

Saudi Hepco LLC

Into the New Age with
GRP



GRP Pipes
Technical &
Product Guide



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Introduction

Saudi HEPCO LLC was established in 2002 to manufacture a wide range of plastic pipes and pipe fittings.

Saudi HEPCO LLC is one of the pioneering companies and the second in the field of GRP pipe manufacturing in the Kingdom of Saudi Arabia.

Saudi HEPCO manufactures a comprehensive range of pipes in GRP for a wide range of applications. GRP composite pipes are made as small as 50mm diameter and as large as 3700mm. Special epoxy pipes are made for industrial and petrochemical applications.

Saudi HEPCO GRP pipes provide a unique combination of high strength, light weight and corrosion resistance. These qualities make GRP pipes first choice for a wide range of systems.

Saudi HEPCO pipes and joints are suitable for use in potable water applications.

المقدمة

شركة هييكو السعودية ذات مسؤولية محدودة تم تأسيسها في عام ٢٠٠٢م وذلك لتصنيع مجموعة واسعة من الأنابيب البلاستيكية والأنابيب وتجهيزاتها .

هييكو السعودي هي واحدة من الشركات الرائدة ، والثانية في مجال تصنيع أنابيب الفايبرجلاس في المملكة العربية السعودية.

تقوم هييكو السعودية بتصنيع أنابيب الألياف الزجاجية المقواة بالبوليستر بأقطار مختلفة تبدأ بـ ٥٠ ملم وتصل حتى ٣٧٠٠ ملم وذلك لخدمة مجموعة واسعة من التطبيقات. كذلك تصنع الشركة أنابيب الألياف الزجاجية المقواة بالإيبوكسي للقطاع الصناعي والبتروكيماوي.

أنابيب هييكو السعودية من الفايبرجلاس توفر مزيجاً فريداً من القوة العالية، خفة الوزن وقدرة مقاومة التآكل. هذه الخصائص تجعل أنابيب الفايبرجلاس الخيار الأول لمجموعة واسعة من النظم.

أن أنابيب وتوصيلات هييكو السعودية مناسبة للاستخدام في تطبيقات مياه الشرب.



About Us

ماذا عنا

SAUDI HEPCO is second company in Kingdom of Saudi Arabia to start manufacture of GRP Pipes and Fittings.

HEPCO has a professional management team and an experienced and competent workforce. Competition is intense in pipe business demanding high standards, thus we apply stringent quality control programs to ensure that all our pipes meet Saudi and International classification requirements, and are fit for the purpose.

HEPCO's policy is to provide quality pipes and associated pipeline products on time and at competitive prices. At the same time, HEPCO undertakes to provide professional support to its customers on all technical and other matters relating to pipelines and networks, including potable water, sewage, gas, industrial and petrochemical.

إن هيبكو السعودية هي الشركة السعودية الثانية في المملكة العربية السعودية التي بدأت في مجال تصنيع أنابيب جي أربي وقطع تركيب الأنابيب .

هيبكو لديها فريق عمل إداري ومهني من ذوي الخبرة الكبيرة والاختصاص. حيث أن المنافسة الشديدة في مجال الأعمال التجارية التي تتعلق بالأنابيب تتطلب معايير عالية ، ونتيجة لذلك فقد قمنا بتطبيق برامج ذات تقنية عالية في مجال مراقبة وضمان الجودة ولكي نتأكد من أن جميع الأنابيب التي نقوم بتصنيعها تقابل معايير متطلبات التصنيف الدولي ، وتكون مناسبة لهذا الغرض .

إن سياسة شركتنا هو تصنيع وتقديم أنابيب ذات جودة عالية وكذلك المنتجات المرتبطة بالأنابيب في الوقت المطلوب وبأسعار تنافسية. وفي نفس الوقت، تتعهد الشركة بتوفير الدعم الفني لعملائها في جميع المسائل الفنية والتقنية ، وكذلك الدعم الآخر المتعلق بشبكات خطوط الأنابيب، ويشمل ذلك مياه الشرب والصرف الصحي والغاز والصناعات البتروكيمياوية .



Vision

Vision

To manufacture quality products and provide excellent service at all times. We will earn our customer's loyalty through continuous improvement driven by innovation.

A great place to work where people are inspired to be the best.

الرؤية

إنَّ رؤيتنا هي تصنيع منتجات ذات جودة عالية وتوفير خدمة ممتازة في جميع الأوقات. ونحن سوف نعمل على كسب ولاء العملاء لدينا من خلال التطويرات والتحسينات المستمرة والتي يقودها الابتكار.

إنه مكان عظيم لتقديم أفضل ما يرضي تطلعات وآمال الناس .

Mission

Mission

To be the leading manufacturer in and out of the Kingdom while innovating to meet or surpass specifications and standards.

Our goal is to provide superior value products while our employees and business partners will share in our success and our shareholders will receive a sustained better return on their investment.

المهمة

المهمة هي أن نكون ضمن المصانع الرائدة والقيادية للتصنيع داخل وخارج المملكة العربية السعودية التي تقوم بتصنيع منتجات مطابقة للمقاييس والمواصفات العالمية .

إنَّ هدفنا هو توفير منتجات ذات قيمة عالية في حين أن موظفينا وشركائنا في الأعمال يشاركوننا ويساهمون في نجاحنا وبالتالي سوف تتلقى عائداً أفضل على الاستثمار .

Values

Values

Excellent customer service

Superiority in performance

Harmonious relationship with the team

Innovation in products and technology

Perfection in doing the "right" thing

Respect for all people

القيم

خدمة العملاء بصورة ممتازة

التفوق في الأداء

العلاقة متناغمة وانسجام مع فريق العمل

الابتكار في المنتجات والتكنولوجيا

الكمال في القيام "الشئ الصحيح".

احترام جميع الناس .



Plant

Our plant is located in the Western Region of Saudi Arabia at Yanbu Light Industrial Park Area, Royal Commission Yanbu, which was established in 2002 to manufacture:

- PVC Pipes and Fittings
- GRP Pipes and Fittings
- FRP Customized Products

Our plant's area is 40,000 square meters, and has the most advanced machineries and technologies with highly qualified engineers, technicians and operators to meet customer's demands and expectations.

On a yearly basis, we manufacture and supply over 5,000 tons of Glass Reinforced Plastic (GRP), 100 tons of Fiber Reinforced Plastic (FRP), and 5,000 tons of Polyvinyl Chloride (PVC) in and out of the Kingdom.

المصنع

لدينا مصنع يقع في المنطقة الغربية من المملكة العربية السعودية في مدينة ينبع منطقة الصناعات الخفيفة ، الهيئة الملكية للجبيل وينبع ، والذي تم تأسيسه في عام ٢٠٠٢م وذلك لتصنيع ما يلي :

- أنابيب عديد كلوريد الفينيل وتوصيلاته.
- أنابيب الألياف الزجاجية وتوصيلاتها.
- منتجات ذات تصميم خاص من الفيبيرجلاس

مساحة المصنع ٤٠,٠٠٠ متر مربع ، ومزود بأكثر المكائن والآلات والتقنيات الحديثة تقدماً وإشراف مهندسين أكفاء في هذا المجال ، وكذلك فنيي على درجة عالية من الكفاءة وذلك لمقابلة متطلبات العملاء وتوقعاتهم .

وعلى أساس سنوي ، نقوم بتصنيع وتوريد ما يزيد عن ٥,٠٠٠ طن من أنابيب الألياف الزجاجية المقواة بالبوليستر وتوصيلاتها، بالإضافة إلى ١٠٠ طن من منتجات الفيبيرجلاس و ٥,٠٠٠ طن من البولي فينيل كلورايد للاستعمال داخل وخارج المملكة العربية السعودية .



Pipe Specifications

Nominal Diameter ND

Saudi HEPCO pipes are manufactured in the following diameters. Special application diameters are available upon request.

DN		
100	500	1300
150	600	1400
200	700	1500
250	800	1600
300	900	1800
350	1000	2000
400	1200	2400

Stiffness Classes

Saudi HEPCO GRP pipes are manufactured to the following specific tangential stiffness (STIS) – EI/D³ depending on customer requirements:

Stiffness Classes STIS

SN	N/m ²
2500	2500
5000	5000
10000	10000

Pressure Classes

Saudi HEPCO GRP pipes are supplied in the following pressure classes:

Pressure Classes PN	Pressure Rating BAR
Gravity	4
6	6
10	10
16	16

Note: 1 bar = 14.5 P.S.I.

Chemical Resistance

Saudi HEPCO pipes are corrosion resistant to a wide range of liquids and chemicals. Pipes and associated fittings can be made for a wide range of applications using speciality resins. Our technical department can advise upon specials to meet customers precise requirements.

Typical mechanical properties of the structural wall of Saudi HEPCO GRP Pipes

Property	Test Method	Value
Specific Gravity	ASTM D 2584	1580 – 1800kg/m ³
Hoop Tensile Strength	BS5480: 1990 @ 23°C	350 – 490 N/mm ²
Axial Tensile Strength	BS5480: 1990 @ 23°C	148 – 169 N/mm ²
Hoop Tensile Strength	From Pressure Tests 23°C	2800-30000 N/mm ²
Hoop Flexural Modulus	BS5480: 1990 @ 23°C	13800 – 20265 N/mm ²
Compressive Strength	ASTM D 695	208 – 364 N/mm ²
Compressive Modulus		10000 N/mm ²

Method Of Manufacture

Saudi Hepco GRP pipes are filament wound on a fixed length, rotating mandrel. This process of manufacture enables continuous glassfiber filaments to be placed precisely at the desired angle, forming a double helix pattern, to provide the customer with the exact product for this application. The resin systems used in the process are chosen for the particular application.

The inner liner of the pipe is applied by hand and allowed to gel, so that it can be inspected before structural helical winding begins. This process ensures the highest quality of the important corrosion resistant liner.

The Bell and Spigot type joint is made as part of the pipe, other types of joint are made by filament winding on other machines, to the same quality control standards.

The resulting pipe laminate is allowed to cure fully on the mandrel before being removed and cut to the exact length, to ensure dimensional stability.

Pipe end preparations according to the joint required is carried out and the pipe, now complete, is sent to storage.

At each stage of the pipe making process quality control tests are carried out and recorded to ensure that only products that are within the project specification are delivered to the customer. Double bell couplings are manufactured by the same method and materials as used in the structure of Saudi HEPSCO GRP pipes, the composition of the sealing gasket can be either EDPM, Neoprene or a custom product to suit the pipeline medium.



Table of GRP Pipe Wall Thickness

This table is based upon pipes made by using E-Glass and Polyester Resin. Alternative compositions of pipes may vary in wall thickness and weight.

ND mm	STIS 2500	STIS 5000	STIS 10000
	Thickness mm	Thickness mm	Thickness mm
80	4.5	4.5	4.5
100	4.5	4.5	4.5
150	4.5	4.5	4.5
160	4.5	4.5	4.5
200	4.5	4.5	5
250	4.5	4.5	5
300	4.5	5	6
350	4.5	5.5	6.5
400	5	6	7
450	5	6	7
500	5.5	6.5	7.5
600	5.5	7.5	9
700	7	8.5	10
800	7.5	10	11.5
900	8.5	11	13
1000	9	12	14
1100	12	13	16
1200	12.5	14	18
1500	14	17	22
1600	15	18	24
1700	16	19	25
1800	17	21	26
1900	17.5	22	28
2000	19	23	30

Table of GRP Pipe Wall Thickness

This table is based upon pipes made by using E-Glass and Polyester Resin. Alternative compositions of pipes may vary in wall thickness and weight.

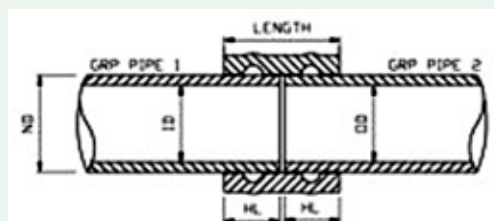
ND mm	STIS 2500	STIS 5000	STIS 10000
	Thickness mm	Thickness mm	Thickness mm
2100	20	23.5	31
2200	21	24.5	31.5
2300	22	25.5	32.5
2400	23	27.5	34
2500	24	28	35.5
2600	25	29	36.5
2700	26	30	38
2800	27	31	39.5
2900	28	32	41
3000	29	33.5	42
3100	29.5	34.5	44.5
3200	30.5	35.5	46
3300	31.5	36.5	47.5
3400	32.5	38	48.5
3500	33.5	39	50
3600	34.5	40	51.5
3700	35.5	41	53

Dimensions and mass may vary from the tabled values, depending on local standard and practices, however product performance always comply with the relevant standards.



GRP Pipes

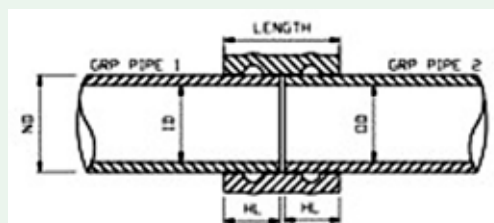
GRP - Double Bell Coupling and Spigot Dimensions STIS - 2500



DOUBLE BELL COUPLING				DOUBLE BELL COUPLING TOLERANCE				SPIGOT	
N.D. MM	THK MM	I.D. MM	Length MM	I.D. MIN	I.D. MAX	I.D. AVG	% Length	Dia Out Side	Tolerance
50	6	62	75	61	63	62	± 5 %	59	± 0.5 %
80	6	92	150	91	93	92	± 5 %	89	± 0.5 %
100	6	112	150	111	113	112	± 5 %	109	± 0.5 %
150	6	162	150	161	163	162	± 5 %	159	± 0.5 %
200	6	212	210	211	213	212	± 5 %	209	± 0.5 %
250	6	262	210	261	263	262	± 5 %	259	± 0.5 %
300	6	312	250	311	313	312	± 5 %	309	± 0.5 %
350	6	362	250	361	363	362	± 5 %	359	± 0.5 %
400	8	414	250	412	416	414	± 5 %	410	± 0.5 %
450	8	464	250	462	465	463.5	± 5 %	460	± 0.5 %
500	8	515	250	513	516	514.5	± 5 %	511	± 0.5 %
600	8	615	250	613	616	614.5	± 5 %	611	± 0.5 %
700	10	717	270	715	719	717	± 5 %	714	± 0.5 %
800	10	818	270	816	819	817.5	± 5 %	815	± 0.5 %
900	12	920	290	918	921	919.5	± 5 %	917	± 0.5 %
1000	13	1025	290	1023	1026	1024.5	± 5 %	1018	± 0.5 %
1100	18	1130	310	1128	1132	1130	± 5 %	1124	± 0.5 %
1200	18	1231	310	1228	1232	1230	± 5 %	1225	± 0.5 %
1500	21	1534	350	1532	1536	1534	± 5 %	1528	± 0.5 %
1600	21	1636	350	1634	1638	1636	± 5 %	1630	± 0.5 %
1700	24	1738	350	1736	1740	1738	± 5 %	1732	± 0.5 %
1800	24	1840	350	1838	1842	1840	± 5 %	1834	± 0.5 %
1900	27	1942	350	1940	1944	1942	± 5 %	1935	± 0.5 %
2000	27	2045	350	2043	2047	2045	± 5 %	2038	± 0.5 %
Information # 01				Information # 02				Information # 03	

GRP Pipes

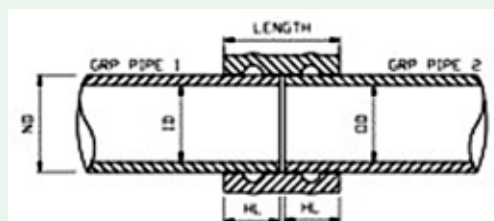
GRP - Double Bell Coupling and Spigot Dimensions STIS - 5000



DOUBLE BELL COUPLING				DOUBLE BELL COUPLING TOLERANCE				SPIGOT	
N.D. MM	THK MM	I.D. MM	Length MM	I.D. MIN	I.D. MAX	I.D. AVG	% Length	Dia Out Side	Tolerance
50	6	62	75	61	63	62	± 5 %	59	± 0.5 %
80	6	92	150	91	93	92	± 5 %	89	± 0.5 %
100	6	112	150	111	113	112	± 5 %	109	± 0.5 %
150	6	162	150	161	163	162	± 5 %	159	± 0.5 %
200	6	212	210	211	213	212	± 5 %	209	± 0.5 %
250	6	262	210	261	263	262	± 5 %	259	± 0.5 %
300	8	313	250	311	315	313	± 5 %	310	± 0.5 %
350	8	364	250	362	366	364	± 5 %	361	± 0.5 %
400	9	415	250	413	417	415	± 5 %	412	± 0.5 %
450	9	475	250	473	477	475	± 5 %	472	± 0.5 %
500	9	515	250	513	517	515	± 5 %	513	± 0.5 %
600	10	619	250	617	622	619	± 5 %	615	± 0.5 %
700	12	721	270	719	723	721	± 5 %	717	± 0.5 %
800	15	824	270	822	826	824	± 5 %	820	± 0.5 %
900	15	926	290	924	928	926	± 5 %	922	± 0.5 %
1000	18	1028	290	1026	1030	1028	± 5 %	1024	± 0.5 %
1100	18	1130	310	1128	1132	1130	± 5 %	1126	± 0.5 %
1200	20	1232	310	1230	1234	1232	± 5 %	1228	± 0.5 %
1500	25	1540	350	1537	1543	1540	± 5 %	1534	± 0.5 %
1600	27	1642	350	1641	1645	1642	± 5 %	1636	± 0.5 %
1700	27	1744	350	1741	1747	1744	± 5 %	1738	± 0.5 %
1800	30	1850	350	1847	1853	1850	± 5 %	1844	± 0.5 %
1900	30	1950	350	1947	1953	1950	± 5 %	1944	± 0.5 %
2000	30	2052	350	2049	2055	2052	± 5 %	2046	± 0.5 %
Information # 01				Information # 02				Information # 03	

GRP Pipes

GRP - Double Bell Coupling and Spigot Dimensions STIS - 10,000



DOUBLE BELL COUPLING				DOUBLE BELL COUPLING TOLERANCE				SPIGOT	
N.D. MM	THK MM	I.D. MM	Length MM	I.D. MIN	I.D. MAX	I.D. AVG	% Length	Dia Out Side	Tolerance
50	6	62	75	61	63	62	± 5 %	59	± 0.5 %
80	6	92	150	91	93	92	± 5 %	89	± 0.5 %
100	6	112	150	111	113	112	± 5 %	109	± 0.5 %
150	6	162	150	161	163	162	± 5 %	159	± 0.5 %
200	8	214	210	212	216	214	± 5 %	210	± 0.5 %
250	8	264	210	262	266	264	± 5 %	260	± 0.5 %
300	9	316	250	314	318	316	± 5 %	312	± 0.5 %
350	9	367	250	365	369	367	± 5 %	363	± 0.5 %
400	10	418	250	416	420	418	± 5 %	414	± 0.5 %
450	10	468	250	466	470	468	± 5 %	464	± 0.5 %
500	10	519	250	517	521	519	± 5 %	515	± 0.5 %
600	13	622	250	620	624	622	± 5 %	618	± 0.5 %
700	15	724	270	722	726	724	± 5 %	720	± 0.5 %
800	15	827	270	825	829	827	± 5 %	823	± 0.5 %
900	18	930	290	928	932	930	± 5 %	926	± 0.5 %
1000	20	1032	290	1030	1034	1032	± 5 %	1028	± 0.5 %
1100	24	1136	310	1134	1138	1136	± 5 %	1132	± 0.5 %
1200	27	1240	310	1241	1247	1240	± 5 %	1236	± 0.5 %
1500	33	1560	350	1557	1563	1560	± 5 %	1544	± 0.5 %
1600	36	1654	350	1651	1657	1654	± 5 %	1648	± 0.5 %
1700	36	1756	350	1753	1759	1756	± 5 %	1758	± 0.5 %
1800	36	1858	350	1855	1861	1858	± 5 %	1852	± 0.5 %
1900	40	1962	350	1959	1965	1962	± 5 %	1956	± 0.5 %
2000	40	2066	350	2063	2069	2066	± 5 %	2060	± 0.5 %
Information # 01				Information # 02				Information # 03	

Fittings and Pipeline Accessories

Fittings

Saudi HEPKO GRP fittings are manufactured to the same high standards as the pipes. A full range of GRP fittings are manufactured, Bends, Tees, Wyes, Reducers, Flange Adapters, End Caps and plugs, covering the full range of diameters, stiffness and pressure classes.

GRP fittings are not only manufactured to suit Saudi HEPKO GRP piping systems, they are produced as standard to suit Fiber Cement pipes (AC), Ductile Iron pipes and PVC pipelines.

Special fittings can be tailor made for individual applications in our Fabrication Department.

Manhole Liners

GRP manhole liners are produced by filament winding either as liner tube or as pre-formed liners of defined length and supplied with integral cover slabs bonded, with GRP, to the liner tube.

Water Well Casing

Saudi HEPKO GRP large water well casings are strong, safe and easy to install.

Quality Control System

Quality Control System

Continuous quality is assured by Saudi HEPKO independent quality control department. Quality systems under the requirements of BS EN ISO 9002:2002 are contained in the Saudi HEPKO quality manual, issued by the Quality Assurance Manager, and are continuously monitored by the Quality Control department.

Quality Control of Raw Materials

Each batch of raw materials received at Saudi HEPKO GRP division undergoes test in our independent laboratory to certify that the materials meet the required specifications. Resins and glass fibers are stored under controlled conditions as required by the manufacturer. All raw materials used in the production of Saudi HEPKO GRP products are accompanied with a certificate of conformity as supplied by the manufacturer to ensure specifications compliance.

Quality Control of the Finished Product

QC Test	Tested	Standard
Visual Inspection	Yes	BS 5480 Part 7
Dimensions	Yes	BS 5480 Part 5
Stiffness	Yes	BS 5480 App H
Deflection	Yes	BS 5480 App H
Axial Tensile Strength	Yes	BS 5480 App A
Hoop Tensile Strength	Yes	BS 5480 App D
Hydrostatic Tightness	Yes	BS 5480 App K
Marking	Yes	BS 5480 Part 11

Installation

long life characteristics of Saudi HEPCO GRP pipe is achieved depends on the handling and installation techniques used on site.

Handling

Pipes must be handled, transported and stored correctly to prevent damage prior to installation. Pipes must be stored/transported on wooden supports equally spaced and of adequate width to withstand the weight of the product.

Pipes must not be stacked more than 2 meters in height.

More information on handling and storage is available from our technical department.

Trench Bedding

The trench bedding material should be of sound composition enough to provide continuous support to the pipe during initial installation. No sharp or oversized materials must be used in the bedding.

Backfill

When using backfill materials these must be chosen and used correctly to prevent any adverse conditions to the surface of the buried pipe.

The backfill material must not be greater than the bedding material. Rocks, clumps, debris (glass, metal, concrete, wood, etc) or frozen material must be avoided at all times in the backfill operation. Compaction must be carried out at regular intervals to ensure correct pipe support during the post installation.

Post installation tests are carried out to determine the maximum vertical deflection of Saudi HEPCO GRP pipes in accordance with the relevant specifications.

Maximum Cover of Backfill

Saudi HEPCO GRP pipes are designed to each installation, however a guide to maximum cover from the soffit is given below, this may vary to the site soil condition.

Onsite Technical Service

Saudi HEPCO GRP division offer technical back-up to all products supplied through field service technicians and representatives. For on-site service or technical information on Saudi HAPCO GRP products please contact us at our Jeddah Head Office.

Stiffness Classes STIS

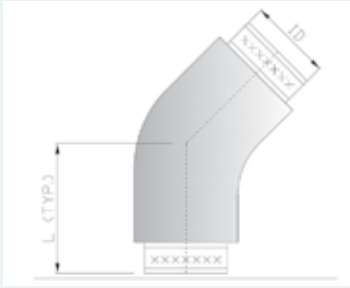
STIS	Cover/m
2500	8
5000	12
10000	16



GRP Fittings

SHELL ELBOW (Standard Dimensions)

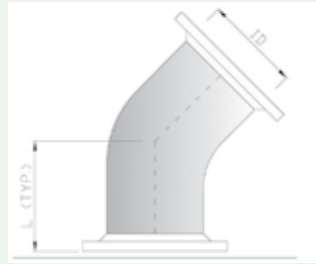
45° Elbow, SP/SP



Code: GPF5PAS4B000

ID	L
80	185
100	180
150	215
200	245
225	265
250	290
300	305

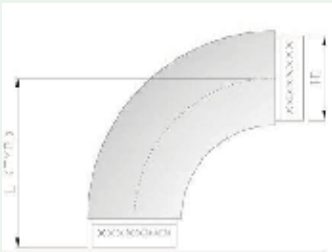
45° Elbow, FL/FL



Code: GPF5PAF4B000

ID	L
80	165
100	175
150	230
200	260
225	275
250	310
300	340

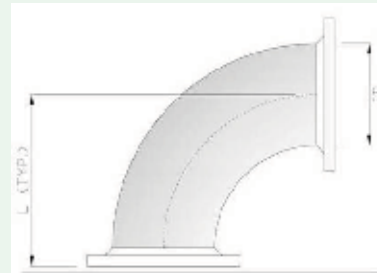
90° Elbow, SP/SP



Code: GPF5PAS9B000

ID	L
80	255
100	270
150	345
200	420
225	470
250	520
300	570

90° Elbow, FL/FL

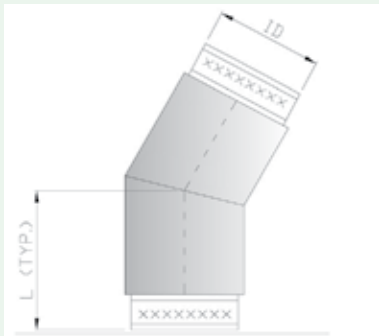


Code: GPF5PAF9B000

ID	L
80	235
100	265
150	360
200	435
225	480
250	530
300	605

MITERED ELBOW (Standard Dimensions)

One Miter 0°-30°



Code: GPF5PAS1B000
Code: GPF5PAS2B000
Code: GPF5PAS3B000

Miter Elbow 11.25°, 22.5° & 30° SP/SP

ID	L	ID	L
350	332	750	712
400	380	800	760
450	427	900	855
500	475	1000	950
550	522	1100	1045
600	570	1200	1140
700	665		

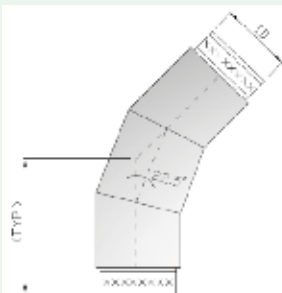
GRP Fittings

MITERED ELBOW (Standard Dimensions)

Miter Elbow 45° SP/SP

ID	L	ID	L
350	433	750	928
400	495	800	990
450	557	900	1114
500	619	1000	1238
550	681	1100	1361
600	743	1200	1485
700	866		

One Miter 31°-45°

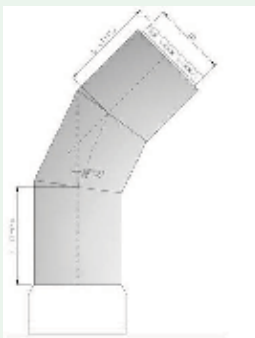


Code: GPF5PAS4B000

Miter Elbow 45° BL/SP

ID	L	ID	L
350	433	750	928
400	495	800	990
450	557	900	1114
500	619	1000	1238
550	681	1100	1361
600	743	1200	1485
700	866		

One Miter 31°-45°



Three Miter 60°-90°



Code: GPF5PAS9B000

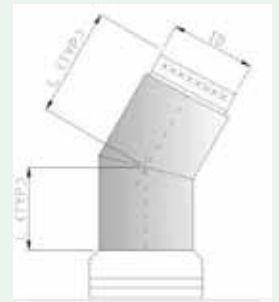
Miter Elbow 90° SP/SP

ID	L	ID	L
350	717	750	1536
400	819	800	1638
450	921	900	1843
500	1024	1000	2048
550	1126	1100	2252
600	1229	1200	2457
700	1433		

Miter Elbow 11.25°, 22.5° & 30° BL/SP

ID	L	ID	L
350	433	750	928
400	495	800	990
450	557	900	1114
500	619	1000	1238
550	681	1100	1361
600	743	1200	1485
700	866		

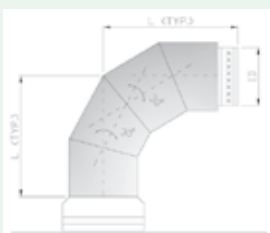
One Miter 0°-300



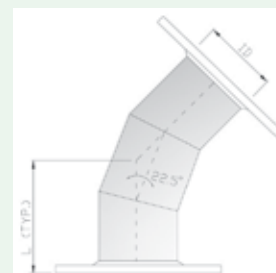
Miter Elbow 90° BL/SP

ID	L	ID	L
350	717	750	1536
400	819	800	1638
450	921	900	1843
500	1024	1000	2048
550	1126	1100	2252
600	1229	1200	2457
700	1433		

Three Miter 60°-90°



Two Miter 31°-45°



Code: GPF5PAS4B000


Miter Elbow 45° FL/FL

ID	L	ID	L
350	468	750	963
400	530	800	1025
450	592	900	1149
500	654	1000	1273
550	716	1100	1396
600	778	1200	1520
700	901		

GRP Fittings

MITERED ELBOW (Standard Dimensions)

Three Miter 60°-90°



Code: GPF5PAF9B000

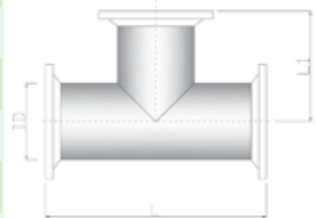
Miter Elbow 90° FL/FL			
ID	L	ID	L
350	752	750	1571
400	854	800	1673
450	956	900	1878
500	1059	1000	2083
550	1161	1100	2287
600	1264	1200	2492
700	1468		



CONCENTRIC TEE (Standard Tee Dimensions)

ID1	L	L1
80	400	200
100	416	208
150	534	267
200	632	316
225	686	343
250	730	365
300	826	413
350	924	462
400	1090	545
450	1226	613
500	1364	682
550	1500	750
600	1636	818
700	1908	954
900	2454	1227
1000	2726	1363
1200	3270	1635

Equal Tee, FLG/FLG/FLG

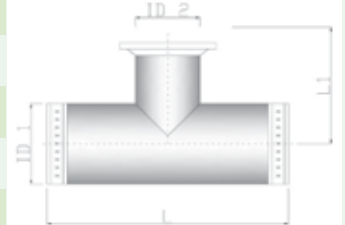


Code: GPF5PAS0T000

TEE (Standard Tee Dimensions)

ID1	ID2	L	L1
100	80	380	188
150	80	464	213
150	100	484	223
200	80	512	238
200	100	532	248
200	150	582	272
250	80	542	263
250	100	552	273
250	150	612	297
250	200	662	321
300	80	606	288
300	100	525	298
300	150	575	322
300	200	726	346
300	250	752	370

Unequal Tee, SP/FL/SP

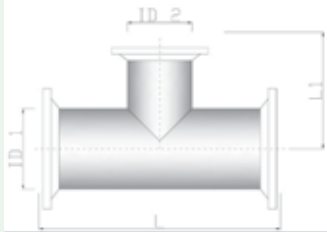


Code: GPF5PAAU0000

GRP Fittings

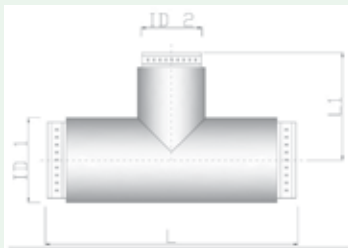
TEE (Standard Tee Dimensions)

Unequal Tee, FL/FL/FL



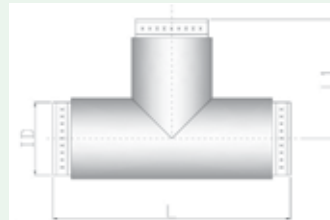
Code: GPF5PAFU0000

ID1	ID2	L	L1
100	80	350	188
150	80	434	213
150	100	454	223
200	80	482	238
200	100	502	248
200	150	552	272
250	80	512	263
250	100	532	273
250	150	582	297
250	200	632	321
300	80	576	288
300	100	596	298
300	150	646	322
300	200	696	346
300	250	722	370



Unequal Tee, SP/SP/SP
Code: GPF5PASU0000

Equal Tee, SP/SP/SP



Code: GPF5PAS0T0000

ID1	L	L1
80	400	200
100	416	208
150	534	267
200	632	316
225	686	343
250	730	365
300	826	413
350	924	462
400	1090	545
450	1226	613
500	1364	682
550	1500	750
600	1636	818
700	1908	954
900	2454	1227
1000	2726	1363
1200	3270	1635

ID1	ID2	L	L1
350	300	950	480
350	250	900	470
350	200	850	450
400	350	1050	550
400	300	1000	500
400	250	950	480
400	200	900	450
450	400	1150	600
450	350	1100	580
450	300	1050	550

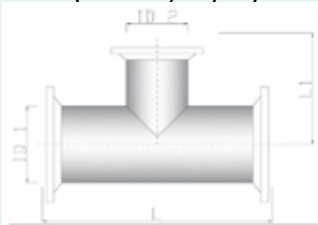
ID1	ID2	L	L1
500	450	1300	700
500	400	1200	650
500	350	1170	600
500	300	1100	580
600	500	1400	700
600	400	1300	680
600	300	1200	650
700	600	1670	880
700	500	1600	840
700	400	1500	800

ID1	ID2	L	L1
900	700	2000	1050
900	600	1900	1000
900	500	1800	900
900	300	1600	800
1200	900	2500	1300
1200	700	1400	1200
1200	600	1300	1150
1200	500	2200	1100
1200	400	2100	1000
1200	300	2000	900

GRP Fittings

TEE (Standard Tee Dimensions)

Unequal Tee, FL/FL/FL

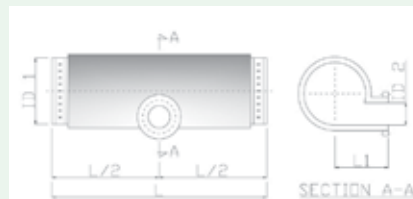


Code: GPF5PAFU0000

ID1	ID2	L	L1
350	200	820	430
350	250	870	450
350	300	920	460
400	200	870	430
400	250	920	460
400	300	970	480
400	350	1020	530
450	300	1020	530
450	350	1070	560
450	400	1120	580
500	300	1070	530
500	350	1140	580
500	400	1170	630
500	450	1270	680
500	300	1170	630

ID1	ID2	L	L1
600	400	1270	660
700	400	1470	780
700	500	1570	820
700	600	1640	860
900	300	1570	780
900	500	1770	880
900	600	1870	980
900	700	1970	1030
1200	300	1970	880
1200	400	2070	980
1200	500	2170	1080
1200	600	2270	1130
1200	700	2370	1180
1200	900	2470	1280

INVERT TEE (Standard Tee Dimensions)



Tangential Tee, SP/FLG/SP

Code: GPF5PAAI0000

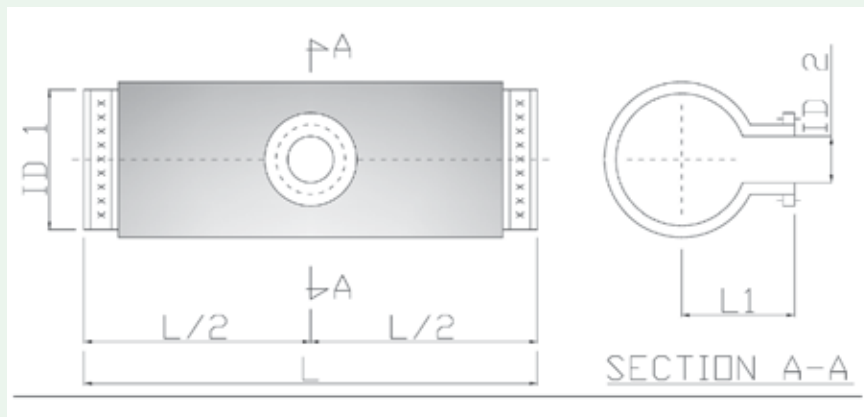
ID1	ID2	L	L1
500	150	900	500
500	200	900	650
600	150	900	600
600	200	900	650
700	150	1000	700
700	200	1000	750
700	300	1100	750
900	150	1000	800

ID1	ID2	L	L1
900	200	1000	850
900	300	1200	850
1000	150	1000	800
1000	200	1000	850
1000	300	1200	900
1200	150	1000	900
1200	200	1100	1000
1200	300	1300	1000

GRP Fittings

INVERT TEE (Standard Tee Dimensions)

Unequal Tee, SP/FL/SP



Code: GPF5PAAU0000

ID1	ID2	L	L1
350	300	950	460
350	250	900	450
350	200	850	430
400	350	1050	530
400	300	1000	480
400	250	950	460
400	200	900	430
450	400	1150	580
450	350	1100	560
450	300	1050	530
500	450	1300	680
500	400	1200	630
500	350	1170	580
500	300	1100	560
600	500	1400	680

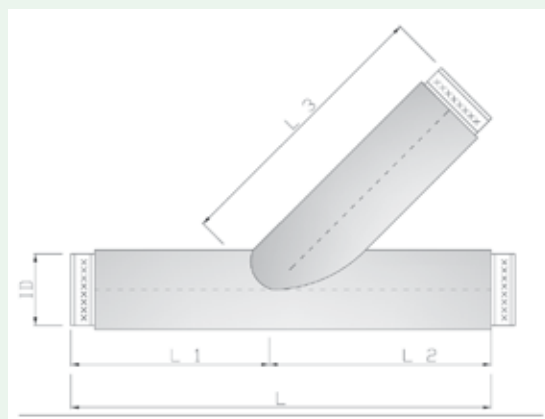
ID1	ID2	L	L1
600	400	1300	660
600	300	1200	630
700	600	1670	850
700	500	1600	810
700	400	1500	770
900	700	2000	1020
900	600	1900	970
900	500	1800	870
900	300	1600	770
1200	900	2500	1270
1200	700	2400	1170
1200	600	2300	1120
1200	500	2200	1070
1200	400	2100	970
1200	300	2000	870

GRP Fittings

WYES (Standard Dimensions)

ID	L	L1	L2	L3
80	750	330	420	420
100	750	330	420	420
150	850	350	500	500
200	1000	400	600	600
250	1000	400	600	600
300	1100	450	650	650
400	1100	450	650	650
500	2200	800	1400	1400
600	2200	800	1400	1400
700	2300	850	1450	1450
900	2700	1000	1700	1700
1200	3700	1200	2500	2500

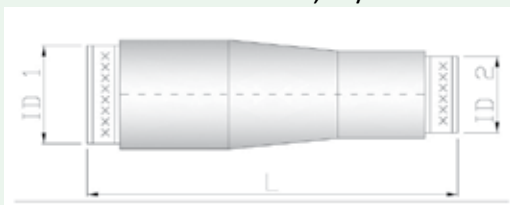
45° "Y" Branch, SP/SP/SP



Code: GPF5PASW0000

Reducer (Standard Reducer Dimensions)

Concentric Reducer, SP/SP



Code: GPR5PAS00000

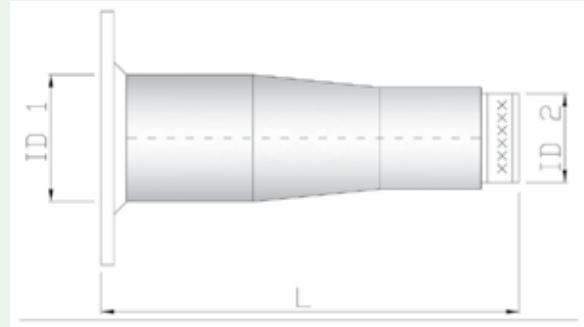
ID1	ID2	L	ID1	ID2	L
100	80	230	300	200	600
150	80	430	300	250	580
150	100	365	500	150	1700
200	100	550	500	300	1325
200	150	380	600	250	1700
250	80	650	600	300	1500
250	100	620	600	500	1000
250	150	530	700	600	1150
250	200	450	900	500	1780
300	80	840	900	600	1660
300	100	810	1200	900	1800
300	150	720			

GRP Fittings

Reducer (Standard Reducer Dimensions)

ID1	ID2	L
100	80	240
150	80	440
150	100	375
200	100	560
200	150	390
250	80	650
250	100	620
250	150	530
250	200	450
300	80	840
300	100	810
300	150	720
300	200	610
300	250	600

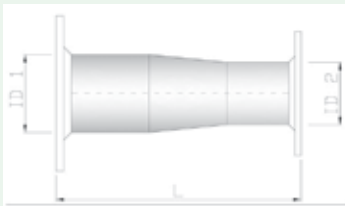
Concentric Reducer, FL/SP



Code: GPR5PAA00000



Concentric Reducer, FL/FL



Code: GPR5PAF00000

ID1	ID2	L
100	80	250
150	80	450
150	100	385
200	100	570
200	150	400
250	80	650
250	100	620

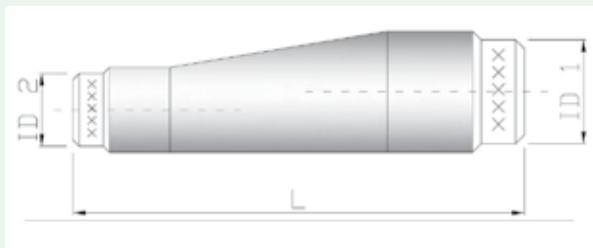
ID1	ID2	L
250	150	530
250	200	450
300	80	840
300	100	810
300	150	720
300	200	620
300	250	600
500	150	1700

ID1	ID2	L
500	300	1325
600	250	1700
600	300	1500
600	500	1000
700	600	1150
900	500	1780
900	600	1660
1200	900	1800

GRP Fittings

Reducer (Standard Reducer Dimensions)

Eccentric Reducer



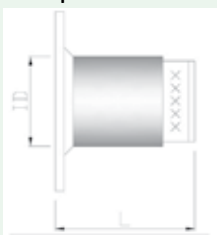
ID1	ID2	L
100	80	230
150	80	430
150	100	365
200	100	550
200	150	380
250	80	650
250	100	620

ID1	ID2	L
250	150	530
250	200	450
300	80	840
300	100	810
300	150	720
300	200	600
300	250	580
500	150	1700

ID1	ID2	L
500	300	1325
600	250	1700
600	300	1500
600	500	1000
700	600	1150
900	500	1780
900	600	1660
1200	900	1800

Spigot Flange Adaptor (Standard Dimensions)

Spigot Flange Adaptor

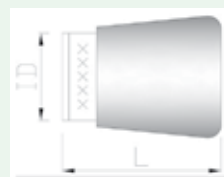


Code:
GPA5PAAFA000

ID	L	ID	L
80	250	400	400
100	250	500	600
150	250	600	600
200	250	700	600
250	250	900	600
300	250	1200	600

End Caps (Standard Dimensions)

Male End Cap

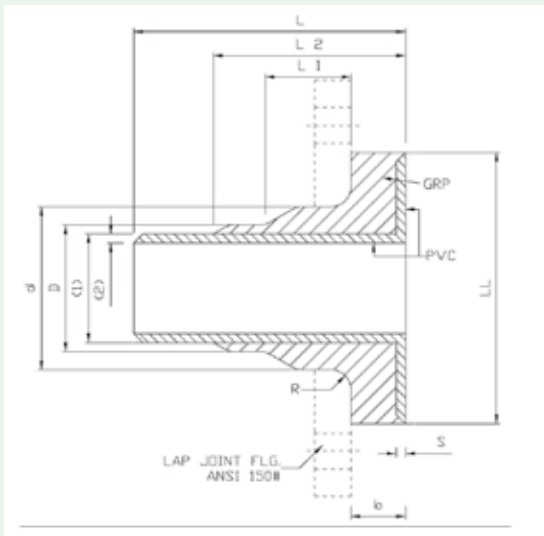


Code:
GPF5PA08E000

ID	L	ID	L
80	250	400	350
100	250	500	400
150	250	600	400
200	250	700	400
250	250	900	450
300	250	1200	450

GRP Fittings

Stub-end GRP Lined PVC

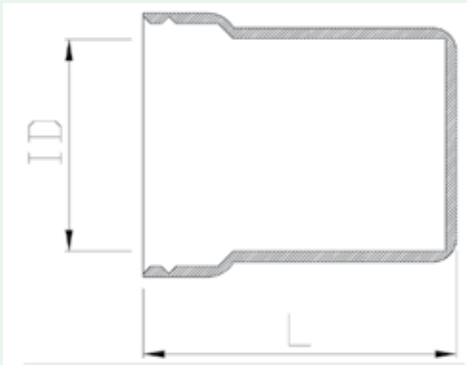


Nominal Diameter ND	Outside Diameter F	THK B	Outside Diameter O	Diameter Tang. d	THK S	Radius R	Length L1	Tang. Length L2	Total Length L
1"	61	15	38	47	5	5	40	100	130
1 ½"	78	18	56	68	5	5	52	115	150
2"	97	19	69	82	5	5	56	115	170
2 ½"	117	20	81	93	5	5	60	120	200
3"	129	20	98	113	5	5	60	130	200
4"	167	20	118	133	5	5	60	140	220
5"	187	24	133	150	5	5	76	150	240
6"	212	24	168	185	5	6	76	165	270
8"	269	24	208	230	5	7	76	195	320
10"	329	24	260	283	5	7	76	220	370
12"	399	24	327	340	5	7	76	290	470
14"	440	24	367	390	5	7	76	320	520
16"	504	28	412	440	5	8	92	345	570
18"	539	32	464	492	7	8	100	395	620
20"	596	32	514	545	7	8	100	395	670

GRP Fittings

End Caps (Standard Dimensions)

Female End Cap



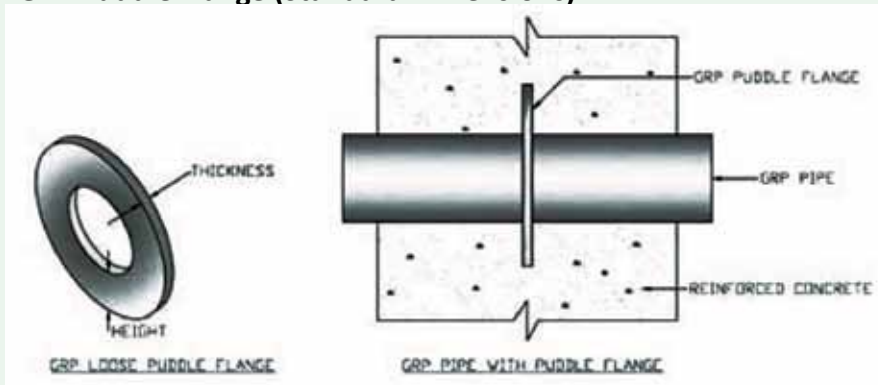
Code: GPF5PA08E000

Female End Cap

ID	L
80	250
100	250
150	250
200	250
250	250
300	250
350	300
400	350

ID	L
450	450
500	450
600	450
700	450
800	450
900	450
1000	450
1100	450
1200	450

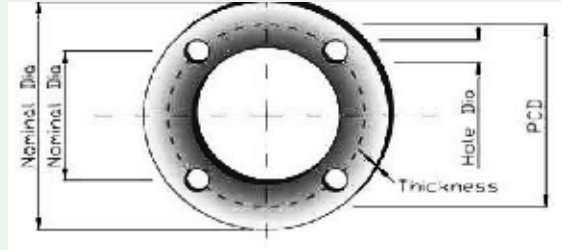
GRP Puddle Flange (Standard Dimensions)



ND	HEIGHT	THICKNESS
50	60	6 mm
80	60	6 mm
90	70	6 mm
100	80	8 mm
150	80	8 mm
200	80	8 mm
250	80	8 mm
300	80	10 mm
350	90	10 mm
400	90	10 mm

ND	HEIGHT	THICKNESS
450	90	10 mm
500	90	10 mm
600	90	10 mm
700	90	10 mm
800	100	12 mm
900	100	12 mm
1000	120	15 mm
1200	120	15 mm
1500	130	15 mm

GRP Fittings



**GRP Puddle Flange
(Standard Dimensions)**

ND MM	PN 10 BS 4504 / DIN 2501 / ISO 2084					PN 16 BS 4504 / DIN 2501 / ISO 2084					CLASS 150 BS 4504 / DIN 2501 / ISO 2084				
	OD	PCD	HOLE DIA.	NO. OF HOLES	THICKNESS	OD	PCD	HOLE DIA.	NO. OF HOLES	THICKNESS	OD	PCD	HOLE DIA.	NO. OF HOLES	THICKNESS
25	115	85	14	4	30	115	85	14	4	30	114	79	16	4	30
40	150	110	18	4	30	150	110	18	4	30	133	98	16	4	30
50	165	125	18	4	35	165	125	18	4	35	159	120.6	19.4	4	35
65	185	145	18	4	35	185	145	18	4	35	178	139.7	19.1	4	35
80	200	160	18	8	40	200	160	18	8	40	191	152.4	19.1	4	40
100	220	180	18	8	40	220	180	18	8	40	230	190.5	19.1	8	40
125	250	210	18	8	45	250	210	18	8	45	258	215.9	22.4	8	45
150	285	240	22	8	45	285	240	22	8	45	283	241.3	22.4	8	45
200	345	295	22	8	45	345	295	22	12	45	343	298.5	22.4	8	45
250	410	350	22	12	55	405	355	26	12	55	410	362	25.4	12	55
300	450	400	22	12	55	460	410	26	12	55	483	431.8	25.4	12	55
350	525	460	22	16	55	540	470	26	16	55	540	476.3	28.5	12	55
400	585	515	26	16	60	600	525	30	16	60	605	539.8	28.5	16	60
450	635	565	26	20	65	660	585	30	20	65	660	577.9	31.8	16	65
500	690	620	26	20	70	735	650	33	20	70	719	635	31.8	20	70
600	800	725	30	20	75	860	770	36	20	75	836	749.3	35.1	20	75
700	915	840	30	24	80	910	840	36	24	80	925	863	35	28	80
750	985	900	33	24	85	970	900	36	24	85	985	914	35	28	85
800	1035	950	33	24	90	1035	950	39	24	90	1060	978	41	28	90
900	1135	1050	33	28	95	1135	1050	39	28	95	1170	1086	41	32	95
1000	1250	1160	36	28	100	1255	1170	42	28	100	1290	1200	41	36	100
1100	1360	1270	36	32	105	1355	1270	42	32	110	1405	1314	41	40	110
	1475	1380	39	32	110	1485	1390	48	32	120	1510	1422	41	44	120

FRP Manholes, Tanks and Vessels

Saudi Hepco LLC offers a wide range of FIBER REINFORCED PLASTIC TANKS and MANHOLES for various industries and applications. Our tanks come in both standard and custom dimensions and designs for both underground and above ground applications as well as vehicle mounted applications for storage and transport of various fluids.

FRP tank and manhole technology is now accepted as standard in virtually every industry from chemicals to food and water, microelectronics and offshore oil and gas.

All Hepco LLC FRP tank and manhole products are designed and constructed to comply with BS4994:1987 - THE DESIGN AND CONSTRUCTION OF MANHOLES, VESSELS AND TANKS IN GLASS REINFORCED PLASTICS.

BS4994 - a very stringent standard, covers design, manufacture, transport and installation of manholes, tanks and vessels in FRP (fiber reinforced plastic) materials.



FRP Products

Saudi Hepco LLC being an experienced fiberglass reinforced plastic (FRP) manufacturer and fabricator since 2002, is now diversifying in the following areas:

1. Development and marketing of new and standardized FRP products for use in water, oil, gas, and chemical industries.
2. Insulating products suitable for the prevention of electrical power distribution areas.

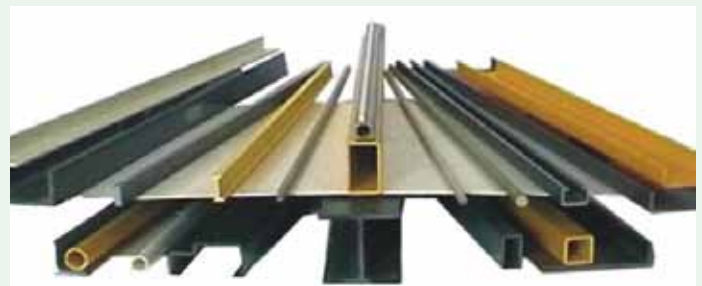
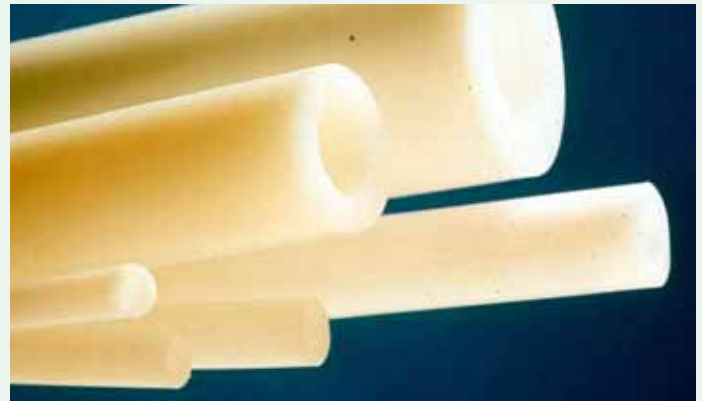
After a comprehensive development program, Saudi Hepco LLC designed and began fabricating a line of corrosion and abrasion control products specifically shaped for piping and particularly useful to the gas, oil and chemical industries. These new FRP products are standardized, work effectively and are economical to use. They are also available from stock.

All are products pre-formed and fabricated for specific functional uses.

It is obvious that fiberglass reinforced plastic (FRP) provides all the physical advantages and properties while eliminating or reducing the disadvantages of the non-reinforced plastics or steel.

Our following newly introduced products meet all industry recommended standard specifications:

- FRP roll-on shields
- FRP insulation spacers
- FRP casing insulators
- FRP pipe saddles
- FRP flatties
- FRP Dome and Slab



Fiberbond Installation Guide

1. STRUCTURE PREPARATION

Basic repairs must be made to the structure prior to strengthening with Fiberbond. Spilled concrete removed, corroded or damaged steel addressed and major cracks injected.



2. SURFACE PREPARATION

The surface to be repaired is typically abraded to smooth out irregularities, remove contaminants and radius sharp corners. This can be performed by shot or sand blasting, water jet or grinder.



3. PRIMER

In order to promote adhesion and prevent the surface from drawing resin from the FRP, a low viscosity epoxy primer is applied with a roller until the substrate is locally saturated.



4. PUTTY

An adhesive, high viscosity putty is applied when necessary to the surface to fill in 'bug holes' offsets or voids.



5. CUTTING FABRIC

In a clean area away from the resins, the fabric is carefully measured and cut in accordance with the specifications.



Fiberbond Installation Guide

6. SATURATING FABRIC

On large, high volume projects, the fabric can be saturated using Edge Structural Composites' custom saturator. For lower volumes & shorter strips, the fabric can be either saturated on a table, or the surface can be coated with resin and the dry fabric applied.



7. APPLYING FABRIC

The pre-wetted, or dry, fabric is carefully laid onto the surface and smoothed out to remove air bubbles and ensure that the fibers are straight.



8. QUALITY CONTROL MONITORING

During the cure, 2 to 6 hrs depending on ambient conditions, the fabric is checked to ensure that all air bubbles are removed and that the fabric is not sagging. Edge Structural Composites highly recommends that a trained, qualified inspector monitor applications.



9. QUALITY ASSURANCE

Good record keeping in accordance with Edge Structural Composites QA/QC procedures ensures a successful repair.



10. TOP COAT

Once cured and inspected, Fiberbond can be coated with any coating, for aesthetic blending and low maintenance protection.



Fiberbond Installation Guide



SOME OF THE STRENGTHENING APPLICATIONS :

- BRIDGES
- BUILDINGS, MASONRY, CONCRETE & STEEL FRAME
- PARKING GARAGES
- CHIMNEYS
- WATER TANKS
- INDUSTRIAL CONTAINMENT FACILITIES
- SILOS
- RETAINING WALLS
- TOWERS
- SUPPORT SLABS

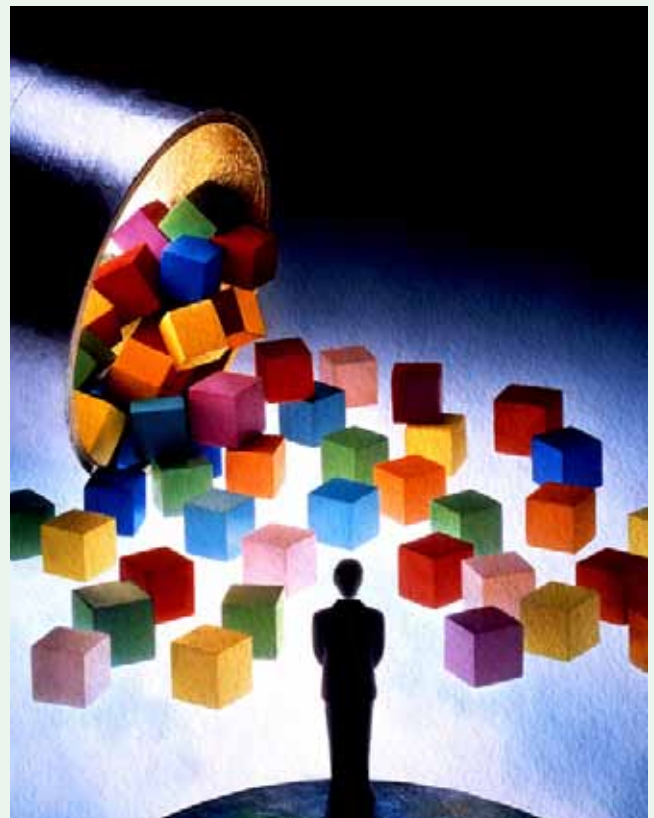
Quality Assurance

Pipeline Integrity Assessment Service:

- Analyze pipeline design, construction & maintenance to verify old pipelines integrity.
- Define time dependent defects and differentiate between various types and forms of corrosion on the basis of internal and external pipe surface.
- Develop integrity management program and list the integrity management strategies and tools.
- Perform external surveys, pressure and leak tests and pipeline rehabilitation and repair techniques.

Following Testing methods are performed to localize the area of leakage:

- Optical time domain refractometer
- Acoustic
- Negative pressure gradient
- Flow or pressure gradient
- Optical sensor

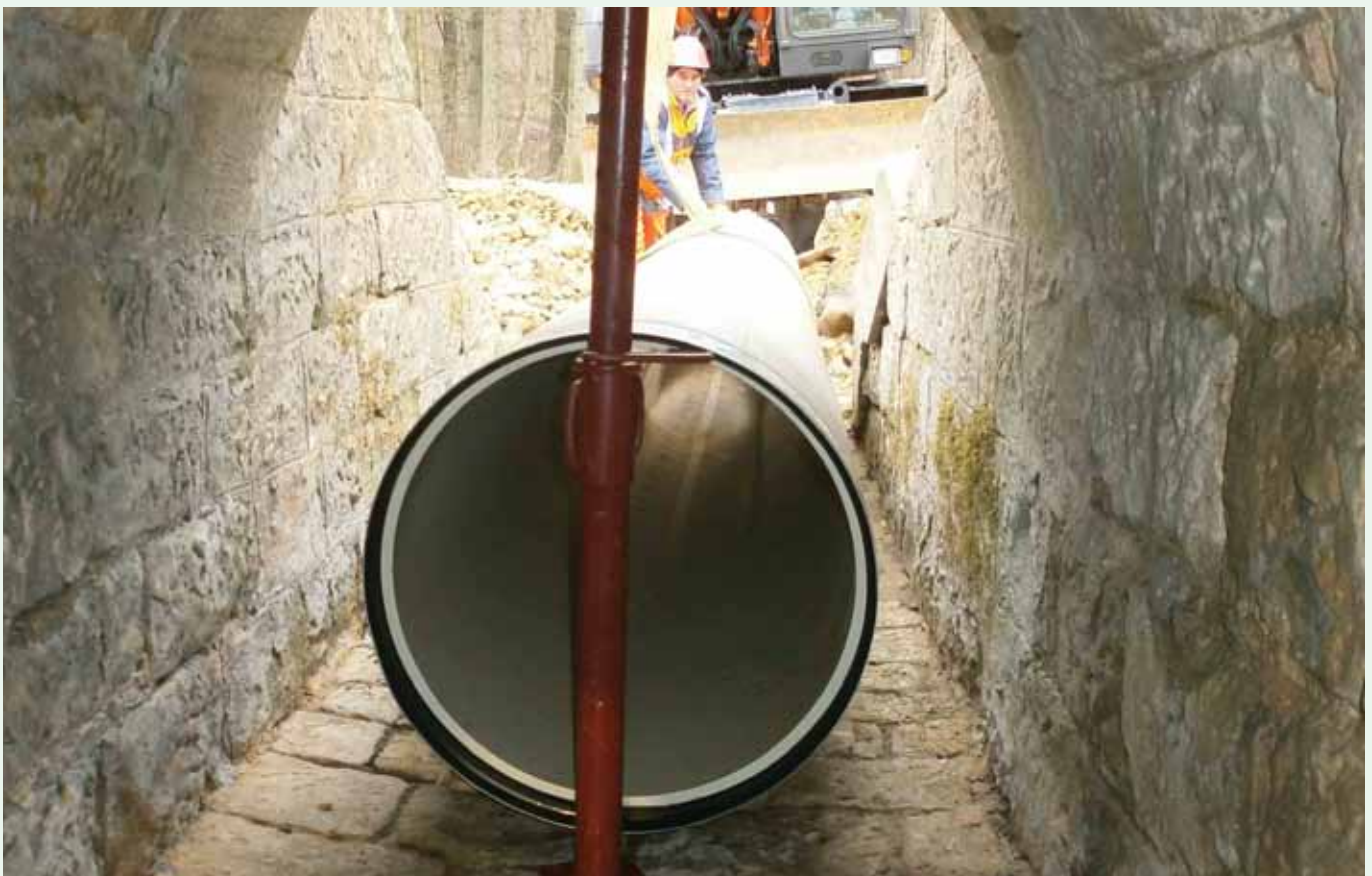


Quality Assurance

Hydrostatic Test significance and method:

Fiberglass piping systems should be tested before their commissioning, good hydrostatic test procedures be followed to prevent personal injury or property damage. On aboveground systems all guides and supports must be in place prior to hydrostatic testing.

On buried applications the piping should be partially backfilled, with the joints exposed prior to testing, bend, ends should be supported. Large or complex systems should be tested in subsections. One of the reasons for doing this is to confirm that proper fabrication and installation techniques have been followed in execution of the system. If the piping system does not have any connections for testing, tie-ins may be required. These can be flange connections, threaded, or grooved connections. The connections can be cut off after the test. For drainage systems expandable plugs can be used for low-pressure testing, but because of the smooth bore of fiberglass piping, testing may be limited to less than five psi on larger diameters



Jointing and Handling

Unloading, Handling, Storage and Transportation

1- Inspection, unloading and handling of GRP pipe and fittings

All pipes and fittings should be carefully inspected upon receipt at job site to ensure that no damage has occurred during transit.

- Make an overall inspection of load, if the load is intact ordinary inspection whilst unloading will normally be sufficient to make sure that the pipe has arrived without damage.
- Check the quantity against the Delivery note.
- Note any transit damage or discrepancy on the Delivery note.
- Unloading Saudi Hepco pipes is the responsibility of the customer so care should be taken to avoid damage.
- When handling single pipes, use pliable straps, slings or rope to lift. Do not use steel cables or chains to lift or transport the pipe. Two support points should be used when lifting pipes, 25% of the length from each end.
- If at any time during handling any damage occurs, the pipe should be repaired before installation. Contact the supplier for repair procedures

2- Storage of GRP pipes and fittings

Pipe storage areas should be relatively flat and free from rocks and other potentially damaging debris. Pipes should be stored on flat timber to protect the pipe and facilitate the removal of the lifting slings. Pipes should be choked with timber chocks to avoid movement.

If it is necessary to stack pipes, they should be stacked on flat timber Supports at a maximum of 6meter spacing with chocks. Maximum stack Height is 2meters. Stacking of larger than 1400mm are NOT recommended.

Rubber ring gaskets should be stored in their shipping packaging in the shade.

Fittings should be stored on sheets of plywood in a secure area away from transport.

3- Transporting GRP pipes and fittings

Pipes should be handled with care to avoid damage. Pipes should be lifted using two-support points. Support all pipes on flat timbers at a maximum of 4 meters centers with wooden chocks to avoid movement. Ensure that the pipes do not contact each other to avoid abrasion during transportation. Maximum stack height is approx. 2 meters. Ensure that pipes are correctly secured to the vehicle BEFORE transporting.

Inspect the pipes whilst unloading. If the pipes are not to be immediately installed, they should be stored. Fittings should be secured and protected from contact whilst transporting.

Installation of Saudi Hepco GRP pipes in a buried condition:

4.1 Introduction:

The principal feature of GRP pipes, in common with flexible pipes of other materials, is their ability, in the absence of side restraint, to deflect progressively as the top load is increased.

It is therefore important that GRP pipes are bedded and surrounded in a suitable, selected and well compacted granular material, which is capable of transmitting the side thrust from the pipe, to the native soil and that the native soil has adequate properties to provide sufficient passive resistance.

4.2 Materials:

Most gravels, sands and crushed stones are acceptable for GRP pipe zone installation. If native soil is used it must be free from all foreign objects. Suitable pipe zone bedding and surround materials are those classified in ASTM D-3839 as «Coarse grained soils containing less than 5% fines, such as GW, GP, SW, GW-GP and SW-SP». See the enclosed chart «Unified Soil Classification Group Symbols».

4.3 Compaction:

Bedding should be compacted to 90% proctor. Gravel backfill can be applied in 300mm lifts as it is relatively easy to compact Sand should be applied in 150mm lifts and compacted to 90% proctor. Care should be taken to ensure good filling and compaction under the haunches of the pipe.

Jointing and Handling

UNIFIED SOIL CLASSIFICATION-GROUP SYMBOLS Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils More than 50% retained on No.200 sieve	Gravels More than 50% of coarse fraction retained on No.4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3E$	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $1 > Cc < 3E$	GP	Poorly Graded gravel ^F	
		Gravel with Fines More than 12% fines ^C	Fines classify as ML or MH	GM	Silty Gravel ^{F,G,H}	
		Fines classify as CL or CH	GC	Clayey Gravel ^{F,G,H}		
	Sands 50% or more of coarse fraction passes No.4 sieve	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3E$	SW	Well-graded Sand ^I	
			$Cu < 6$ and/or $1 > Cc < 3E$	SP	Poorly graded Sand ^I	
Sands with Fines More than 12% fines ^D		Fines classify as ML or MH	SM	Silty Sand ^{G,H,I}		
		Fines classify as CL or CH	SC	Clayey Sand ^{G,H,I}		
Fine-Grained Soils 50% or more passes the No.200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean Clay ^{K,L,M}	
			PI < 4 or plots below "A" line ^J	ML	Slit ^{K,L,M}	
		Organic	Liquid limit – oven dried < 0.75	OL	Organic clay ^{K,L,M,N}	
			Liquid limit – not dried		Organic silt ^{K,L,M,O}	
		Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
				PI plots below "A" line	MH	Elastic silt ^{K,L,M}
	Organic		Liquid limit – oven dried < 0.75	OH	Organic clay ^{K,L,M,P}	
			Liquid limit – not dried		Organic silt ^{K,L,M,O}	
	Highly organic soils	Primarily organic matter, dark in color, and organic odor		PT	Peat	

^ABased on the material passing the 3-in (75mm) sieve.

^BIf field sample contained cobble or boulders, or both, and "with cobbles or boulders, or both" to group name.

^CGravels with 6 to 12% fines require dual symbols:

GW-GM well-graded gravel with silt
GW-WC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

^DSands with 5 to 12% fines require dual symbols:

SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

$${}^E C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^{12}}{D_{10} \times D_{60}}$$

^FIf soil contains $\geq 15\%$ sand, add "with sand" to group name.

^GIf fines classify as CL-ML, use dual symbol GC-GM, or SC-SM

^HIf fines are organic, add "with organic fines" to group name.

^IIf soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^JIf Atterberg limits plot in hatched area, soil is a CL-ML silty clay.

^KIf soil contains 15 to 29% plus no.200, add "with sand" or "with gravel", whichever is predominant.

^LIf soil contains $\geq 30\%$ plus no.200, predominantly sand, add "sandy" to group name.

^MIf soil contains $\geq 30\%$ plus no.200, predominantly gravel, add "gravelly" to group name.

^NPI ≥ 4 and plots on or above "A" line.

^OPI < 4 or plots below "A" line

^PPI plots on or above "A" line

^QPI plots below "A" line

Jointing and Handling

4.4 Deflection tests

Deflection tests should be carried out on the pipe when it is installed to grade. Initial deflection should not exceed 3%.

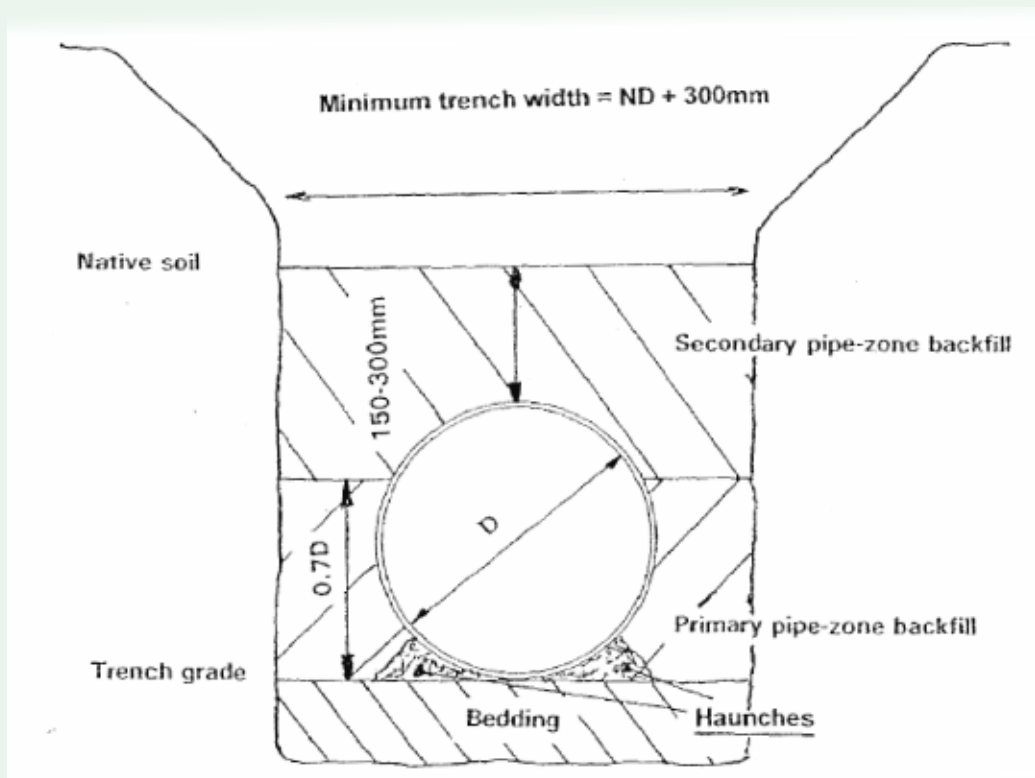
5. Trenches

5.1 Trench width

The width of the trench, at the top of the pipe should not be greater than is necessary to provide safety and adequate room for jointing the pipe in the trench and compacting the pipe-zone backfill at the haunches and the side of the pipe. The minimum trench width should be $1.25 \times ND + 300\text{mm}$.

5.2 Trench Depth

In situations where traffic loads may be experienced, the minimum depth of the trench, to the crown of the pipe, should be not less than 1.0 meters, with normal bedding materials.



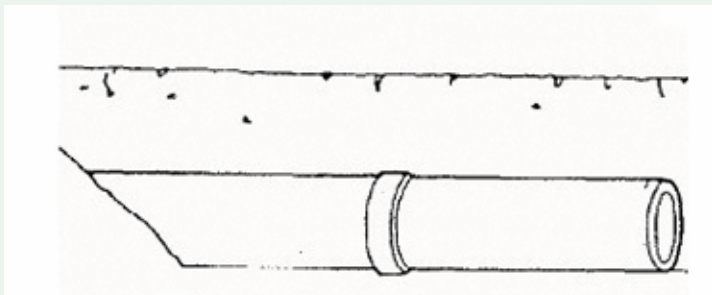
Jointing and Handling

5.3 Trench Bottom

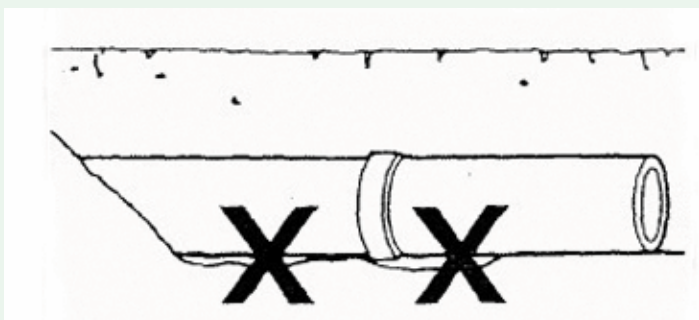
The trench bottom should be trimmed to an undisturbed soil level, allowing 150mm for bedding material beneath the pipe.

5.4 Bedding

The bedding should be of the primary pipe-zone backfill material compacted to a minimum 90% Proctor to ensure proper support for the pipe. The surface of the bedding shall be continuous and smooth. The bed shall be over-excavated for the pipe bell, to ensure that no material is trapped during the jointing operation. These bell holes must be carefully made good after the joint has been made.



Proper Bedding Support



Improper Bedding Support

Jointing and Handling

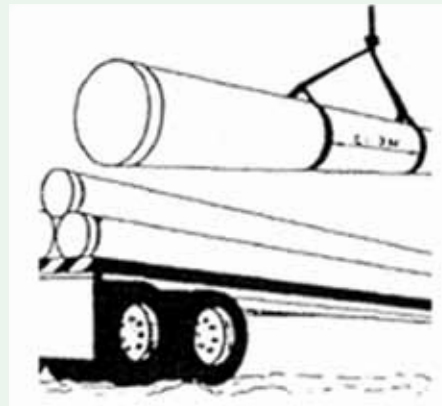
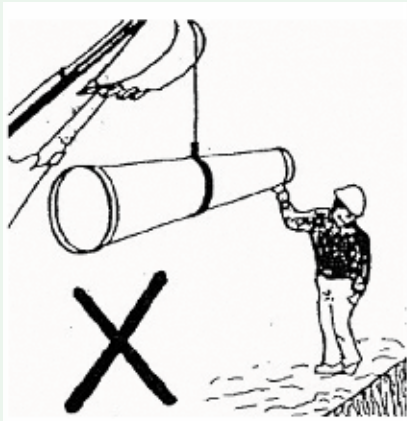
Pipe laying and jointing

6.1 Inspection

All pipes should be carefully examined before placing in the trench. Any defects such as damage to the pipe, jointing surface or joint should be rejected and not installed.

6.2 Pipe laying

Pipes should be handled carefully, nylon slings should be used to lift the pipes into the trench, before the pipe is laid, the bedding should be inspected to ensure that no stones or foreign objects are under the pipe.



6.3 Pipe Jointing

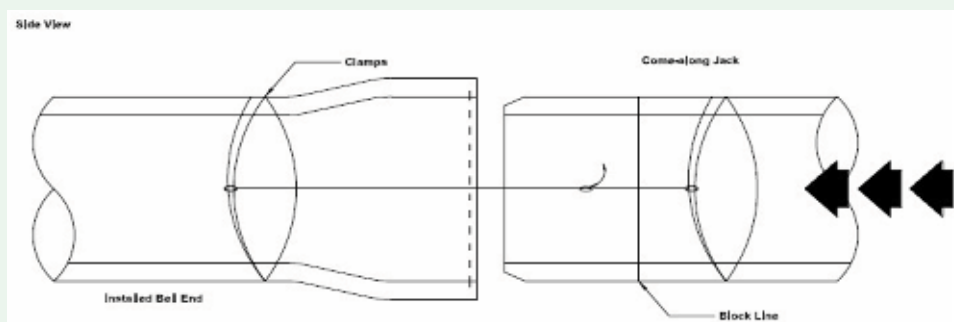
A. Integral Bell and Spigot joint pipes:

The pipe should be laid onto the trench bed, leveled and aligned, ready for jointing.

At the location of the Bell, the bed should be over-excavated to ensure that the pipe barrel is in full contact with the bed.

The procedure for jointing is as follows;

- Thoroughly clean the Bell, rubber ring and spigot of the pipes to be jointed.
- Apply lubricant to the rubber ring and the spigot to be jointed.
- Pull the joint together with the come-along jack until the black home-line is reached. See sketch below.

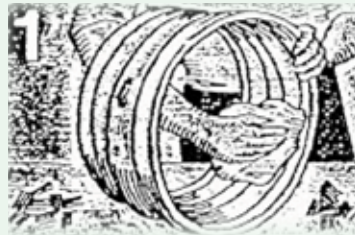


Jointing and Handling

B. Jointing pipes and fittings with double bell couplers.

Step 1-

Thoroughly clean Double Bell Coupling grooves and rubber gasket rings, to make sure no dirt or oil is present.



Step 2-

Insert the rubber gasket into the groove, leaving two to four uniform loops of rubber extending out of the groove. There should be a minimum of one loop for each 500 mm of gasket ring circumference.



Step 3-

With uniform pressure, push each loop of the rubber gasket into the gasket groove. Next using a clean cloth, apply a thin film of lubricant to the rubber gasket.

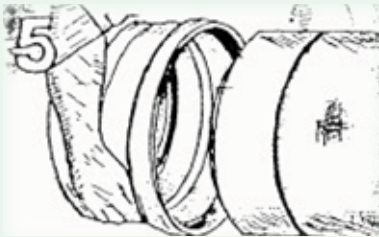


Step 4-

Using a clean cloth, apply a thin film of lubricant to the pipe from the end of the pipe to the Black Line.



Jointing and Handling



Step 5-
Lift either mechanically or by hand the Double Bell Coupling and align with the pipe section.



Step 6-
Firmly push the coupling into, using levers and protective timbers, until it is aligned with the Black Line.

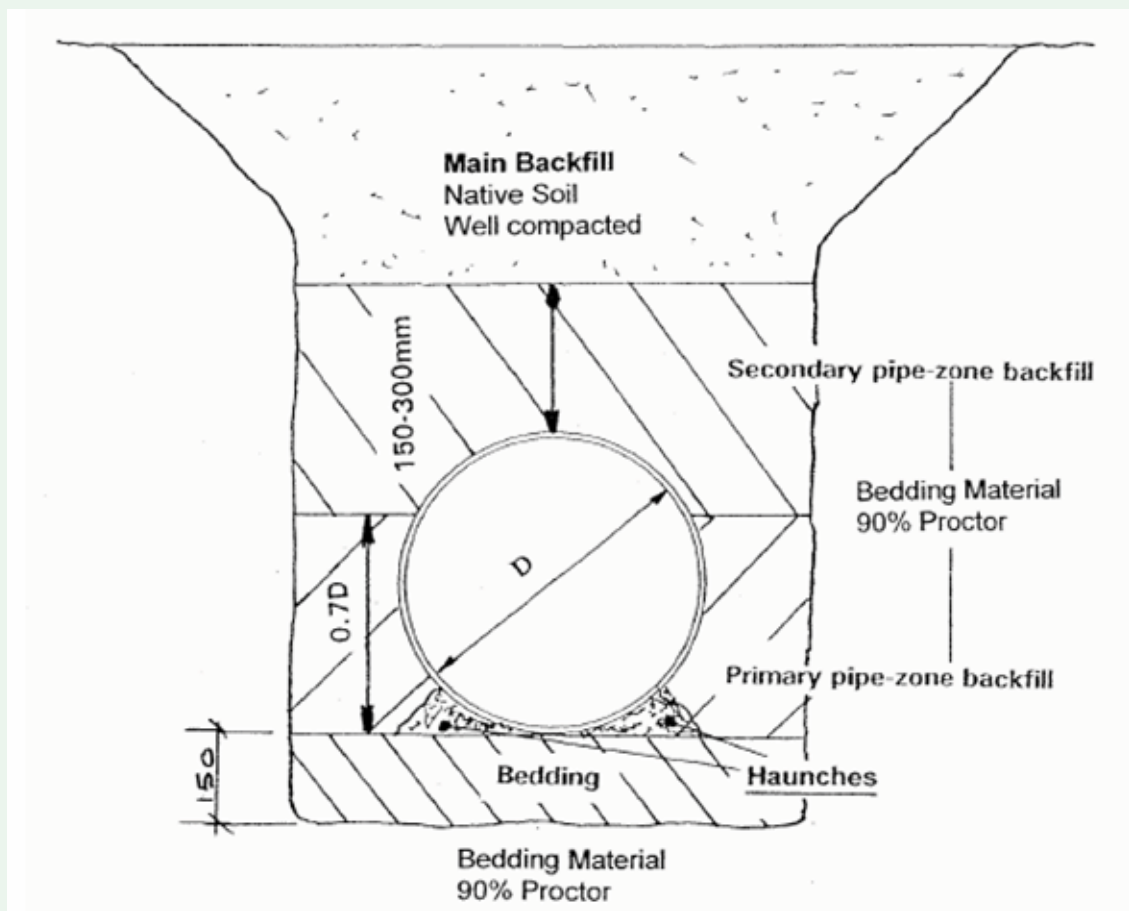


Step 7-
For larger pipe, the double bell coupling may be pushed into the pipe using the bucket of Backhoe or a Bulldozer. Protective Bulkheads of timbers must be used to distribute forces evenly to prevent damage to the coupling and pressure alignment. Never apply an uneven force directly to the coupling. Always ensure close supervision of the operation.



Step 8-
Before proceeding with installation, make sure pipe is uniformly and solidly supported along the entire length of the section as shown in figure 8.

Jointing and Handling



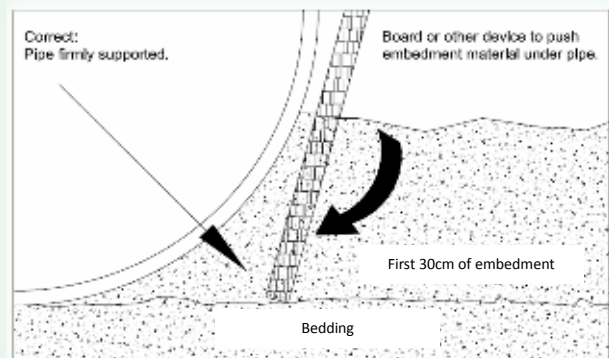
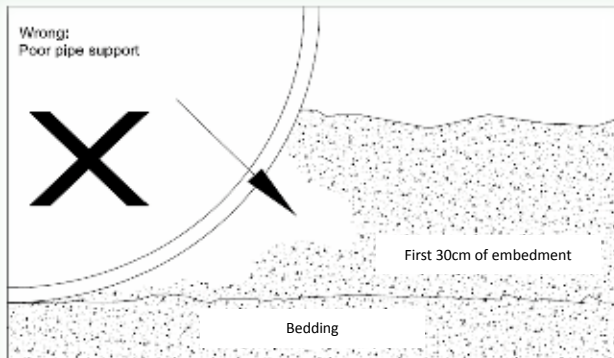
7. Backfilling

In the process of backfilling, protect the pipe from falling rocks, direct impact of compaction equipment and other sources of potential damage. Do not use compaction equipment directly over the pipe until sufficient backfill has been placed to ensure that such equipment will not have a damaging effect on the pipe.

7.1 Primary pipe-zone backfilling

Place the primary pipe-zone backfill material carefully in layers of 150 mm on each side of the pipe. Take extra care to ensure that the material is completely filled and well compacted under the haunches of the pipe. Place the compacted primary pipe-zone backfill material to a minimum of 70% of the pipe diameter. Backfill should be compacted to 90-95% Proctor. Check the pipe diameter to ensure that any increase in the vertical dimension of the pipe is no more than 2%.

Jointing and Handling



7.2 Secondary pipe-zone backfill.

Place the secondary pipe-zone backfill uniformly on both sides of the pipe in 150 lifts compacting each lift to 90% Proctor. Continue to 150-300mm above the crown of the pipe.

7.3 Main backfill

The main backfill above the pipe-zone can be completed, in equal layers, with native soil using mechanical compactors.

7.4 Deflection checks

After backfill is completed on a section of pipe, test for sufficient support by measuring deflection.

$$\% \text{Deflection} = \frac{\text{Nominal I.D.} - \text{Installed Vertical I.D.}}{\text{Nominal I.D.}} \times 100$$

1. Carefully and accurately measure vertical inside diameter (at least 90cm behind joint) of the installed pipe section.
2. Subtract the vertical J.D. from the nominal (specified) I.D. of the pipe.
3. Divide the remainder from step 2 by the nominal I.D. and multiply the result by 100 to get percentage of deflection.

Jointing and Handling

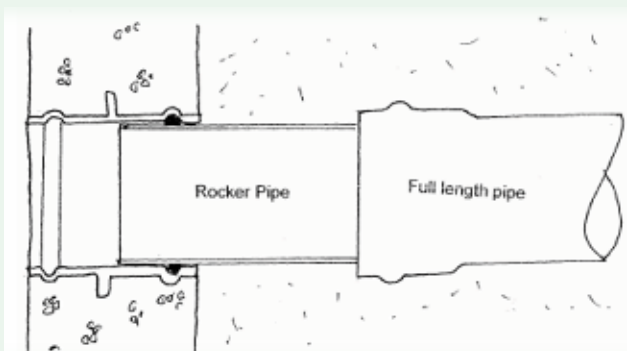
7.5 Connections at Rigid Structures

Where GRP pipes enter or leave rigid structures, such as when passing through walls, into anchor blocks, manholes, valve chambers, etc., it is possible for shear stresses to be introduced into the pipeline by differential settlement.

It is thus necessary to follow the established pipeline practice of introducing two flexible joints in close proximity to the rigid structure, so that shear stresses can be minimized by articulation.

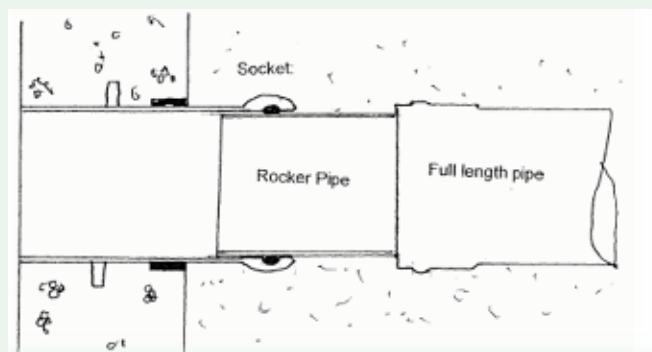
Several methods of connecting to structures are commonly used and are shown in the enclosed sketches.

It is also recommended that pipes built-in to a rigid structure should have a flexible relieving band of rubber, 100mm wide minimum width, wrapped around the pipe at the point of entry to eliminate localized stress points.



Special Double-Bell coupler as wall cast-in pipe:

This system allows testing of the whole pipeline from both structures, as a male GRP test plug can be used with the internal rekka joint. After testing, the ring can be removed and the groove filled with epoxy material.



Standard type of wall cast-in pipe

Associates and Customers



سابك
SABIC



ينساب
YENSAB



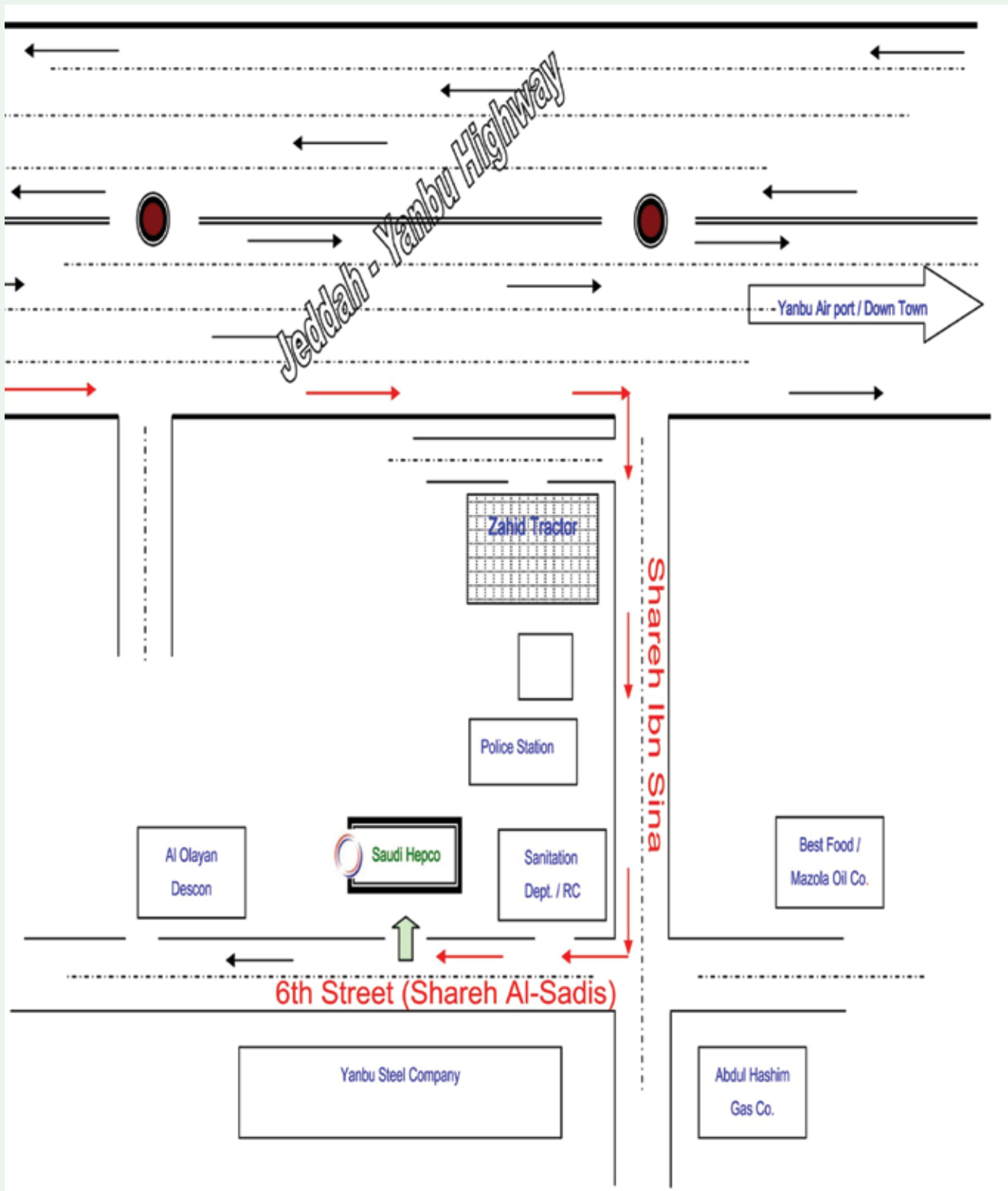
مرافيق
MARAFIQ



Certificates



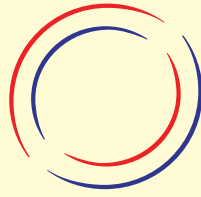
Location Map





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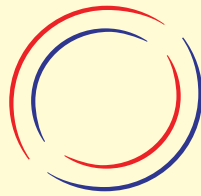


مكتب الرئيسي هيبكو السعودية

ص.ب. ١٠٢ ينبع
شارع السادس - منطقة الصناعات الخفيفة
الهيئة الملكية - ينبع الصناعية
المملكة العربية السعودية
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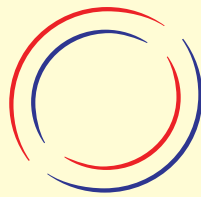


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فاكس ١٢ ٦٤٢٦٨٧١ +٩٦٦