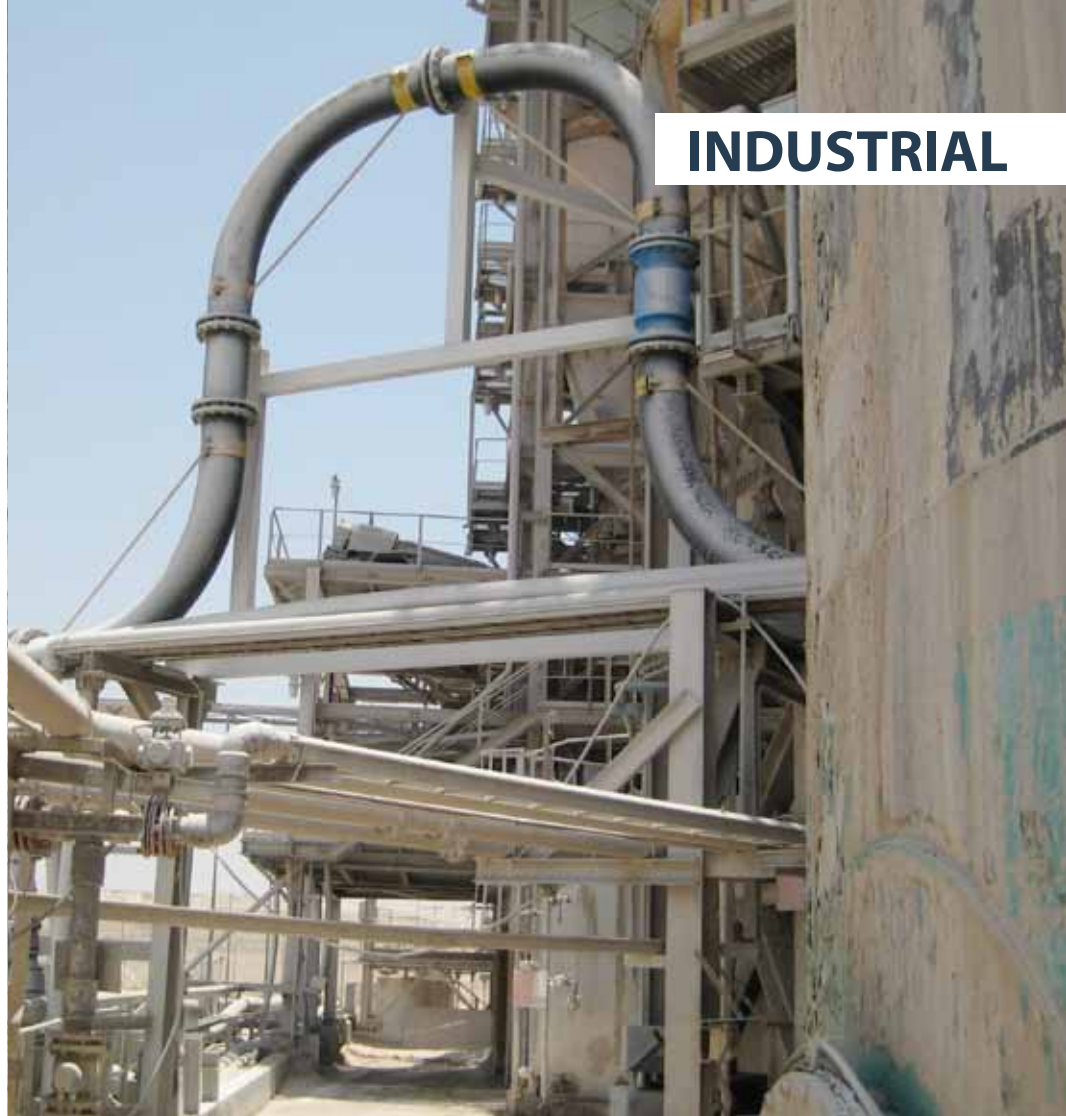


# TAILING



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