



# PTFE Lined Piping and Fittings Full Product Catalogue



Automated PFA Moulding



Paste Extrusion PTFE Facility



Van Stone Pipe Spool Manufacture



[www.crp.co.uk](http://www.crp.co.uk)

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## Quality System

Corrosion Resistant Products is an ISO 9001:2000 approved company. Originally accredited to BS5750 Part 1 in 1992, CRP maintains this accreditation through a process of continuous third party surveillance with, six monthly, annual and triennial audits taking place. The company was one of the first in the UK to obtain approval to the upgraded version ISO 9001:2000. All of the company's manufacturing and test procedures fall within this regime.



## Design and Test Standards

Products are all manufactured and tested to national and international standards where applicable, with fundamental design qualification having been undertaken via the approval process required to comply with the Pressure Equipment Directive 97/23/EC.

- Qualification Testing: To EDSPIP 53.01C and ASTM F423/ASTM F1545.
- Rating: Full vacuum to Class 150 at 200°C for sizes up to and including 150NB.
- Design: ASME B16.5 Class 150 (except instrument tees, since these are not covered by any standard). Instrument tees – in-house design, approved under Pressure Equipment Directive, and line with relevant ASME standards.
- Terminations: Fixed flanges fitted off centres.
- Dimensions: Fitting centreline to face and face to face dimensions are in accordance with those laid down in ASME B16.5 where relevant.

## Product Traceability

All CRP manufactured Lined Pipe & Fittings are backwards traceable from the finished component to the manufacturing tests, processes and lining materials. Each spool has one flange stamped with the reference of the liner batch used in its construction. This provides traceability back to the liner manufacture, the tests undertaken and the materials certification of the polymer. PFA moulded items likewise are stamped with a mould reference which again provide traceability back to the manufacturing and test activities and the material certification of the polymers used.





## Product Origin

All Corrosion Resistant Products (CRP) manufactured products originate from a single manufacturing source at Littleborough near Manchester, England or produced locally by authorised distributors using CRP liner in accordance with CRP manufacturing and quality assurance procedures. This both clearly establishes the origin and gives a commonality of manufacturing methods and materials – providing consistency of product standards through materials supplied.



## Common Product Standards

All PTFE pipe spools are manufactured using in-house produced PTFE paste extruded liner, whilst PFA lined fittings use virgin material.

All products are painted with a corrosion resistant two component low VOC, high solids fast curing epoxy primer/finish containing zinc phosphate anti-corrosive pigmentation. Colour RAL 5015 Blue Semi-Gloss. Typical thickness 125 microns.

All products (except type 1 spacers) include suitable venting within the metal structure of the item. Typically one or more 3mm diameter holes in spools and PTFE lined fittings, and the injection boss of PFA moulded fittings.

When Vent Extensions are required, a 10mm high 1/4" BSPT internally threaded boss is welded to pipe spools. For moulded fittings the injection boss is drilled and tapped with an appropriate BSPT female thread. A 65mm long vent extension is then supplied to fit to this, to provide a standard 75mm vent extension.

## Special requirements

As part of the supply CRP can provide alternative special paint finishes, stainless steel spools & fittings, BS or DIN flanges, the use of static dissipating polymers, special low temperature service requirements, non-standard face to face dimensions, rotating flanges and the creation of special components for the reduction of flanges or to assist in tight access areas.

## Product Identification and Packaging

All CE marked product is identified with a UV resistant, high temperature, nylon cable tie, providing manufacturers details, location and notified body CE registration number.

Additionally all cast products are identified with the CRP logo and details of the product size, cast materials specification and cast reference – “heat number”. All products where relevant are identified with CRP’s traceability reference.



Additionally, product is marked in indelible marker with details of the sales order and line item for easy cross-reference to the delivery documentation and for project activity; tape colour coding is used for identifying specific isometric drawing content.

Pipe spools are finished with protective water resistant MDF end boards using BZP Roofing Bolts. PFA lined products are protected with a polyethylene end cap.







## Product Certification

Standard product certification comprises a certificate of compliance and test to EN10204 type 2.2, confirming that the products supplied meet the relevant specifications, that fluoropolymers meet the requirements of the FDA regulation reference 21 CFR 177.1550 and details of the product tests undergone.

Project documentation – to customer specification. The following documentation can be supplied as evidence of quality control: Quality Plan, Product Drawings, Weld Procedures, Welder Qualifications, NDT Procedures, NDT Operator Qualification, Material Certification (2.2 or 3.1) and CRP Certificate of Conformance.

## Testing

- All virgin PTFE/PFA lined products are subject to an electrostatic spark test at 25kV. All pipe spools and certain fittings are also subject to Hydrotest at 29 bar(g) for three minutes, followed by a relaxation dwell to atmospheric pressure and a repeat.
- All spools and fittings lined in static dissipating PTFE/PFA are subject to Hydrotest at 29 bar(g) for three minutes, followed by a relaxation dwell to atmospheric pressure and a repeat.
- All spools and fittings are visually examined, particularly the flare faces, to ensure that there are no defects that would prevent the item sealing against adjacent items.
- The mechanical properties and the specific gravity of representative samples of PTFE liner, selected from each sinter batch, are tested

## PTFE and PFA Specifications

Liner Type	Specification	Properties
Virgin PTFE Paste Extruded	ASTM D4895	Minimum Tensile Strength: 20.7 MPa Minimum Elongation at Break: 250% Specific Gravity: 2.14 – 2.18 (when tested to ASTM D792 or D1505)
Static Dissipating PTFE Paste Extruded	ASTM D4895	Minimum Tensile Strength: 20.7 MPa Minimum Elongation at Break: 250% Specific Gravity: 2.14 – 2.18 (when tested to ASTM D792 or D1505) Volume Resistivity: <math>10^{10}</math> $\Omega$ .cm
Virgin PFA	ASTM D3307	Minimum Tensile Strength: 26.2 MPa Minimum Elongation at Break: 300% Specific Gravity: 2.12 – 2.17 (when tested to ASTM D792 or D1505) Melt Flow Rate: 1-2.5g/10mins (when tested to ASTM D3307 at 372°C)
Static Dissipating PFA	ASTM D3307	Minimum Tensile Strength: 26.2 MPa Minimum Elongation at Break: 300% Specific Gravity: 2.12 – 2.17 (when tested to ASTM D792 or D1505) Melt Flow Rate: 1-2.5g/10mins (when tested to ASTM D3307 at 372°C) Volume Resistivity: <math>10^{10}</math> $\Omega$ .cm
Virgin PTFE Isostatically Moulded	ASTM D4894	Minimum Tensile Strength: 17.3 MPa Minimum Elongation at Break: 250% Specific Gravity: 2.14 – 2.18 (when tested to ASTM D792 or D1505)
Static Dissipating PTFE Isostatically Moulded	ASTM D4894	Minimum Tensile Strength: 17.3 MPa Minimum Elongation at Break: 250% Specific Gravity: 2.14 – 2.18 (when tested to ASTM D792 or D1505) Volume Resistivity: <math>10^{10}</math> $\Omega$ .cm





## General Materials of Construction - Lined Piping

Pipe Spools	
Materials	Specification
Liner:	Virgin PTFE in accordance with ASTM D1457 Type III or ASTM D4895. For 8" – 12" NB this can be supplied in either standard or heavy duty versions.
Pipe:	API 5L Grade B or ASTM A106.
Stub End:	BS1501-161-430A.
Flange:	ASTM A105.

Cast Fittings	
Feature	Specification
Liner:	Virgin PTFE in accordance with ASTM D1457 Type III or ASTM D4895. Virgin PFA in accordance with ASTM D3307.
Housing:	Cast Steel ASTM A216 Grade WCB / ASTM A395 Ductile Iron

Fabricated Fittings	
Materials	Specification
Liner:	Virgin PTFE in accordance with ASTM D1457 Type III or ASTM D4895. Virgin PTFE in accordance with ASTM D1457 Type IV and V. Virgin PFA in accordance with ASTM D3307.
Pipe:	API 5L Grade B or ASTM A106.
Wrought Fittings:	ASTM A234 WPB
Stub Ends:	BS1501-161-430A.
Flanges:	ASTM A105.
Carbon Steel Plate:	BS1501-161-430A.

Spacers	
Feature	Specification
Type 1:	Virgin PTFE in accordance with ASTM D1457.
Type 2 & 3 Liner:	Virgin PTFE in accordance with ASTM D1457.
Type 2 Body:	BS1501-161-430A.
Type 3 Pipe:	API 5L Grade B or ASTM A106.
Type 3 Stub End:	BS1501-161-430A.





## PTFE Properties

Raw Material	Test Method
Polymer Grade	ASTM D1457 Type III, ASTM D4895

Mechanical	Value	Test Method
Density	2.15 - 2.18 g/cm <sup>3</sup>	DIN 53479
Tensile Strength	≥26N/mm <sup>2</sup>	DIN 53455
Elongation at Break	≥275%	DIN 53455
Hardness	55 - 60 Shore 'D'	DIN 53516

Thermal	Value	Test Method
Melting Point	320 - 340 °C	ISO 12086
Temperature range	-200 to +260 °C	
Coefficient of linear thermal expansion:		DIN 52328
20°C - 100°C	16 x 10 <sup>-5</sup> K <sup>-1</sup>	
20°C - 200°C	19.5 x 10 <sup>-5</sup> K <sup>-1</sup>	
20°C - 300°C	25 x 10 <sup>-5</sup> K <sup>-1</sup>	
Vicat softening Point	110°C	DN 53640
Conductivity	0.25 - 0.5 W/m K	DIN 52612
Flammability	Non Flammable	
Specific Heat at 0°C	0.96 KJ/Kg x K	
Specific Heat at 50°C	1.05 KJ/Kg x K	

Electrical	Value	Test Method
Dielectric strength (Film 0.2mm thick)	40 - 80 kV/mm	VDE 0303 part 2
Dielectric constant from 50 - 10 <sup>7</sup> Hz	2.1	DIN 53483
Volume resistivity	10 <sup>18</sup> Ω x cm	DIN 53482
Surface resistivity	≥10 <sup>17</sup> Ω	DIN 53482
Arc resistance	L4 Degree	VDE 0303 part 5

Other	Value	Test Method
Water absorption	≤0.01%	DIN 53495
Coefficient of permeability	2 - 8 x 10 <sup>-7</sup>	
FDA Compliant / UL Listed	Yes	21 CFR 177 1550
UL Listed	Yes	File 54681 QMFZ2

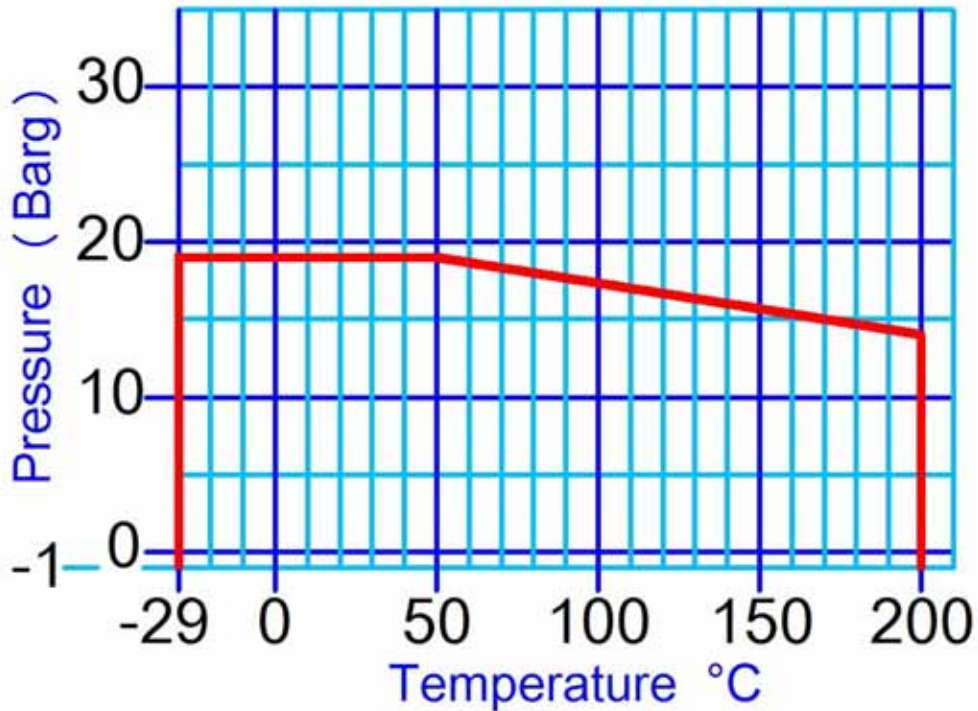




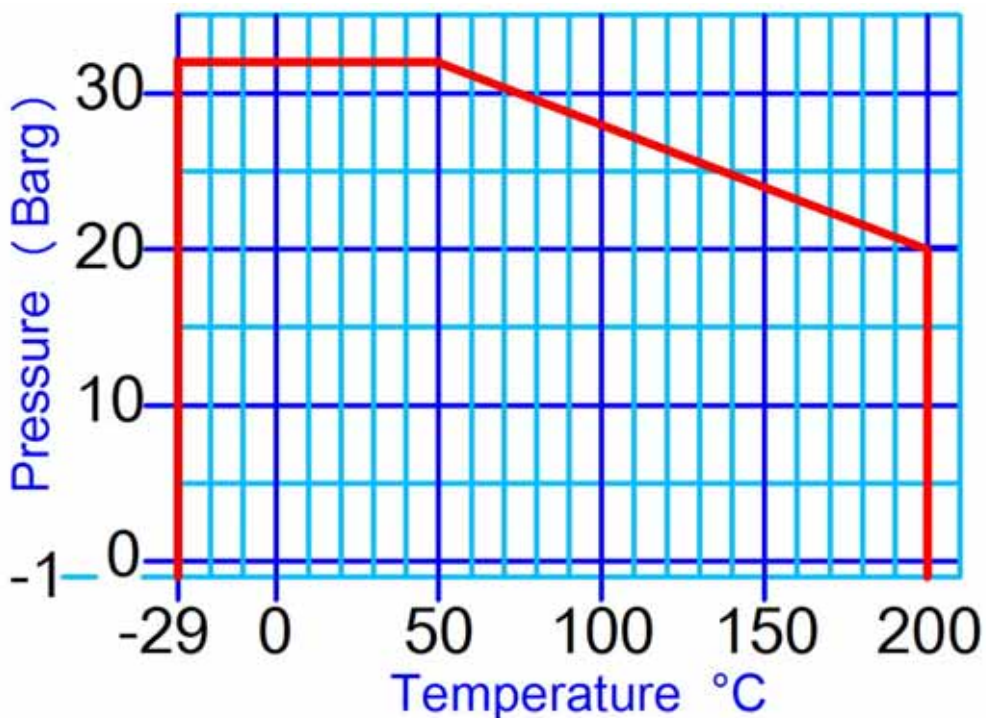
### Service Application Ratings

The Graph below shows the pressure / temperature performance curve for CRP's lined pipe and fittings. For products up to and including 6 in NB, they are rated for full vacuum up to 200 degrees C. Above 6 in NB please consult CRP for vacuum performance.

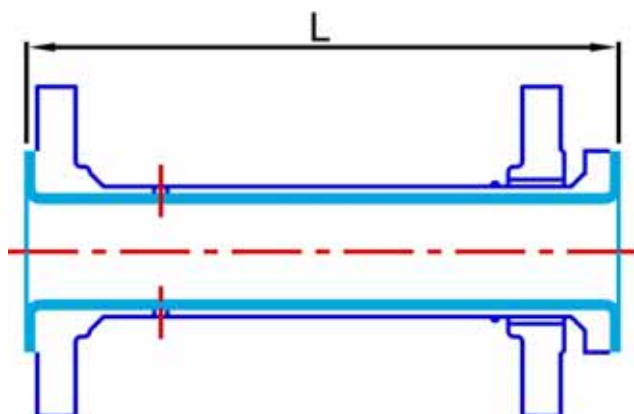
**ASME 150 Lined Piping Systems**



**ASME 300 Lined Piping Systems**







Nominal Bore		Length (L)		Flange Diameter	Raised Face	Pipe Schedule	PTFE Liner Thickness
Inches	mm	Minimum	Maximum				
1/2"	15	90	6000	89	35	40	2
3/4"	20	90	6000	98	43	40	2
1"	25	90	6000	108	51	40	3.3
1.1/2"	40	95	6000	127	73	40	3.3
2"	50	110	6000	152	92	40	3.3
3"	80	120	6000	190	127	40	3.3
4"	100	125	6000	229	157	40	4.5
6"	150	140	6000	279	216	30	5.5
8"	200	150	3000	343	270	30	4.5 or 8
10"	250	165	3000	406	324	30	5 or 9
12"	300	170	3000	483	381	30	5 or 9

This pipe spool has a welded slip on flange one end and a rotating flange with welded stub end the other for bolt hole alignment. Each pipe spool is manufactured to the customers length requirement in 1mm increments. Spools up to and including 6" NB are full vacuum rated, with larger diameters we offer standard weight liners and heavy duty thicker wall liners suitable for vacuum duties. For halogen services we offer spools with super weight liners, further information can be found on page 42. For shorter lengths we supply spacers.

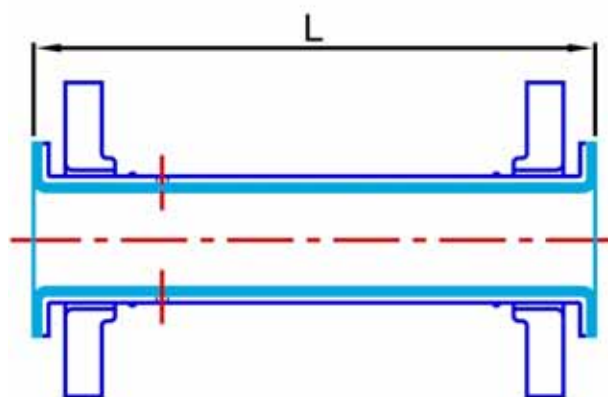
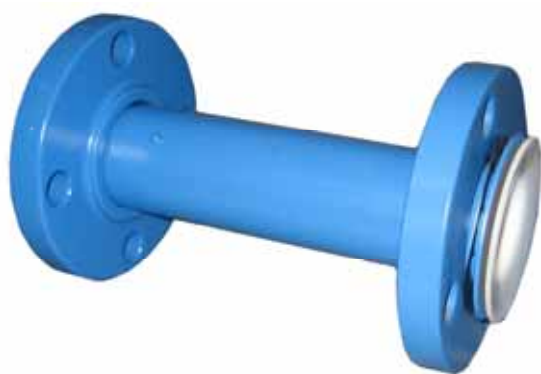
Materials	
Pipe	API 5L Grade B
Flanges	ASTM A105
Liner	PTFE to ASTM D1457
Stub Ends	BS1501 161 430A

Options	
Flanges	DIN PN 10/16, BS10, ASME 300
Materials	Stainless steel
Linings	Static Dissipating / Super Weight.
Extras	Spikie earthing washers, earth studs, vent extensions etc.



### Vent Extensions

When the lined piping system will be lagged, please specify that the spools and fittings should be supplied with vent extensions, these 75mm long extension protrude through the lagging allowing the correct venting of the lined equipment.



Nominal Bore		Length (L)		Flange Diameter	Raised Face	Pipe Schedule	PTFE Liner Thickness
Inches	mm	Minimum	Maximum				
1"	25	250	6000	108	51	40	3.3
1.1/2"	40	250	6000	127	73	40	3.3
2"	50	250	6000	152	92	40	3.3
3"	80	250	6000	190	127	40	3.3
4"	100	250	6000	229	157	40	4.5
6"	150	500	6000	279	216	30	5.5
8"	200	500	3000	343	270	30	4.5 or 8

The Van Stone pipe spool has 2 rotating flanges for easy installation. In manufacture the lap collars are mechanically formed to provide flange sealing faces. As there are no welds the spools can prove to be more cost effective than welded constructions. Due to the manufacturing process very short spool lengths cannot be supplied, for lengths less than the minimum we supply welded construction spools and for the shortest lengths spacers. Each pipe spool is manufactured to the customers length requirement in 1mm increments. Spools up to and including 6" NB are full vacuum rated, For larger diameters we offer standard weight liners and heavy duty thicker wall liners suitable for vacuum duties. For halogen services we offer Van Stone spools with super weight liners, further information can be found on page 42.

Materials	
Pipe	API 5L Grade B
Flanges	ASTM A105
Liner	PTFE to ASTM D1457

Options	
Flanges	DIN PN 10/16 , BS10, ASME 300
Materials	Stainless steel
Linings	Static Dissipating / Super Weight.
Extras	Spikie earthing washers, earth studs, vent extensions etc.



**Spikies Earthing Washer**

In order to address the issue of electrical earthing of rotating flanged components CRP has developed its range of Spikies®. They are simply slipped into place between the loose flange and stub end on a pipe spool or fitting, and the joint made using star washers and studs as on a fixed flange joint. Once in place the centring lugs ensure that the raised points on the Spikies® are positioned to bite into mating components and provide earth continuity from rotating flange to fitting / spool.



# Introduction to Van Stone Piping

**CRP** currently leads the UK market with our Van Stone PTFE lined piping system for both carbon steel and stainless steel piping.

The process of manufacturing a pipe spool with both flanges rotating without the use of conventionally welded or screw threaded collars is known as the "Conrac" or more properly the "Van Stone" system. The process essentially forms a lap collar by spinning over the parent tube at right angles to the original tube axis.

The use of the term "Conrac" which is the most widely recognised name for this process, is derived from the name of the machinery manufacturer who did much to develop the special machinery and promote the use of this flanging system. The "Conrac Corporation of California".

## **Product Development**

The development of this process was born of a need to make the manufacture of pipework cheaper, easier and technically superior. Traditionally pipework sections had been joined by fitting screwed flanges and to use a taper pipe thread, which would lock and form a seal. The steel tubes used for screw threading were very heavy and therefore expensive, the screwed flanges were also costly, prone to leakage and corrosion. The use of all welded systems was an improvement but for pre fabricated sections the quality of set up especially of flange squareness and bolt hole alignment was critical. If the setting out was not done correctly it was often necessary to butcher the system to make it fit or even remake it complete. The twin needs of lower cost and ease of fabrication whilst maintaining piping integrity drove the development of the tafted lap collar. The original developments were mostly in the use of thin wall expensive exotic metals where welding was at best unreliable and often impossible. The process was then taken up for pre-fabricated sections of marine pipework where being able to fit rotating flanges to relatively light wall piping had a marked effect on speed of build, overall weight and costs.

From the very early days of PTFE lined pipe systems the use of Van Stone flanged pipe spools was adopted as the preferred method of flanging and remains the favoured choice of most international lined pipe manufacturers and users alike.

## **Product Testing**

To improve the overall quality and cost effectiveness of CRP lined pipe systems CRP purchased a Conrac machine in November 1995 and began to develop the skills and disciplines required for this type of flanging method. In the months between CRP acquiring the machine and product coming to the market place in mid 1996 a large number of tests were made.

## **Physical Testing**

Sample pipe spools were manufactured and then subjected to the extended steam and cold water cycle qualification tests demanded in ASTM F423. They were also tested for vacuum and heat ageing performance as well as the usual hydrostatic and electrostatic tests; all samples passed without incident. To assess the joint integrity suitably flanged spools were pressure tested to levels of 65 Bar g without any failure being observed. This pressure is substantially in excess of the 52 Bar g maximum pressure test permitted on ASME class 300 and over twice the test level for class 150.

## **Product Advantages**

### **Accuracy**

Because the collar is mechanically formed, it is square and flat which helps produce very sound joints.

### **Transition Radius**

Forming produces a smooth transition radius between the bore and the collar face. This gives the best surface for the minimisation stress in the PTFE flare.

### **Assembly**

With two rotating flanges site assembly is easy enabling bolt holes to be lined up.

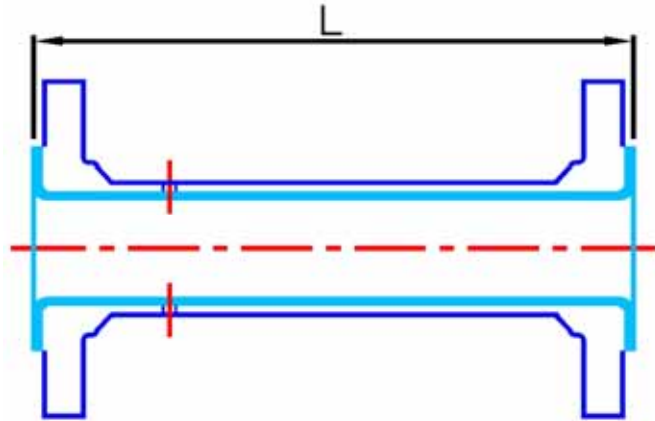
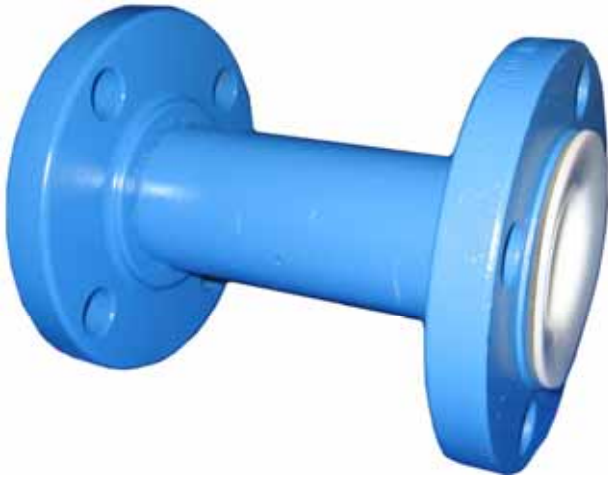
### **Cost**

Moreover, the use of low cost rotating flanges on pipe spool reduces the need to order pipe fittings with rotating flanges. This in turn means that less expensive fixed flange cast fittings can be specified more often. The piping system is in its own right less expensive than a conventionally welded system.

### **Corrosion**

The bolts required are much shorter giving much less shank exposed to gather dirt and get corroded.





Nominal Bore		Length (L)		Flange Diameter	Raised Face	Pipe Schedule	PTFE Liner Thickness
Inches	mm	Minimum	Maximum				
1/2"	15	90	6000	89	35	40	2.0
3/4"	20	90	6000	98	43	40	2.0
1"	25	90	6000	108	51	40	3.3
1.1/2"	40	95	6000	127	73	40	3.3
2"	50	110	6000	152	92	40	3.3
3"	80	120	6000	190	127	40	3.3
4"	100	125	6000	229	157	40	4.5
6"	150	140	6000	279	216	30	5.5
8"	200	150	3000	343	270	30	4.5 or 8
10"	250	165	3000	406	324	30	5 or 9
12"	300	170	3000	483	381	30	5 or 9

Each pipe spool is manufactured to the customers length requirement in 1mm increments. Spools up to and including 6" NB are full vacuum rated, with larger diameters we offer standard weight liners and heavy duty thicker wall liners suitable for vacuum duties. For halogen services we offer spools with super weight liners, further information can be found on page 42. For shorter lengths we supply spacers.

Materials	
Pipe	API 5L Grade B
Flanges	ASTM A105
Liner	PTFE to ASTM D1457

Options	
Flanges	DIN PN 10/16 , BS10, ASME 300
Materials	Stainless steel
Linings	Static Dissipating / Super Weight.
Extras	Spikie earthing washers, earth studs, vent extensions etc.

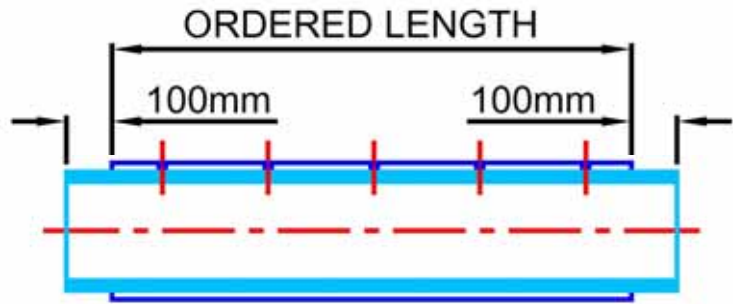


### Venting

All lined piping systems must have vent holes drilled through the steel body. This is for 2 reasons, firstly to vent any gasses that may permeate through the liner over time to the atmosphere rather than allow them to build up behind the liner trapped within the steel pipe and to act as an early warning if the liner should fail. Pipe spools less than 500mm have 2 off vent holes located centrally, longer spools have 4 vent holes 1 pair at located at each end.



# Field Flare Pipe Spool, slide fit liner without flanges [ES1048]



Nominal Bore		Length		Pipe Schedule	PTFE Liner Thickness
Inches	mm	Minimum	Maximum		
1"	25	100	3000	40	3.3
1.1/2"	40	100	3000	40	3.3
2"	50	100	3000	40	3.3
3"	80	100	3000	40	3.3
4"	100	100	3000	40	4.5

These field flare spools are finished on site by the customer, the liners are a loose fit within the bore of the pipe and are slid out on site to allow the flanges to be fitted, either welded or screwed or used in conjunction with a welded stub end. The liner is then reintroduced and flared to form the raised face using special flaring tools.

Field flare pipe spools allow the rapid manufacture of piping on site. This means that closing spools can quickly be fabricated and fitted. In breakdown situations pipe spools can be manufactured on site by the customers maintenance teams to keep down time to an absolute minimum. Site measure spools can be easily manufactured keeping installation programmes on track.

CRP manufacture the complete range of tools required to carry out field flaring and offer field flare kits to suit each nominal bore of piping. We hold training sessions for contractors and installation teams and issue certificates of attendance to individuals.

Materials	
Pipe	API 5L Grade B
Liner	PTFE to ASTM D1457



### Static Dissipating Liners

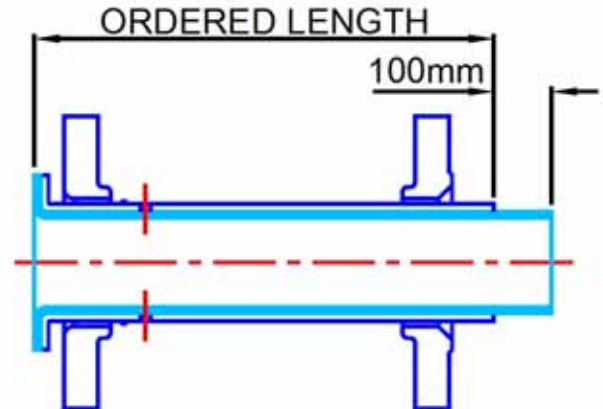
All of our lined piping and fittings can be manufactured with static dissipating liners, commonly referred to as having 'Antistatic' properties. By combining the PTFE or PFA fluoropolymers with a small amount of carbon filler the liners are able to conduct any build up of static from the bore of the pipe to the steelwork. Any build up of static electricity within the bores of the piping is safely dissipated through the conductive lining to the outer steelwork.







# Field Flare Pipe Spool, slide fit liner with Van Stone flange [ES1051]



Nominal Bore		Length		Flange Diameter	Raised Face	Pipe Schedule	PTFE Liner Thickness
Inches	mm	Minimum	Maximum				
1"	25	100	6000	108	51	40	3.3
1.1/2"	40	100	6000	127	73	40	3.3
2"	50	100	6000	152	92	40	3.3
3"	80	100	6000	190	127	40	3.3
4"	100	100	6000	229	157	40	4.5

These field flare spools are finished on site by the customer, the liners are a loose fit within the bore of the pipe. This field pipe spool has a fully factory finished Van Stone flanged end complete with rotating flange. The other end is supplied unfinished with a tacked on slip on weld flange. When ready to be fabricated the PTFE is slid away from the unfinished end, the steel is sawn to the correct length, the flanged welded on and then the PTFE reintroduced and field flared completing the pipe spool leaving a pipe spool with fixed / rotating flanges ready for installation.

Materials	
Pipe	API 5L Grade B
Flanges	ASTM A105
Liner	PTFE to ASTM D1457



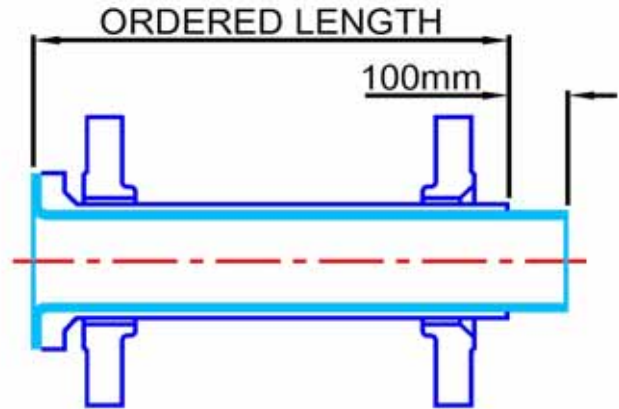
### Field Flare Tooling Kits

To complement our range of field flare liners we carry a full range of tooling kits. A complete set is required for each size of pipe spool to be manufactured, full instructions and training can be provided.





# Field Flare Pipe Spool, slide fit liner with welded flange [ES1038]



Nominal Bore		Length		Flange Diameter	Raised Face	Pipe Schedule	PTFE Liner Thickness
Inches	mm	Minimum	Maximum				
1"	25	100	6000	108	51	40	3.3
1.1/2"	40	100	6000	127	73	40	3.3
2"	50	100	6000	152	92	40	3.3
3"	80	100	6000	190	127	40	3.3
4"	100	100	6000	229	157	40	4.5

These field flare spools are finished on site by the customer, the liners are a loose fit within the bore of the pipe. This field pipe spool has a fully factory finished welded stub end and rotating slip on flange. The other end is supplied unfinished with a tacked on slip on weld flange. When ready to be fabricated the PTFE is slid away from the unfinished end, the steel is sawn to the correct length, the flanged welded on and then the PTFE reintroduced and field flared completing the pipe spool leaving a pipe spool with fixed / rotating flanges ready for installation.

Materials	
Pipe	API 5L Grade B
Flanges	ASTM A105
Liner	PTFE to ASTM D1457
Stub End	BS1501 161 430A

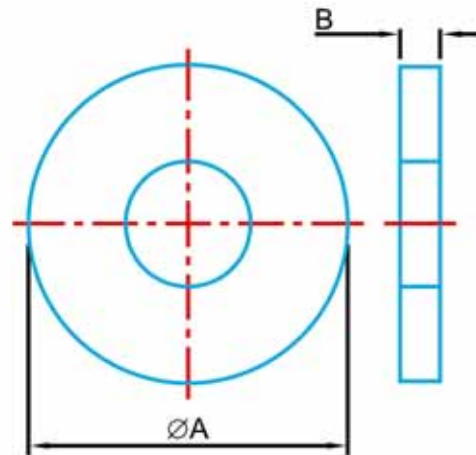
Options	
Flanges	DIN PN 10/16 , BS10, ASME 300
Materials	Stainless steel
Linings	Static Dissipating / Super Weight.
Extras	Spikie earthing washers, earth studs, vent extensions etc.



### Field Flaring Procedure

The image on the left shows the PTFE being formed into a raised sealing face on a field flare spool. We supply full illustrated working procedures for the manufacture of field flare spools.





Nominal Bore		Length (B)		Diameter (A)
Inches	mm	Minimum mm	Maximum mm	mm
1/2"	15	1	25	44
3/4"	20	1	25	54
1"	25	1	25	64
1.1/2"	40	1	25	83
2"	50	1	25	102
3"	80	1	25	133
4"	100	1	25	171
6"	150	1	25	219
8"	200	1	25	275
10"	250	1	25	336
12"	300	1	25	405

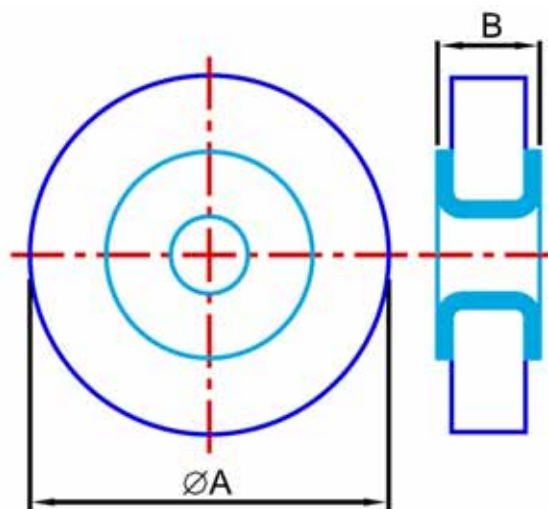
Type 1 spacers are manufactured from solid PTFE and used to fill short gaps up to 25mm maximum.

Materials	
PTFE	ASTM D1457



### Tapered Spacers

CRP supply tapered type 1 spacers to offer falls on pipelines to aid draining or to overcome misalignment issues with a flanged connection



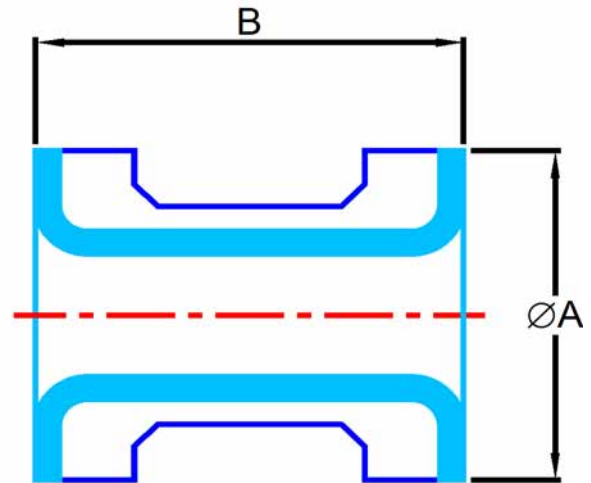
Nominal Bore		Length (B)		Diameter (A)	PTFE Liner Thickness
Inches	mm	Minimum	Maximum		
1/2"	15	26	60	44	2.0
3/4"	20	26	60	54	2.0
1"	25	26	60	64	3.3
1.1/2"	40	26	60	83	3.3
2"	50	26	60	102	3.3
3"	80	26	70	133	3.3
4"	100	26	70	171	4.5
6"	150	26	70	219	5.5
8"	200	26	80	275	4.5 or 8
10"	250	26	80	336	5 or 9
12"	300	26	80	405	5 or 9

Type 2 spacers are manufactured from heavy wall steel tube with a PTFE lining flared each end.

Materials	
Body	BS1501 161 430A
Liner	PTFE to ASTM D1457

### High Permeation Resistant Liners

Bromine along with other members of the halogen family is highly reactive, this can lead over time to particles permeating through fluoropolymer linings used to carry this highly corrosive chemical. Working closely with a global agricultural chemical manufacturer CRP has developed a special lined piping range utilising super-weight paste extruded PTFE liners and PFA moulded fittings. All of our piping systems can be supplied lined in these super weight liners reducing the effects of permeation. See page 42 for details.



Nominal Bore		Length (B)		Raised Face Diameter (A)	PTFE Liner Thickness
Inches	mm	Minimum	Maximum		
1/2"	15	61	90	44	2.0
3/4"	20	61	90	54	2.0
1"	25	61	90	64	3.3
1.1/2"	40	61	95	83	3.3
2"	50	61	110	102	3.3
3"	80	71	120	133	3.3
4"	100	71	125	171	4.5
6"	150	71	140	219	5.5
8"	200	81	150	275	4.5 or 8
10"	250	81	165	336	5 or 9
12"	300	81	170	405	5 or 9

Type 3 spacers are manufactured from 2 stub ends and a steel pipe welded to form the housing with a PTFE liner flared each end to provide sealing faces.

Materials	
Pipe	API 5L Grade B
Stub Ends	BS1501 161 430A
Liner	PTFE to ASTM D1457

Options	
Flanges	To suit DIN PN 10/16 , BS10, ASME 300
Materials	Stainless steel
Linings	Static Dissipating / Super Weight.
Extras	Earth studs, vent extensions etc.



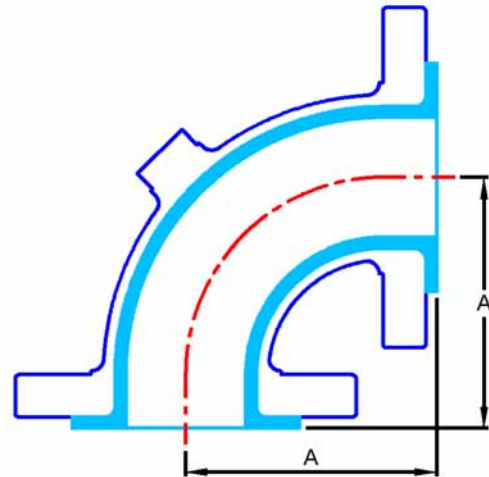
### Earthing Studs / Lugs

We offer all our piping with the option to have earth continuity studs or lugs welded to the pipe, flange or both depending upon site specifications.





# 90 Degree Elbow



Nominal Bore		Centre Line to Face (A)	Flange Diameter	Raised Face	Steel Thickness	Liner Thickness
Inches	mm					
1/2"	15	100	89	35	3.0	2.5
3/4"	20	75	98	43	3.0	2.5
1"	25	89	108	51	4.5	4.1
1.1/2"	40	102	127	73	5.0	4.5
2"	50	114	152	92	6.0	4.7
3"	80	140	190	127	6.0	6.5
4"	100	165	229	157	6.5	9.0
6"	150	203	279	216	7.5	9.5
8"	200	229	343	270	8.0	9.5
10"	250	279	406	324	8.0	11.0
12"	300	305	483	381	8.0	11.0

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D3307

Materials - PTFE lined Fabrications	
Pipe	API 5L Grade B / ASTM A234
Flanges	ASTM 105
Lining	PTFE to ASTM D1457

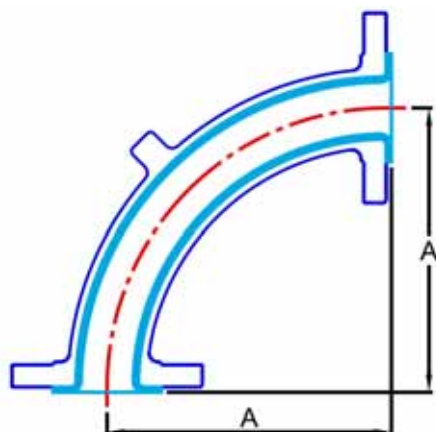
**Specials**

As well as standard 45 and 90 degree elbows, CRP can supply special elbows with any angle from 1 degree up to 180 degrees which are commonly found on heat exchangers. Whilst we would encourage using standard dimensioned elbows to ASME B16.5 dimensions we can supply special elbows with swept bends for slurry duty or to overcome installation problems etc. For elbows with angles less than 45 degrees the centre-line to face dimension adopted would be the same as 45 degree elbows, For elbows with angles above 45 degrees we adopt the 90 degree centre-line to face dimensions.





# 90 Degree Long Radius (5D) Elbow



Nominal Bore		Centre Line to Face (A)	Flange Diameter	Raised Face	Steel Thickness	PTFE Liner Thickness
Inches	mm	mm	mm	mm	mm	mm
1"	25	127	108	51	5.5	2.5
1.1/2"	40	191	127	73	5.5	3.3
2"	50	254	152	92	5.5	3.3
3"	80	381	190	127	5.5	3.3
4"	100	508	229	157	6.5	4.5
6"	150	762	279	216	7.0	5.5
8"	200	1016	343	270	7.0	4.5 or 8
10"	250	1270	406	324	8.0	11.00
12"	300	1524	483	381	8.0	11.00

Please note 1/2" and 3/4" long radius bends are not available

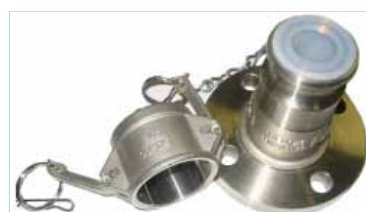
These swept bends are ideal for use with slurries. The centreline to faces are based on 5 times

Materials - PTFE lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PTFE to ASTM D1457

Materials - PTFE lined Fabrications	
Pipe	API 5L Grade B / ASTM A234
Flanges	ASTM 105
Lining	PTFE to ASTM D1457

**Specials**

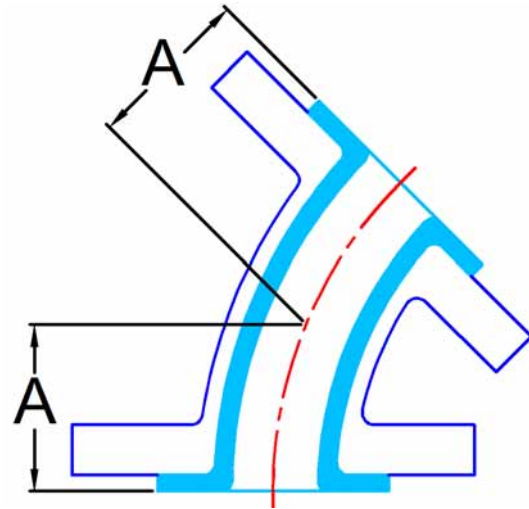
As well as standard 45 and 90 degree elbows, we can supply special elbows with any angle from 1 degree up to 180 degree which are commonly found on heat exchangers. Whilst we would encourage using standard dimensioned elbows to ASME B16.5 dimensions we can supply special elbows with swept bends for slurry duty or to overcome installation problems etc. For elbows with angles less than 45 degrees the centre-line to face dimension adopted would be the same as 45 degree elbows, For elbows with angles above 45 degrees we adopt the 90 degree centre-line to face dimensions.



### Hose Adaptors

CRP manufacture PFA lined camlock, triclamp and threaded flanged hose adaptors.





Nominal Bore		Centre Line to Face (A)	Flange Diameter	Raised Face	Steel Thickness	PTFE Liner Thickness
Inches	mm	mm	mm	mm	mm	mm
1/2"	15	44	89	35	3.0	2.5
3/4"	20	44	98	43	3.0	2.5
1"	25	44	108	51	4.5	3.3
1.1/2"	40	57	127	73	5.0	3.3
2"	50	63	152	92	6.0	3.3
3"	80	76	190	127	6.0	3.3
4"	100	102	229	157	6.5	4.5
6"	150	127	279	216	8.0	5.5
8"	200	140	343	270	8.0	9.5
10"	250	165	406	324	9.0	11.0
12"	300	190	483	381	10.0	11.0

Materials - PTFE lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PTFE to ASTM D1457

Materials - PTFE lined Fabrications	
Pipe	API 5L Grade B / ASTM A234
Flanges	ASTM 105
Lining	PTFE to ASTM D1457

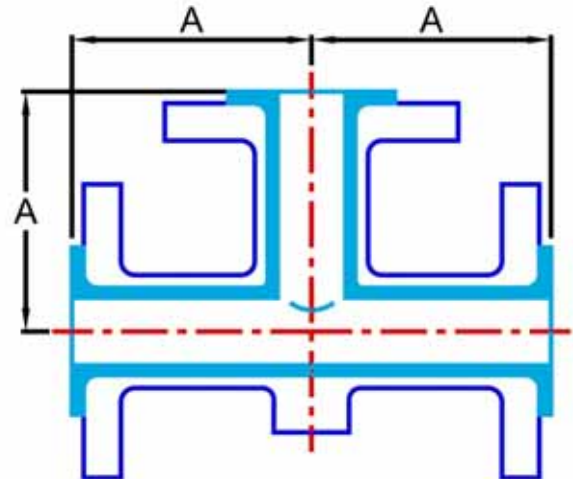
**Investment Steel Castings**

We try to standardise on castings where commercially viable rather than traditional fabrications. These precision investment (lost wax) castings provide consistent liner thickness and installation geometry. Their heat numbers and other product markings are easily readable unlike their sand cast counterparts.



### Blanking Spades

CRP supply a full range of PTFE lined blanking spades for positive line shutoff in shutdown and maintenance instructions.



Nominal Bore		Centre Line to Face (A)	Flange Diameter	Raised Face	Steel Thickness	Liner Thickness
Inches	mm	mm	mm	mm	mm	mm
1/2"	15	65	89	35	4.0	3.5
3/4"	20	75	98	43	4.0	3.5
1"	25	89	108	51	5.5	4.0
1.1/2"	40	102	127	73	5.5	4.5
2"	50	114	152	92	5.5	4.8
3"	80	140	190	127	6.5	6.5
4"	100	165	229	157	7.5	9.0
6"	150	203	279	216	7.5	9.5
8"	200	229	343	270	8.0	9.5
10"	250	279	406	324	9.0	11.0
12"	300	305	483	381	10.0	11.0

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D3307

Materials - PTFE lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM 105
Lining	PTFE to ASTM D1457

**Tee Range**

CRP offer the widest range of PFA lined tees:  
 Equal Tees  
 Reducing Tees  
 Short Branch Tees  
 Lateral Tees  
 Instrument Tees

Any of these can be supplied with fixed or rotating flanges to aid installation.  
 The PFA linings offer the best permeation resistance and smoothest bores, it's nonwetttable properties are excellent and allow easy cleaning.



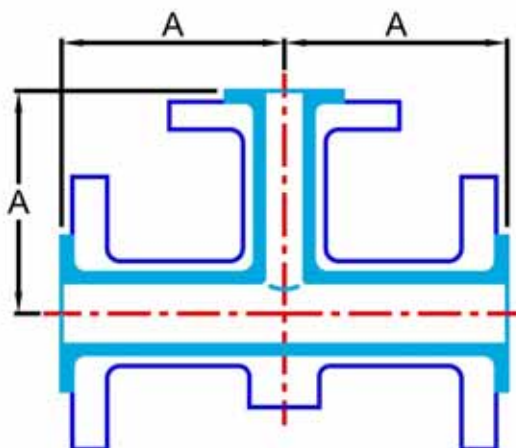
**Stainless Steel Lined Pipe and Fittings**  
 CRP can supply our complete range in stainless steel. We have developed the range to provide a very cost effective alternative to lined carbon steel.





# Reducing Tee

**ASME B16.5  
Class 150**



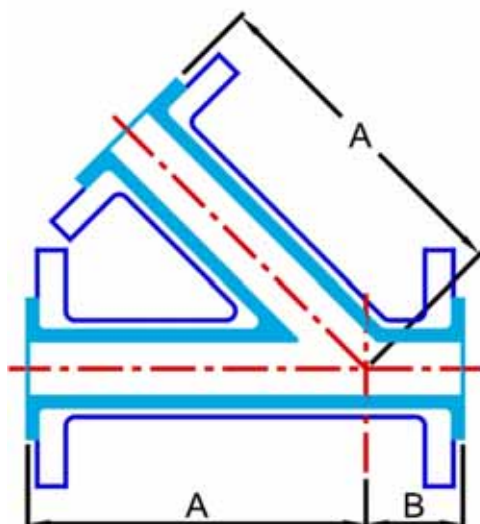
Nominal Bore		Centre Line to Face (A)	Large NB Flange Ø	Large NB Raised Face	Small NB Flange Ø	Small NB Raised Face
Inches	mm					
3/4" x 1/2"	20x15	75	98	43	90	35
1" x 3/4"	25x20	89	108	51	100	43
1.1/2" x 1"	40 x 25	102	127	73	108	51
2" x 1"	50 x 25	114	152	92	108	51
2" x 1.1/2"	50 x 40	114	152	92	127	73
3" x 1"	80 x 25	140	190	127	108	51
3" x 1.1/2"	80 x 40	140	190	127	127	73
3" x 2"	80 x 50	140	190	127	152	92
4" x 1"	100 x 25	165	229	157	108	51
4" x 1.1/2"	100 x 40	165	229	157	127	73
4" x 2"	100 x 50	165	229	157	152	92
4" x 3"	100 x 80	165	229	157	190	127
6" x 2"	150 x 50	203	279	216	152	92
6" x 3"	150 x 80	203	279	216	190	127
6" x 4"	150 x 100	203	279	216	229	157
8" x 4"	200 x 100	229	343	270	229	157
8" x 6"	200 x 150	229	343	270	279	216
10" x 6"	250 x 150	279	406	324	279	216
10" x 8"	250 x 200	279	406	324	343	270
12" x 6"	300 x 150	305	483	381	279	216
12" x 8"	300 x 200	305	483	381	343	270
12" x 10"	300 x 250	305	483	381	406	324

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D3307

Materials - PTFE lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM A105
Lining	PTFE to ASTM D1457







Nominal Bore		Centre Line to Face (A)	Centre Line to Face (B)	Flange Diameter	Raised Face	Steel Thickness	PFA Liner Thickness
Inches	mm	mm	mm	mm	mm	mm	mm
1"	25	146	44	108	51	5.5	4.0
1.1/2"	40	178	51	127	73	5.5	4.5
2"	50	203	64	152	92	5.5	4.8
3"	80	254	76	190	127	6.5	6.5
4"	100	305	76	229	157	7.5	9.0
6"	150	368	89	279	216	7.5	9.5

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB

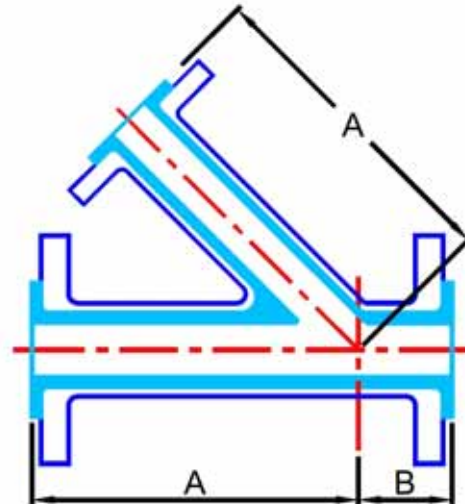
Materials - PFA lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM A105
Liner	PTFE to ASTM D1457



### CRP Flange Shields

We strongly recommend that all flange joints are protected from uncontrolled spay out by fitting flange shields. These are available in roll form to be cut to length and wrapped around the joint and secured.



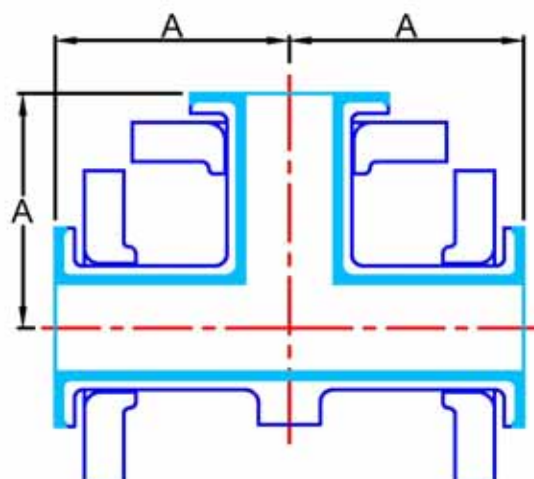


Nominal Bore		Centre Line to Face (A)	Centre Line to Face (B)	Large NB Flange Ø	Large NB Raised Face	Small NB Flange Ø	Small NB Raised Face
Inches	mm	mm	mm	mm	mm	mm	mm
1.1/2" x 1"	40 x 25	178	51	127	73	108	51
2" x 1"	50 x 25	203	64	152	92	108	51
2" x 1.1/2"	50 x 40	203	64	152	92	127	73
3" x 1"	80 x 25	254	76	190	127	108	51
3" x 1.1/2"	80 x 40	254	76	190	127	127	73
3" x 2"	80 x 50	254	76	190	127	152	92
4" x 1.5"	100 x 40	305	76	229	157	127	73
4" x 2"	100 x 50	305	76	229	157	152	92
4" x 3"	100 x 80	305	76	229	157	190	127
6" x 2"	150 x 50	368	89	279	216	152	92
6" x 3"	150 x 80	368	89	279	216	190	127
6" x 4"	150 x 100	368	89	279	216	229	157

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D1457

Materials - PFA lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM 105
Lining	PFA to ASTM D3307

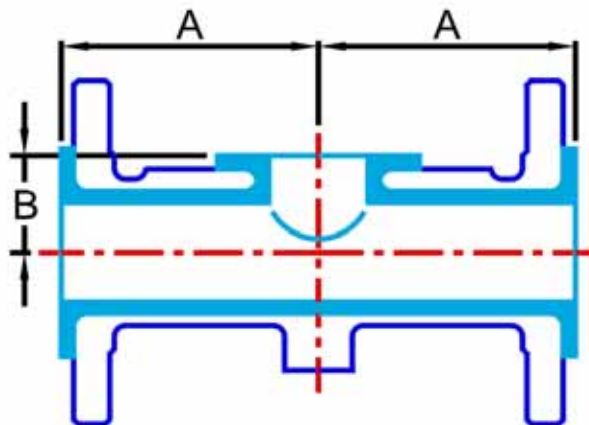
Specials	
	<p>C R P c a n manufacture many special components, All lined in PTFE or PFA. Here on the left is a custom pH probe housing.</p>



Nominal Bore		Centre Line to Face (A)	Flange Diameter	Raised Face	Steel Thickness	Liner Thickness
Inches	mm	mm	mm	mm	mm	mm
1/2"	15	65	89	35	4.0	3.5
3/4"	20	75	98	43	4.0	3.5
1"	25	89	108	51	5.5	4.0
1.1/2"	40	102	127	73	5.5	4.5
2"	50	114	152	92	5.5	4.8
3"	80	140	190	127	6.5	6.5
4"	100	165	229	157	7.5	9.0
6"	150	203	279	216	7.5	9.5
8"	200	229	343	270	8.0	9.5
10"	250	279	406	324	9.0	11.0
12"	300	305	483	381	10.0	11.0

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM 3307
Materials - PFA / PTFE lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM 105
Lining	PTFE to ASTM D1457 / PFA to ASTM D3307.

**Reducing Tees with Rotating Flanges**  
 CRP can supply reducing tees with reducing flanges too.



Nominal Bore		Centre Line to Face (A)	Centre Line to Face (B)	Flange Diameter	Raised Face	Steel Thickness	PFA Liner Thickness
Inches	mm	mm	mm	mm	mm	mm	mm
1"	25	89	30	108	51	5.5	4.0
1.1/2"	40	102	37	127	73	5.5	4.5
2"	50	114	43	152	92	5.5	4.8
3"	80	140	56	190	127	6.5	6.5
4"	100	165	67	229	157	7.5	9.0
6"	150	203	105	279	216	7.5	9.5

Used for mounting probes or around vessel tops where space is at a premium.

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D1457

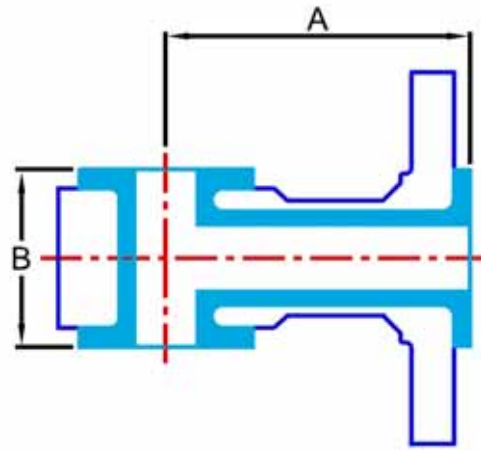
Reducing Short Branch Tees	
CRP also manufacture short branch tees with a reduced bore branch connection, the centre line to face dimensions are the same as shown.	

Materials - PFA lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM 105
Lining	PFA to ASTM D3307



**PFA lined Special Components**

With years of moulding experience and a wide array of moulding tools and transfer moulding machines we are able to offer special lined components like the virgin PFA lined manifold shown on the left.



Nominal Bore		Centre Line to Face (A)	Face to Face (B)
Inches	mm	mm	mm
1/2" x 1/2"	15 x 15	100	51
3/4" x 3/4"	20 x 20	89	51
1.1/2" x 1"	40 x 25	102	76
2" x 1"	50 x 25	114	51
2" x 2"	50 x 50	114	89
3" x 1.1/2"	80 x 40	140	76
3" x 3"	80 x 80	140	150
4" x 1.1/2"	100 x 40	165	76
6" x 1"	150 x 25	203	51
6" x 2"	150 x 50	203	89
8" x 1"	200 x 25	229	51
8" x 2"	200 x 50	229	89
10" x 1"	250 x 25	279	51
10" x 2"	250 x 50	279	89
12" x 1.1/2"	300 x 40	305	76

Nominal Bore		Centre Line to Face (A)	Face to Face (B)
Inches	mm	mm	mm
3/4" x 1/2"	20 x 15	89	51
1" x 1"	25 x 25	89	51
1.1/2" x 1.1/2"	40 x 40	102	76
2" x 1.1/2"	50 x 40	114	89
3" x 1"	80 x 25	140	51
3" x 2"	80 x 50	140	76
4" x 1"	100 x 25	165	51
4" x 2"*	100 x 50*	165	89
6" x 1.1/2"	150 x 40	203	76
6" x 3"*	150 x 80*	203	150
8" x 1.1/2"	200 x 40	200	76
8" x 3"	200 x 80	279	150
10" x 1.1/2"	250 x 40	279	76
12" x 1"	300 x 25	305	51
12" x 2"	300 x 50	305	89

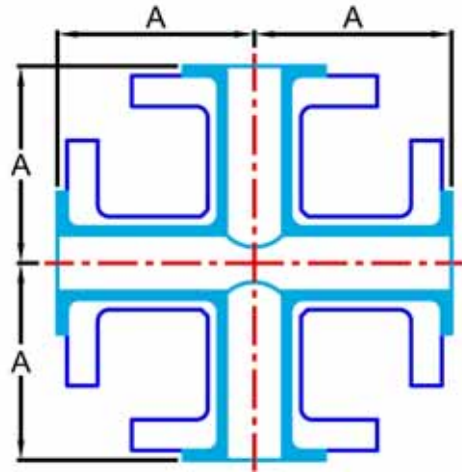
Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D3307

Materials - PTFE / PFA lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM A105
Lining	PTFE to ASTM D1457 / PFA to ASTM D3307

**Notes**

\*Please note the branch of the 6" x 3" instrument tee has a reduced bore manufactured from 2"NB pipe. The branch of the 4" x 2" tee has a reduced bore manufactured from 1.1/2"NB pipe.





Nominal Bore		Centre Line to Face (A)	Flange Diameter	Raised Face	Steel Thickness	Liner Thickness
Inches	mm					
1/2"	15	65	89	35	4.0	3.5
3/4"	20	75	98	43	4.0	3.5
1"	25	89	108	51	5.5	4.0
1.1/2"	40	102	127	73	5.5	4.5
2"	50	114	152	92	5.5	4.8
3"	80	140	190	127	6.5	6.5
4"	100	165	229	157	7.5	9.0
6"	150	203	279	216	7.5	9.5
8"	200	229	343	270	8.0	9.5
10"	250	279	406	324	9.0	11.0
12"	300	305	483	381	10.0	11.0

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D1457

Materials - PTFE / PFA lined Fabrications	
Pipe	API 5L Grade B
Flanges	ASTM 105
Lining	PTFE to ASTM D3307 / PFA to ASTM D1457

**Reducing Crosses**

CRP can also supply reducing crosses upon request, centre line to face dimensions for all branches are dictated by the large nominal bore and are the same as equal crosses.

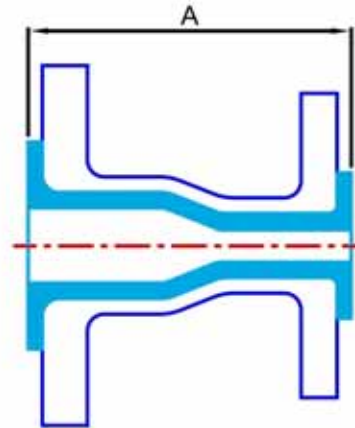


**Stainless Steel Lined Pipe and Fittings**  
CRP can supply our complete range in stainless steel, we have developed the range to provide a very cost effective alternative to lined carbon steel.





# Concentric Reducer

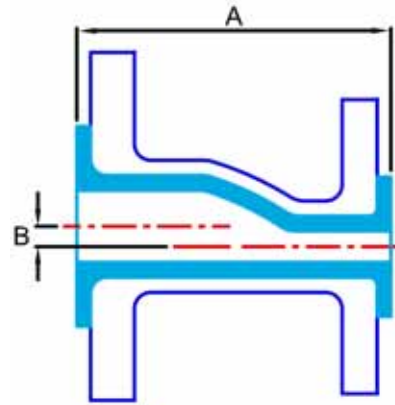


Nominal Bore		Centre Line to Face (A)	Large NB Flange Ø	Large NB Raised Face	Small NB Flange Ø	Small NB Raised Face
Inches	mm	mm	mm	mm	mm	mm
3/4" x 1/2"	20 x 15	114	98	43	89	35
1" x 3/4"	25 x 20	114	108	51	98	43
1.1/2" x 1"	40 x 25	114	127	73	108	51
2" x 1"	50 x 25	127	152	92	108	51
2" x 1.1/2"	50 x 40	127	152	92	127	73
3" x 1"	80 x 25	152	190	127	108	51
3" x 1.1/2"	80 x 40	152	190	127	127	73
3" x 2"	80 x 50	152	190	127	152	92
4" x 1"	100 x 25	178	229	157	108	51
4" x 1.1/2"	100 x 40	178	229	157	127	73
4" x 2"	100 x 50	178	229	157	152	92
4" x 3"	100 x 80	178	229	157	190	127
6" x 2"	150 x 50	229	279	216	152	92
6" x 3"	150 x 80	229	279	216	190	127
6" x 4"	150 x 100	229	279	216	229	157
8" x 4"	200 x 100	279	343	270	229	157
8" x 6"	200 x 150	279	343	270	279	216
10" x 6"	250 x 150	305	406	324	279	216
10" x 8"	250 x 200	305	406	324	343	270
12" x 8"	300 x 200	356	483	381	343	270
12" x 10"	300 x 250	356	483	381	406	324

Materials - PFA / PTFE lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D3307 / PTFE to ASTM D1457

Materials - PFA / PTFE lined Fabrications	
Pipe	API 5L Grade B
Reducer	ASTM A234 Grade WPB
Flanges	ASTM A105
Lining	PTFE to ASTM D1457/ PFA to ASTM D3307

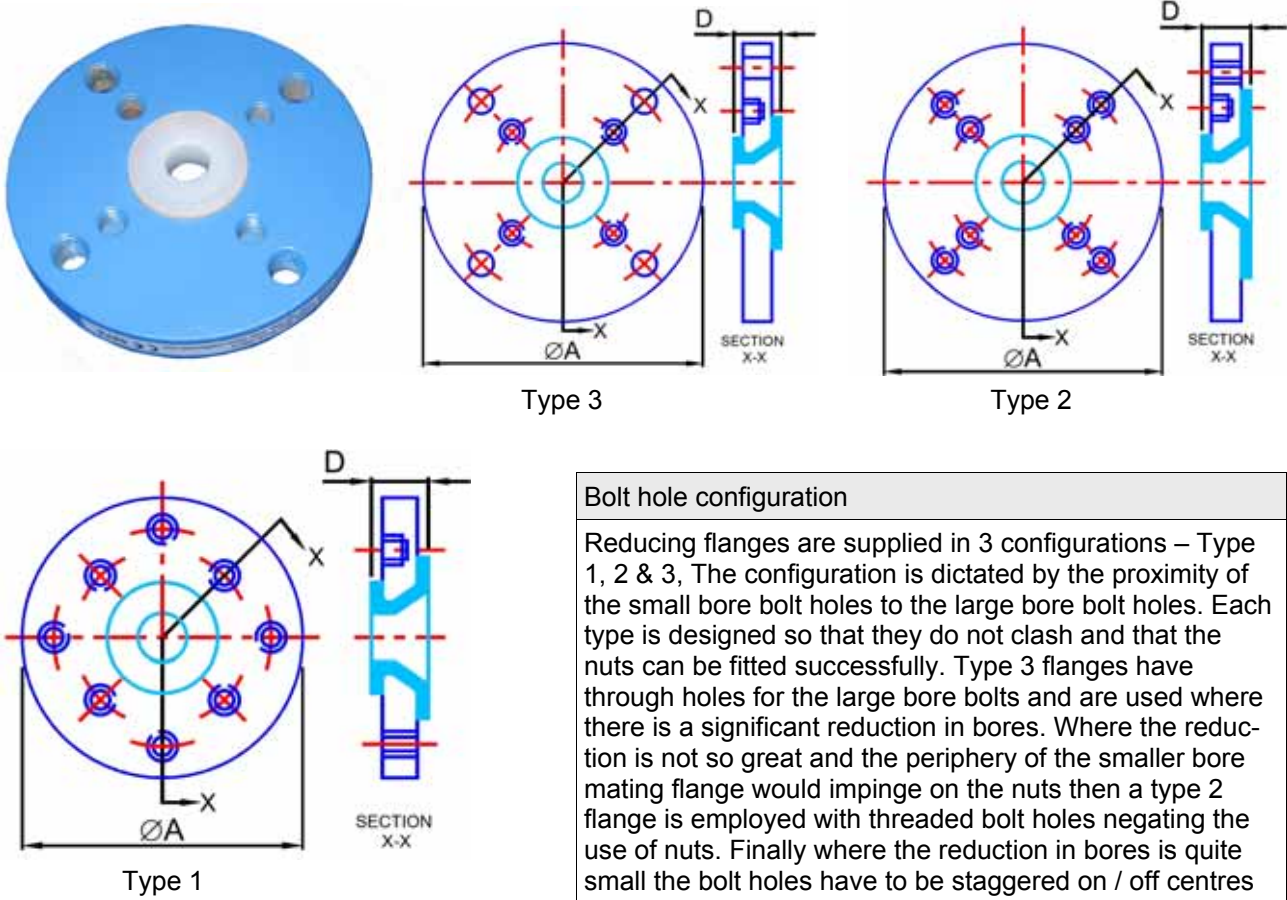




Nominal Bore		Centre Line to Face (A)	Offset (B)	Large NB Flange Ø	Large NB Raised Face	Small NB Flange Ø	Small NB Raised Face
Inches	mm	mm	mm	mm	mm	mm	mm
3/4" x 1/2"	20x15	114	0	98	43	90	35
1" x 3/4"	25x20	114	5	108	51	100	43
1.1/2" x 1"	40 x 25	114	6	127	73	108	51
2" x 1"	50 x 25	127	6	152	92	108	51
2" x 1.1/2"	50 x 40	127	6	152	92	127	73
3" x 1"	80 x 25	152	26	190	127	108	51
3" x 1.1/2"	80 x 40	152	20	190	127	127	73
3" x 2"	80 x 50	152	14	190	127	152	92
4" x 1"	100 x 25	178	38	229	157	108	51
4" x 1.1/2"	100 x 40	178	32	229	157	127	73
4" x 2"	100 x 50	178	27	229	157	152	92
4" x 3"	100 x 80	178	13	229	157	190	127
6" x 2"	150 x 50	229	50	279	216	152	92
6" x 3"	150 x 80	229	38	279	216	190	127
6" x 4"	150 x 100	229	27	279	216	229	157
8" x 4"	200 x 100	279	52	343	270	229	157
8" x 6"	200 x 150	279	25	343	270	279	216
10" x 6"	250 x 150	305	52	406	324	279	216
10" x 8"	250 x 200	305	27	406	324	343	270
12" x 8"	300 x 200	356	52	483	381	343	270
12" x 10"	300 x 250	356	25	483	381	406	324

Materials - PFA lined Castings	
Casting	ASTM A216 Grade WCB
Lining	PFA to ASTM D3307

Materials - PTFE lined Fabrications	
Pipe	API 5L Grade B
Reducer	ASTM A234 Grade WPB
Flanges	ASTM A105
Liner	PTFE to ASTM D1457



**Bolt hole configuration**

Reducing flanges are supplied in 3 configurations – Type 1, 2 & 3, The configuration is dictated by the proximity of the small bore bolt holes to the large bore bolt holes. Each type is designed so that they do not clash and that the nuts can be fitted successfully. Type 3 flanges have through holes for the large bore bolts and are used where there is a significant reduction in bores. Where the reduction is not so great and the periphery of the smaller bore mating flange would impinge on the nuts then a type 2 flange is employed with threaded bolt holes negating the use of nuts. Finally where the reduction in bores is quite small the bolt holes have to be staggered on / off centres so that they don't clash – a type 1 reducing flange.

Nominal Bore		Flange Type	Face to Face (D)	Diameter	Liner Thickness
Inches	mm				
3/4" x 1/2"	20 x 15	1	30	98	5
1" x 1/2"	25 x 15	1	30	108	5
1" x 3/4"	40 x 20	1	30	108	5
1.1/2" x 1/2"	40 x 15	1	30	127	5
1.1/2" x 3/4"	40 x 20	1	30	127	5
1.1/2" x 1"	40 x 25	1	30	127	5
2" x 1/2"	50 x 15	3	30	152	5
2" x 3/4"	50 x 20	2	30	152	5
2" x 1"	50 x 25	2	30	152	5
2" x 1.1/2"	50 x 40	1	35	152	5
3" x 3/4"	80 x 20	3	35	190	5
3" x 1"	80 x 25	3	35	190	5
3" x 1.1/2"	80 x 40	2	35	190	5



Nominal Bore		Flange Type	Face to Face (D)	Diameter	Liner Thickness
Inches	mm				
3" x 2"	80 x 50	1	35	190	5
4" x 3/4"	100 x 20	3	35	229	5
4" x 1"	100 x 25	3	35	229	5
4" x 1.1/2"	100 x 40	3	35	229	5
4" x 2"	100 x 50	3	35	229	5
4" x 3"	100 x 80	2	35	229	5
6" x 1"	150 x 25	3	40	279	5
6" x 1.1/2"	150 x 40	3	40	279	5
6" x 2"	150 x 50	3	40	279	5
6" x 3"	150 x 80	3	40	279	5
6" x 4"	150 x 100	2	40	279	5
8" x 1"	200 x 25	3	35	343	5
8" x 1.1/2"	200 x 40	3	35	343	5
8" x 2"	200 x 50	3	40	343	5
8" x 3"	200 x 80	3	40	343	5
8" x 4"	200 x 100	3	40	343	5
8" x 6"	200 x 150	2	40	343	5
10" x 2"	250 x 50	3	35	406	5
10" x 3"	250 x 80	3	35	406	5
10" x 4"	250 x 100	3	35	406	5
10" x 6"	250 x 150	3	35	406	5
10" x 8"	250 x 200	2	35	406	5
12" x 2"	300 x 50	3	35	483	3.5
12" x 3"	300 x 80	3	35	483	3.5
12" x 4"	300 x 100	3	35	483	3.5
12" x 6"	300 x 150	3	35	483	3.5
12" x 8"	300 x 200	3	35	483	3.5
12" x 10"	300 x 250	2	35	483	3.5

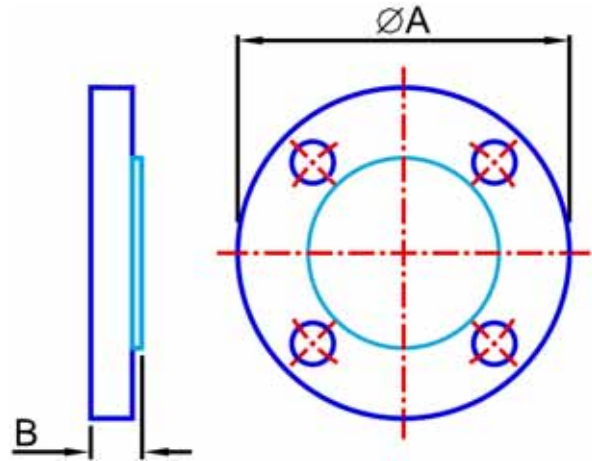
Materials	
Steelwork	BS1501-161-430A
Lining	PFA to ASTM D3307 or PTFE to ASTM D1457

**Special Reducing Flanges**

CRP can manufacture much larger flanges than listed. We can manufacture special adaptor flanges eg DIN to ASME or BS10 to ASME and can also supply other sizes not listed such as 12" x 3/4", 2.1/2" x 1" etc.





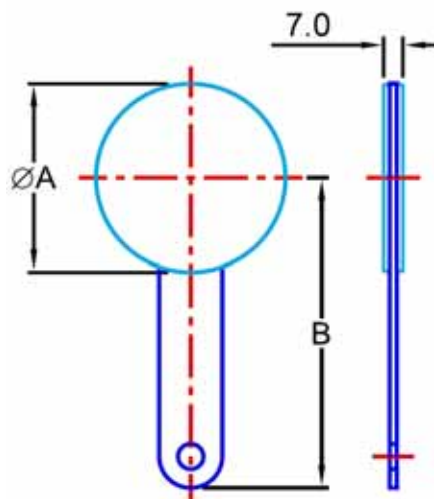


Nominal Bore		Flange Diameter (A)	Raised Face	Flange Thickness (B)	PTFE Liner Thickness
Inches	mm	mm	mm	mm	mm
1/2"	15	89	35	14	2
3/4"	20	98	43	15	2
1"	25	108	51	16	2
1.1/2"	40	127	73	19	2
2"	50	152	92	21	2
3"	80	190	127	26	2
4"	100	229	157	26	2
6"	150	279	216	27	2
8"	200	343	270	31	2
10"	250	406	324	32	2
12"	300	483	381	34	2

Materials	
Flange	ASTM A105
PTFE	ASTM D1457

**Traceability and Testing**  
 All lined equipment is traceable back through hard stamped references on the flanges to the original PFA or PTFE batch numbers. Liners are subjected to tensile testing and finished components subjected to electrostatic and hydrostatic testing.

Tensile Testing



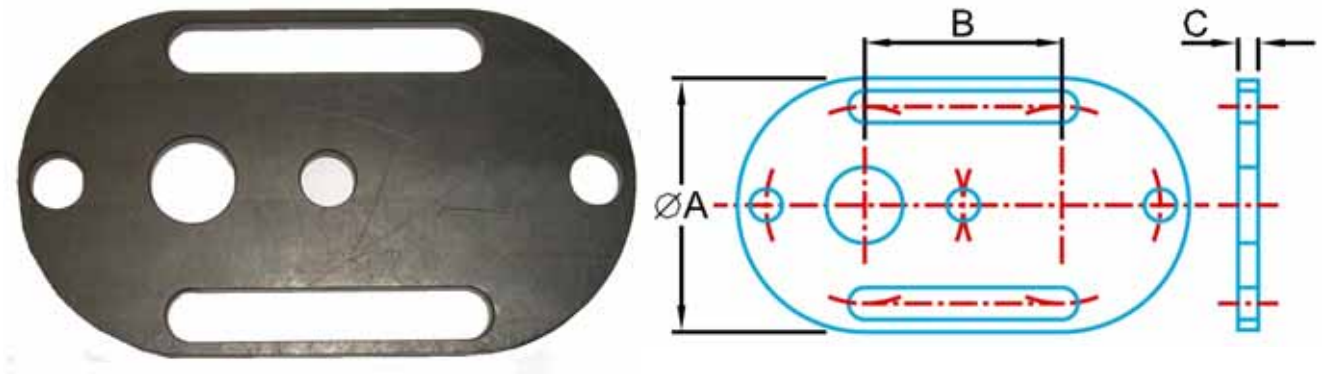
Nominal Bore		Spade Diameter (A)	Handle Length (B)	PTFE Liner Thickness
Inches	mm	mm	mm	mm
1/2"	15	44	102	2
3/4"	20	54	110	2
1"	25	63	148	2
1.1/2"	40	82	156	2
2"	50	102	162	2
3"	80	133	178	2
4"	100	171	194	2
6"	150	219	220	2
8"	200	277	250	2
10"	250	337	300	2
12"	300	407	340	2

Materials	
Flange	ASTM A105
PTFE	ASTM D1457



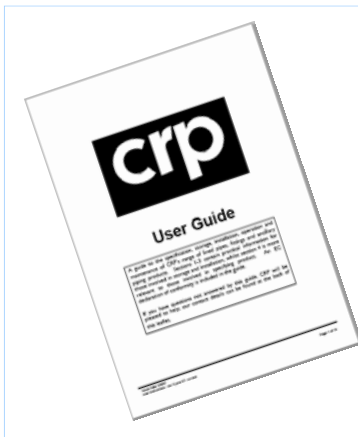
**Orifice Plates**

CRP can supply solid PTFE orifice plates with holes drilled to suit your application. Orifice plates can be used to control flow or help in flow measurement. We can supply them to suit a wide range of pipe nominal bores, they are generally supplied in virgin PTFE but other materials can be provided.



Nominal Bore		Flange Diameter (A)	Dimension (B)	Face to Face (C)
Inches	mm	mm	mm	mm
1/2"	15	89	60	10
3/4"	20	98	70	10
1"	25	108	79	10
1.1/2"	40	127	98	10
2"	50	152	121	16
3"	80	190	152	16
4"	100	229	191	27
6"	150	279	241	27
8"	200	343	298	27
10"	250	406	362	27
12"	300	483	432	27

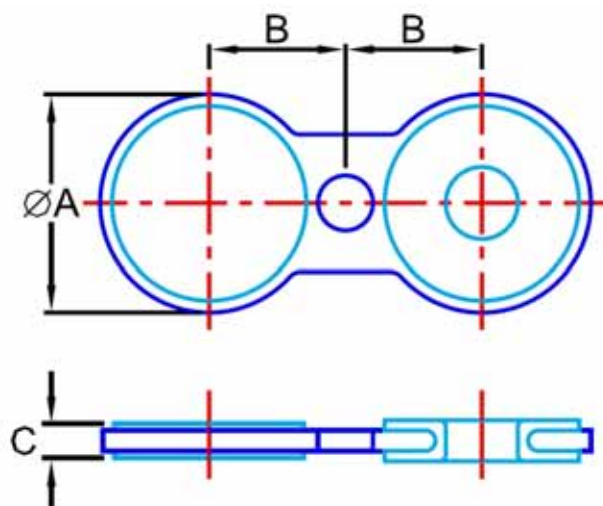
Materials	
PTFE	ASTM D1457



### Installation and Operating Guidance

Detailed storage, installation and operation guidance can be found for all CRP products in our handy "User Manual" This is supplied with all deliveries and can also be downloaded from our website from the Technical Info section.





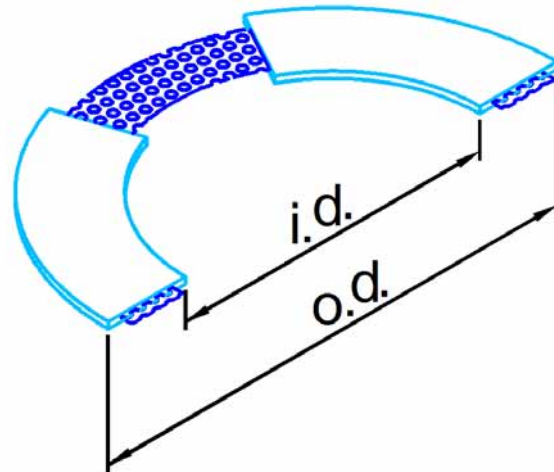
Nominal Bore		Flange Diameter (A)	Dimension (B)	Face to Face (C)
Inches	mm	mm	mm	mm
1/2"	15	89	60	11
3/4"	20	98	70	11
1"	25	108	79	11
1.1/2"	40	127	98	11
2"	50	152	121	11
3"	80	190	152	11
4"	100	229	191	11
6"	150	279	241	19
8"	200	343	298	19
10"	250	406	362	28
12"	300	483	432	28

Materials	
Steelwork	BS1501-161-430A
PTFE	ASTM D1457



### ISO 9001:2000 Accreditation

CRP is an ISO 9001:2000 approved company. Originally accredited to BS5750 Part 1 in 1992, CRP maintains this accreditation through a process of continuous third party surveillance with, six monthly, annual and triennial audit taking place. The company was one of the first in the UK to obtain approval to the upgraded version ISO 9001:2000. All of the company's manufacture and test procedures fall within this regime.



Nominal Bore		Gasket o.d.	Gasket i/d	Thickness
Inches	mm	mm	mm	mm
1/2"	15	47	21	2.5
3/4"	20	57	27	2.5
1"	25	66	33	2.5
1.1/2"	40	85	48	2.5
2"	50	104	60	2.5
3"	80	136	89	2.5
4"	100	174	114	2.5
6"	150	222	168	2.5
8"	200	279	219	2.5
10"	250	339	273	2.5
12"	300	409	324	2.5
14"	350	450	356	3.0
16"	400	514	406	3.0
18"	450	549	457	3.0
20"	500	606	508	3.0
24"	600	717	610	3.0

Toughgask reusable gaskets can be used in nearly all applications to seal metallic flange joints. They are far superior and cost effective compared with other designs such as envelope gaskets as they are reusable many times. Their design is extremely robust and they are very easy to install.

The Toughgask gasket offers superior performance than a standard virgin PTFE gasket as its stainless steel core prevents cold flow of the PTFE which can lead to joint failure.







Flange sprayguards are used to protect personnel from uncontrolled spray out from a failing flange joint. They should always be considered when installing any piping system carrying toxic or corrosive chemicals. By controlling the leak and protecting personnel and surrounding plant equipment from chemical contact considerable cost savings can be made. They help to minimise accidents on plant preventing costly plant down time, unplanned absenteeism, HSE investigations etc.

The CRP range of Sprayguards has been designed to be very cost effective, manufactured from hardwearing polypropylene they have very good chemical resistance, are UV resistant and can be reused.

Very easy to install, they are supplied as a roll, the correct length is cut from the roll and then wrapped around the flange joint, they are secured with a stainless steel self tapping screw.

If a spray out were to occur the spray is safely deflected diminishing the force of the spray.

The spray out is deflected not contained so the guard is never pressurised.

Three widths of Spray Guard will cover most piping installations

The Spray Guards are suitable for use on piping ranging from -40°C to +110°C.



Available by the metre, CRP Spray Guard is available in 5 roll widths, 50mm, 70mm, 100mm, 140mm and 180 mm to cover flange joint sizes from 1/2" up to 24" nominal bore. Typically only 2 or 3 widths can cover most installations on site.

The table below shows the correct width required for typical flange joints and the cut length of sprayguard required for each flange nominal bore.

Nominal Bore		Length Required	Width of roll required for each type of mating flange connection to be shielded		
Inches	mm		mm	Fixed / Fixed	Fixed / Rotating
1/2"	15	360	50	50	70
3/4"	20	390	50	50	70
1"	25	400	50	50	70
1.1/2"	40	460	50	70	70
2"	50	540	50	70	100
3"	80	660	70	70	100
4"	100	780	70	100	100
6"	150	940	70	100	100
8"	200	1140	70	100	140
10"	250	1340	70	100	140
12"	300	1580	100	100	140
14"	350	1740	100	140	140
16"	400	1940	100	140	140
18"	450	2060	100	140	140
20"	500	2260	100	140	180
24"	600	2620	140	140	180



# FluoroFlow<sup>+</sup> Lined Piping

## Corrosion

Corrosion Resistant Products has worked for 25 years to deal with the issues of internal corrosion in piping, fittings and valves for the chemical and pharmaceutical industry. We have now turned our attention to the problems generated through external corrosion.



## Historic Solution

The only solutions have been to specify a corrosion proof material such as welded stainless steel fabrications with a cost base of between 4 and 5 times the carbon steel equivalent or a multi-coat paint system with a high initial cost and a lifetime of inspection and repainting.



## FluoroFlow<sup>+</sup> Products

The FluoroFlow<sup>+</sup> system provides a comprehensive solution to external corrosion problems at a considerably lower cost base to stainless steel, with a lifetime cost far below that of paint systems and without its associated ongoing maintenance costs. It combines Van Stone flared schedule 10 stainless steel spools with high definition investment cast stainless steel fittings for the volume products. Based on our experience of typical project supply this combination of lined piping would provide 80% of all piping components. The remaining 20% of would then be supplied with nickel coated carbon steel for lower volume fittings. All of course lined in CRP's paste extruded PTFE and moulded PFA.

## How it Works

The corrosion performance of stainless steel is well known, but the use of a proprietary nickel coating requires a little more explanation. The nickel coat seals the product and creates a corrosion barrier. The ASTM B117 neutral salt spray test has achieved 700 hours—compared to say a 200 hour requirement for brake callipers in a motor car. Even in the most aggressive atmospheres the nickel can be expected to perform well over a normal product life.



## The

### Cost

The complete fluoropolymer lined system can be delivered for around twice the cost of the equivalent carbon steel lined system. And even less than that if the 20-25% on cost of finish coat painting is considered—as it is no longer required.

### The Savings—Lifetime Cost

With a 2 year cycle of inspection and repainting, a payback can be achieved in 4 years. Over a 10 year life the carbon steel lined equivalent will have cost 45% more to run.





# Static Dissipating Lined Piping & Spikie Earthing Washers

CRP can supply lined pipe and fittings with static dissipating PTFE / PFA liners, commonly referred to as having 'Antistatic' properties. By combining the PTFE or PFA fluoropolymers with a small amount of carbon filler the liners are able to conduct any build up of static from the bore of the pipe to the steelwork.

There are many ways that electrostatic charge can be generated and accumulate. Static electricity develops when two different materials are brought together and then separated, one of the materials acquires electrons from the other material and becomes positively charged.



In pipe lines carrying low conductivity fluids, the fluid can lose some of its electrons and these can accumulate or 'charge' the pipework. This process is known as flow electrification, the charge build up increases as flow velocity and pipe nominal bore increase.

CRPs standard virgin fluoropolymers have excellent insulating properties, so in certain situations electrical charge can accumulate on the liner surface through flow electrification. CRPs static dissipating liners allow any build up of charge to safely dissipate through the liner to the steel pipe. For the electrical charge to dissipate to earth the steel pipe must be sufficiently earthed, typically using earth bonding clamps, spikie washers, star washers on bolts, earthing studs or lugs etc. CRP are able to supply the pipe spool with earth studs/lugs or spikie earthing washers already welded or fitted in position.



The fillers used to provide the electrical continuity do not impair in any way the mechanical and chemical resistance of the liners. They exhibit the same performance as virgin liners, the conducting agent used within the liners are stable and are not subjected to chemical attack and will not leach into the process fluids.

All of our lined pipe and fittings range can be supplied with static dissipating liner.

## Spikies

To aid with earth bonding of the steel pipe CRP has specially developed our own Spikie™ washer which is a very cost effective alternative to earth bonding straps.

Spikies® are simply slipped into place between the loose flange and stub end on a pipe spool or fitting, and the joint made using star washers and studs as on a fixed flange joint. Once in place the centring lugs ensure that the raised points on the Spikies® are positioned to bite into the front of the flange face and the back of the stub end, thus providing earth continuity from rotating flange to fitting / spool. Star washers on at least one connecting bolt must be used in conjunction with the Spikie to allow continuity across the joint.

## Development

The extensive design, development and testing programme for Spikies® has ensured that the optimum spring steel substrate and nickel corrosion protection coating materials have been used, along with a design that makes Spikies® a truly durable fit and forget solution to process plant pipework earth continuity issues.

nb. CRP recommends the replacement of Spikies® whenever a joint is split.



## Cost and Reliability

The spiky provides a robust and cost effective solution to achieving earth continuity between the pipe body and a rotating flange. It can be supplied factory fitted or can easily be retro-fit in the field.





# Super Weight Liners For Halogen Service

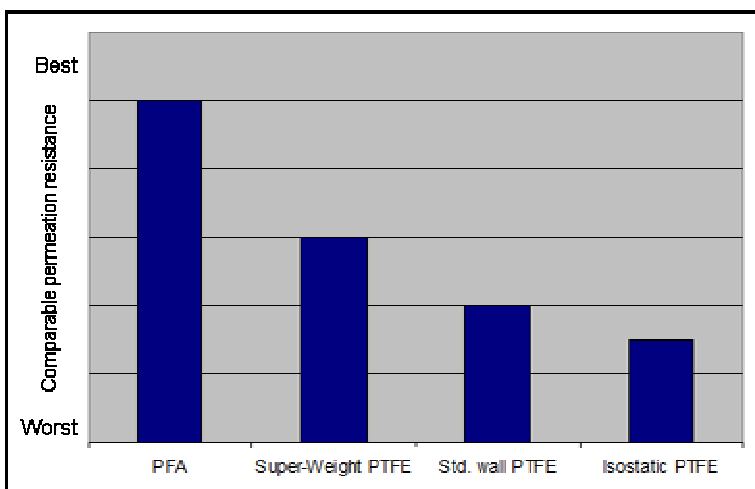


Bromine along with other members of the halogen family is highly reactive, this can lead over time to particles permeating through fluoropolymer linings used to carry this highly corrosive chemical. Working closely with a global agricultural chemical manufacturer CRP has developed a special lined piping range utilising super-weight paste extruded PTFE liners and PFA moulded fittings.

PFA is well known for its excellent permeation resistance properties often double that of PTFE and a natural choice for Bromine applications. Life spans of piping are extended by supplying extra heavy wall PTFE liners up to 50% thicker than our standard heavy wall liners

## Super Weight Piping Specification

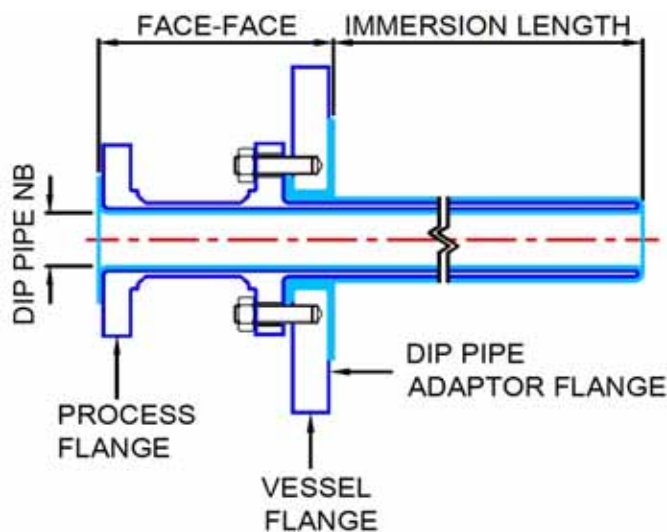
- PFA lined fittings – Heavy wall typically 5mm or more thick.
- PTFE paste extruded liners. Offer superior permeation resistance than isostatically formed liners
- ¼” vent bosses supplied at each end of pipe spools, fitted with PTFE vent plugs, help minimise local corrosion.
- All piping supplied spray painted in yellow preventing product mix up on site.
- All usual CRP quality, testing & inspection standards adhered to.



Typical permeation failure of isostatically formed liner







CRP dip pipes have a wide array of uses. Typically they are used to charge a reactor below the liquid level, to extract samples from the reactor as part of one of our sampling systems, Or to drain liquid from a vessel without the need of side or bottom outlet.

CRP dip pipes are manufactured from a carbon steel fabricated construction with a continuously lined paste extrusion PTFE liner. One piece of PTFE liner lines and protects both the inner and outer diameters of the dip pipe. Our advanced manufacturing techniques enable us to produce dip pipes without any pinched or welded ends eliminating a potential weak point completely.

Having all wetted parts in PTFE gives excellent corrosion resistance. Dip pipes can be supplied straight or curved to angle liquor to the side of the reactor etc.

Powerful agitator blades can create a lot of stress on components installed in a reactor vessel. Before we supply any dip pipes we thoroughly check that the mechanical strength of the dip pipe will be sound against the specific process conditions. This is extremely important to save on very costly breakages.

Nominal Bore		Face to Face	Maximum Immersion	PTFE liner Thickness	Vessel flange range	Minimum id of vessel flange
Inches	mm	mm	mm	mm	Inches	mm
1"	25	150	2850	2.5	1.1/2" - 24"	45
1.1/2"	40	150	2850	2.8	2" - 24"	60
2"	50	150	2850	3.0	3" - 24"	73
3"	80	150	2850	3.0	4" - 24"	101
4"	100	150	2650	4.5	6" - 24"	130



### Entry Pipes / Nozzle liners

Where there is little need for mechanical strength offered by CRPs lined steel dip pipes, CRPs Entry pipes can be an ideal low cost solution to introduce liquor into a storage vessel etc.. They are manufactured from paste extruded PTFE flared one end to raised face dimensions to connect between suitable mating flanges.

They can be supplied in any length up to 6000mm long and generally available in sizes from 3/4" to 6"NB. Entry pipes are often used to protect the bores of glass lined vessels from mechanical damage, being a sacrificial sleeve.