KKB INDUSTRIES (SABAH) SDN. BHD. (675138-T)








Contents

Introduction

KKB Engineering Berhad (KKBEB) had its humble beginnings way back in 1962 as a small engineering workshop in Sarawak founded by the present Chairman and Group Managing Director, Dato Kho Kak Beng which was then undertaking modest steel fabrication works.

The business was officially registered as a sole proprietorship in 1966 with the progression into steel fabrication works for factory buildings and products such as steel storage tanks.

KKB's Headquarters, Kuching

Finished pipes for curing

On 20 February 1976, the business was incorporated as a private limited company under the name and style of Kho Kak Beng Welding and Engineering Contractor Sdn Bhd, the name which was subsequently changed on 11 March 1994 to KKB Engineering Sdn Bhd.

The status of the company was later converted to a public limited company on 23 March 1994 and was listed on the Second Board of Bursa Malaysia Securities Berhad on 9 November 1994. On 21 June 2007, the company was successfully transferred to the Main Board of Bursa Malaysia Securities Berhad.

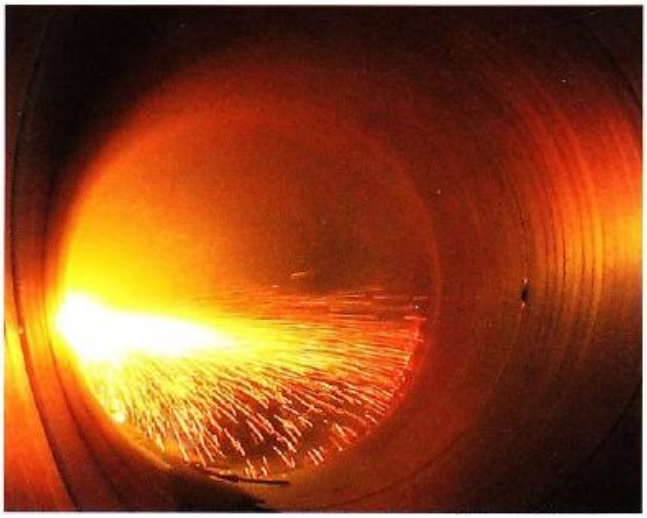
The present activities of KKB Engineering Bhd encompass 4 divisions, viz.,

1. Steel Fabrication Division
2. Hot -dip Galvanising Division
3. Civil Construction Division
4. LPG Cylinder Manufacturing Division

KKB Engineering Bhd through its subsidiary, KKB Industries (Sabah) Sdn Bhd has further diversified into steel pipes and pipe specials manufacturing at Kota Kinabalu Industrial Park (KKIP), Kota Kinabalu, Sabah. With steel fabrication knowledge, experience, expertise and facilities accumulated over a period of more than 40 years, we continuously seek for improvement in our quality products and services for our customers.

In addition to the manufacturing of steel pipes & pipe specials, KKBIS has embarked on its expansion plan into Steel Fabrication & Hot-Dip Galvanizing activities.

KKBIS Steel Pipes
Production



KKBIS manufactures steel pipes in range of diameters from 100mm to 2200mm with provision for system expansions when required.

The methods of manufacture used in our factory are :-

a) Bend Rolling Process (Sectional Welded Steel Pipe)
b) Spiral Forming Process (Spiral Welded Steel Pipe)

These pipes are manufactured by semi and fully automatic submerged arc welding process and are normally supplied in standard lengths of 9.30 meters and specified lengths can be supplied upon request.

KKBIS current initial installed capacity per shift per annum of mild steel pipes is approximately 18,000 metric tons, which is contributed by both sectional and spiral welded steel pipes production.

We have the in-house expertise to plan, customise and manufacture steel pipes that complies to the required standards.

Our comprehensive resources include all necessary fabrication, lining, and coating capabilities coupled with an efficient Engineering and Planning Department together with Information Technology and ERP (Management Software). We can ship our finished product directly from our facility to your project site.

Quality Assurance

KKB has deployed in the group an internationally recognized quality management system conforming to ISO 900 1 :2015 KKBIS, being part of the Group of companies is also certified by Lloyd's Register Quality Assurance for ISO 9001: 2015 for its quality management system.

At KKB Industries (Sabah) Sdn. Bhd., there is a commitment to manufacture high quality products which begins from the selection of pipe making machineries and the raw material required until finished product and onward transportation.

All steel pipes that bear the KKB stamp undergo thorough and rigid quality control on inspection of raw material (Hot-Rolled Coil) including welding wire and flux for suitability and technical compatibility, in-process and final inspections and tests before deliveries from our plant.

Each pipe is also hydrostatically tested as per BS 3601 specifications. In addition, radiography testing may be conducted at the weld seam for each pipe and Third Party Inspectors may be appointed to carry out quality assurance, inspection and testing of our manufacturing process at our plant to suit requirements. Every pipe is subjected to a rigorous check at the final stage to ensure that only the best quality pipes are supplied.

Inspections & Tests

The following inspections and tests for steel pipe are available:

No.	Basic inspections and tests	Sectional/Spiral welded pipes			
		A	B	C	D
1	Chemical Analysis	-	✓	✓	✓
	Mechanical Tests include:				
2	Tensile Test	✓	✓	✓	✓
3	Charpy Test	-	-	✓	-
4	Drop Weight Tear Test	-	-	✓	-
5	Flattening Test	-	-	-	-
6	Guided Bend Test	✓	-	✓	✓
7	Bend Test	-	-	-	-
8	Hydrostatic Test	✓	-	✓	✓
	Radiological Inspections Include:				
9	Radiographic Film	-	-	✓	-
10	Fluorescent Screen	-	-	✓	-
11	Ultrasonic Inspection	-	-	✓	-
	Electromagnetic Inspections Include:				
12	Eddy Current	-	-	-	-
13	Magnetic Particle	-	-	✓	-
14	Dye Penetrant Test	-	-	✓	-

Note : A = AWWA, B = ASTM A252, C = API 5L, D = BS 3601

The following Cooling and Lining inspections and tests are also available:

1 Holiday Detector Test
2 Weight Test
3 Coating Thickness Test
4 Sand Sieving Test
5 Concrete Cube Test
6 Peel Test

Sijil Pengesahan Berangan

Certificate of Approval, approved by Lloyd's Register Quality Assurance for ISO 9001:

Advantages Of Steel Pipes

- **Durability and long lifespan** – Records indicate many instances where steel pipes have been used and lasted for many years. With improved quality in steel, and advancement in lining and coating during the past few decades, the lifespan of steel pipes has also improved.

- **Economy of installation and maintenance** – Steel pipe is not only economical to purchase and install, but will usually have a better and longer lifespan cycle compared to other alternatives.

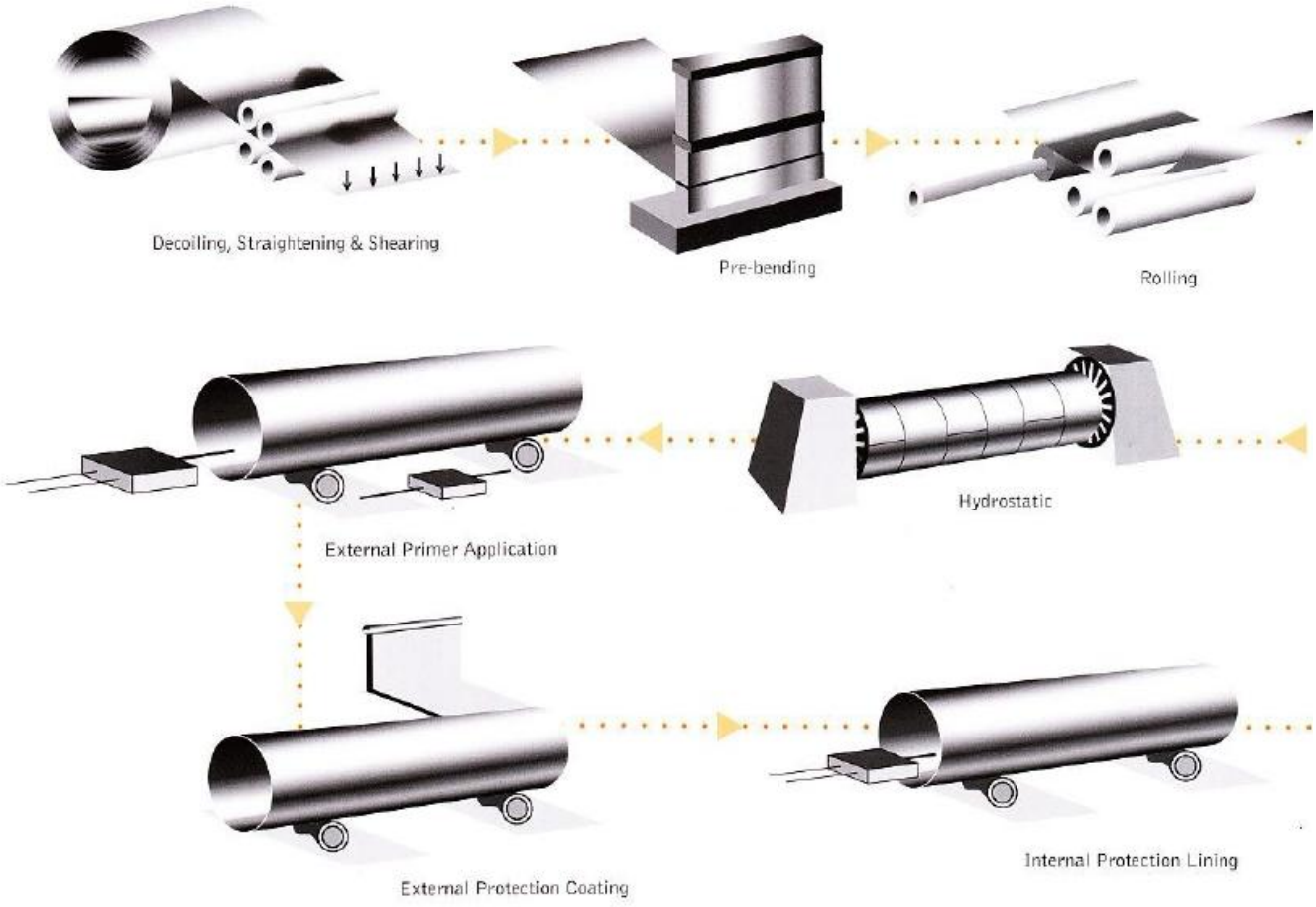
- **Strength and toughness** – With tensile strengths typically exceeding 60,000 pounds per square inch, steel pipes ratio of strength to wall thickness is hard to beat by any other commercial piping system.

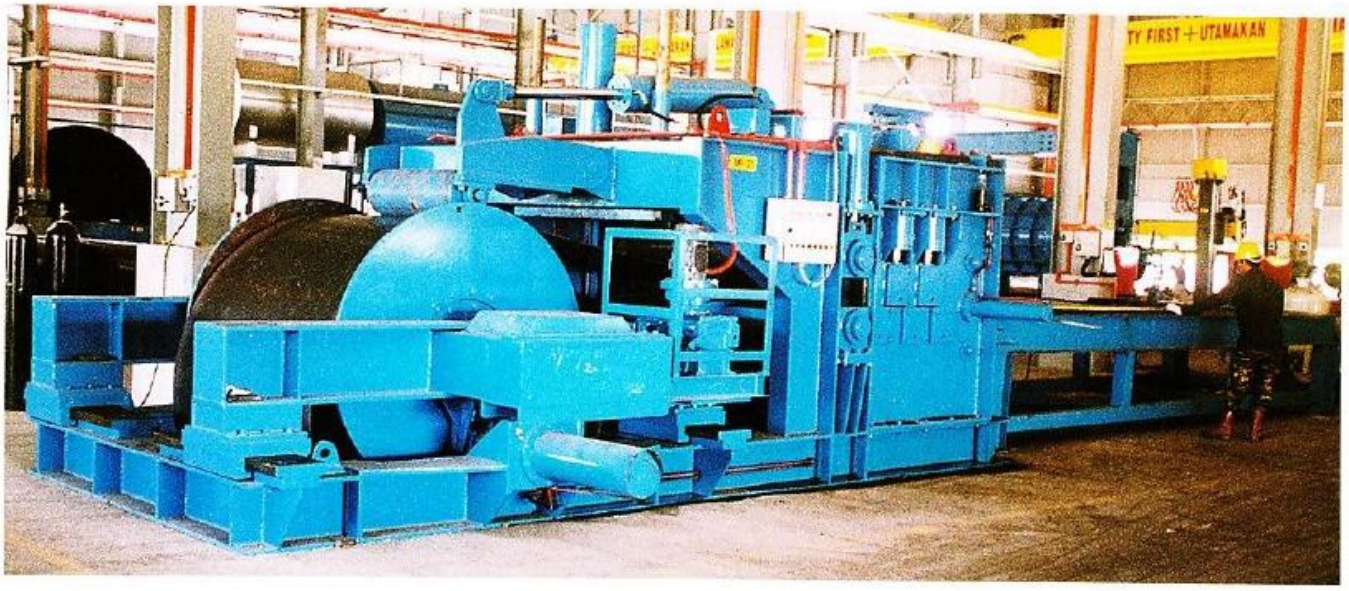
- **Ductility and adaptability** – Having high strength and ductility is unmatched by any other product on the market. Steel pipe's adaptability allows it to be used in terrain where other materials cannot. Steel pipe has the ability to be fabricated to fit specific project. Also, with the many choices of linings and coatings to suit from the simplest to the most complex situations, steel pipe is tough to beat.

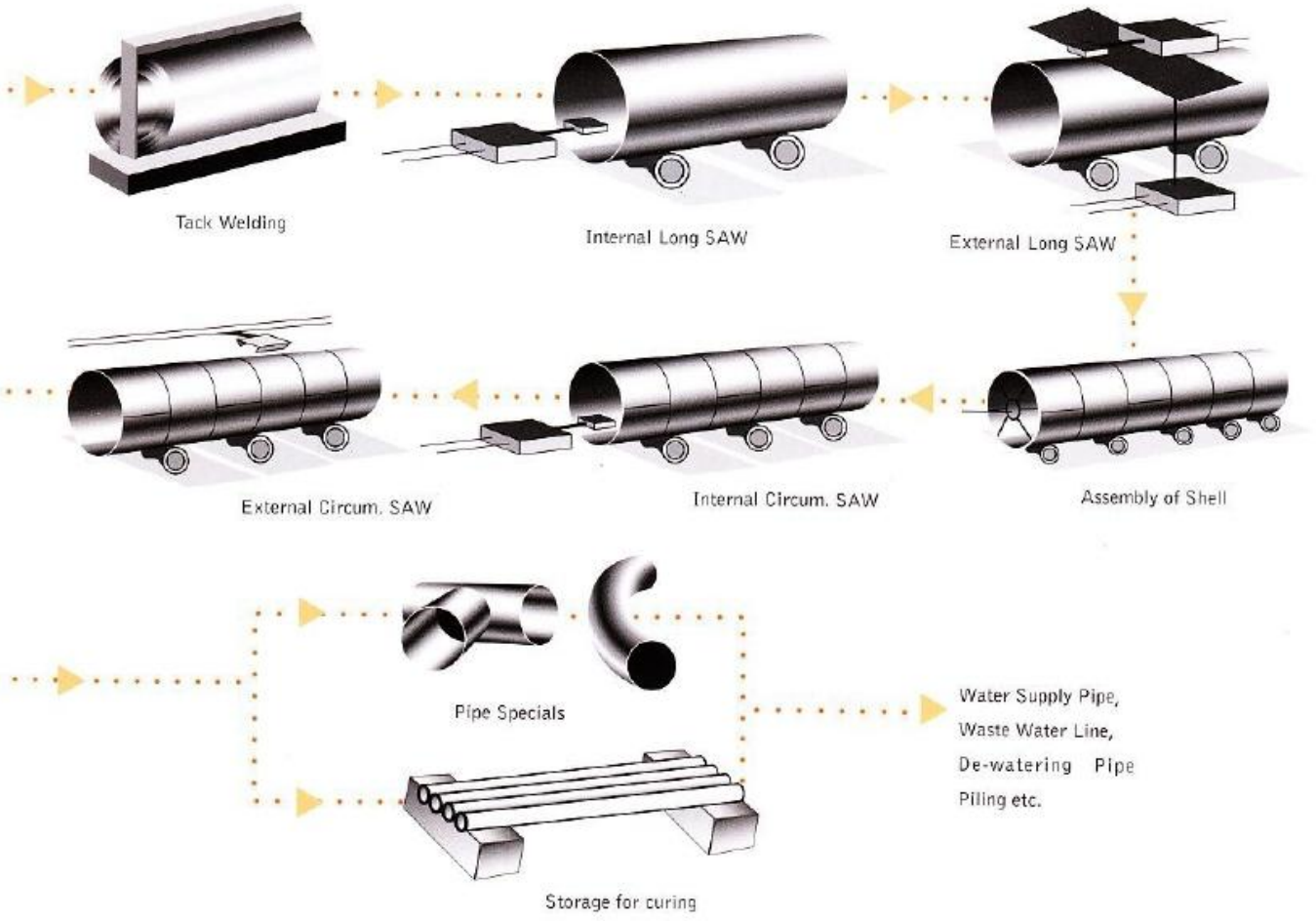
- **Carrying capacity** – Properly protected steel pipe can be designed for a very long life with its intended capacity. Further, with the typically wide margin of safety engineered into steel pipe, it is sometimes possible to increase its carrying capacity

Sectional Welded
Steel Pipes Manufacturing Process

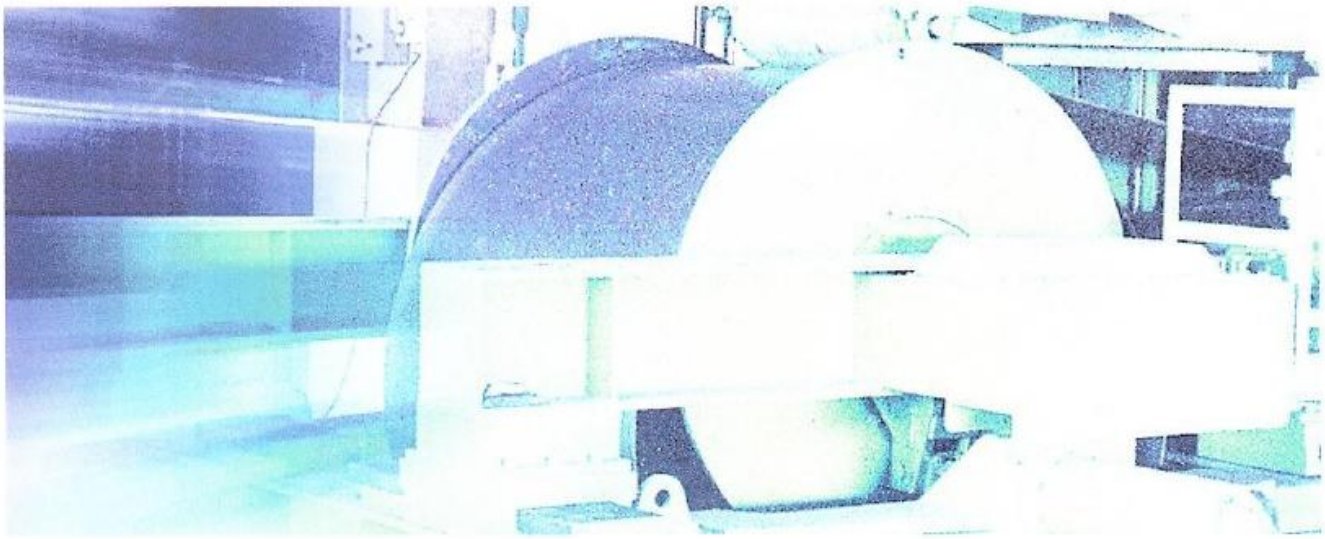
Sectional welded steel pipes process starts from the heavy duty decoiler, straightener and cutting integrated machine which decoils, straightens the Hot Rolled Coil into flat plate and cutting the flat steel plate into required length. Then our highly flexible roller bending process makes possible a very large range of available diameters and wall thickness, transforms the plate into steel shells (barrels). All steel shells are (internal and external) Longitudinally Submerged Arc Welded (SAW) to form completely welded steel shells. A number of steel shells (depend on the length required) will be put together to form a long pipe with a number of internal and external Submerged Arc Circumferential Welds.

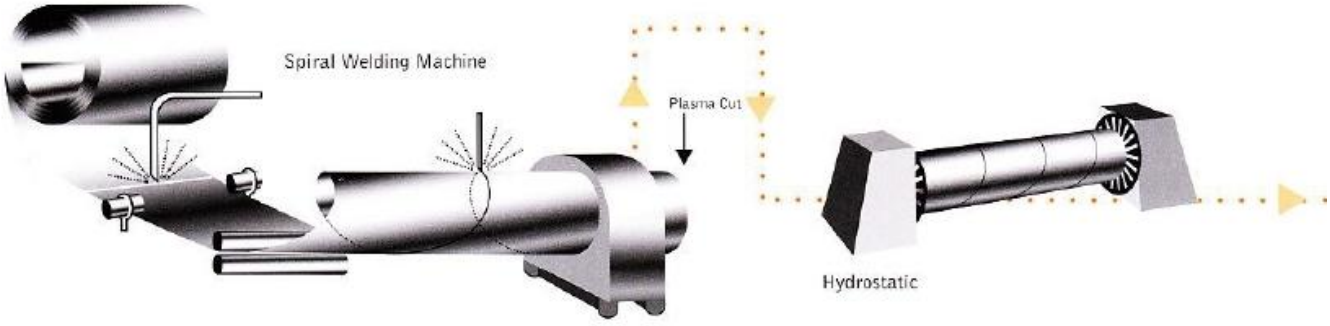



TY FIRST + UTAMAKAN


Tack Welding
Internal Long SAW
External Long SAW
Assembly of Shell
Internal Circum. SAW
External Circum. SAW
Pipe Specials
Storage for curing
Water Supply Pipe,
Waste Water Line,
De-watering Pipe
Piling etc.

Spiral Welded
Steel Pipes Manufacturing Process





When compared to other alternatives , spiral welded steel pipes are stronger, higher-quality, more economical, and offer more design options for large diameter piping applications.

Spiral welded steel pipes are manufactured from hot-rolled steel coil. An automated mill unrolls the coil and forms the steel strip into a tube with a helical seam sealed by a continuous submerged-arc weld, on both sides.

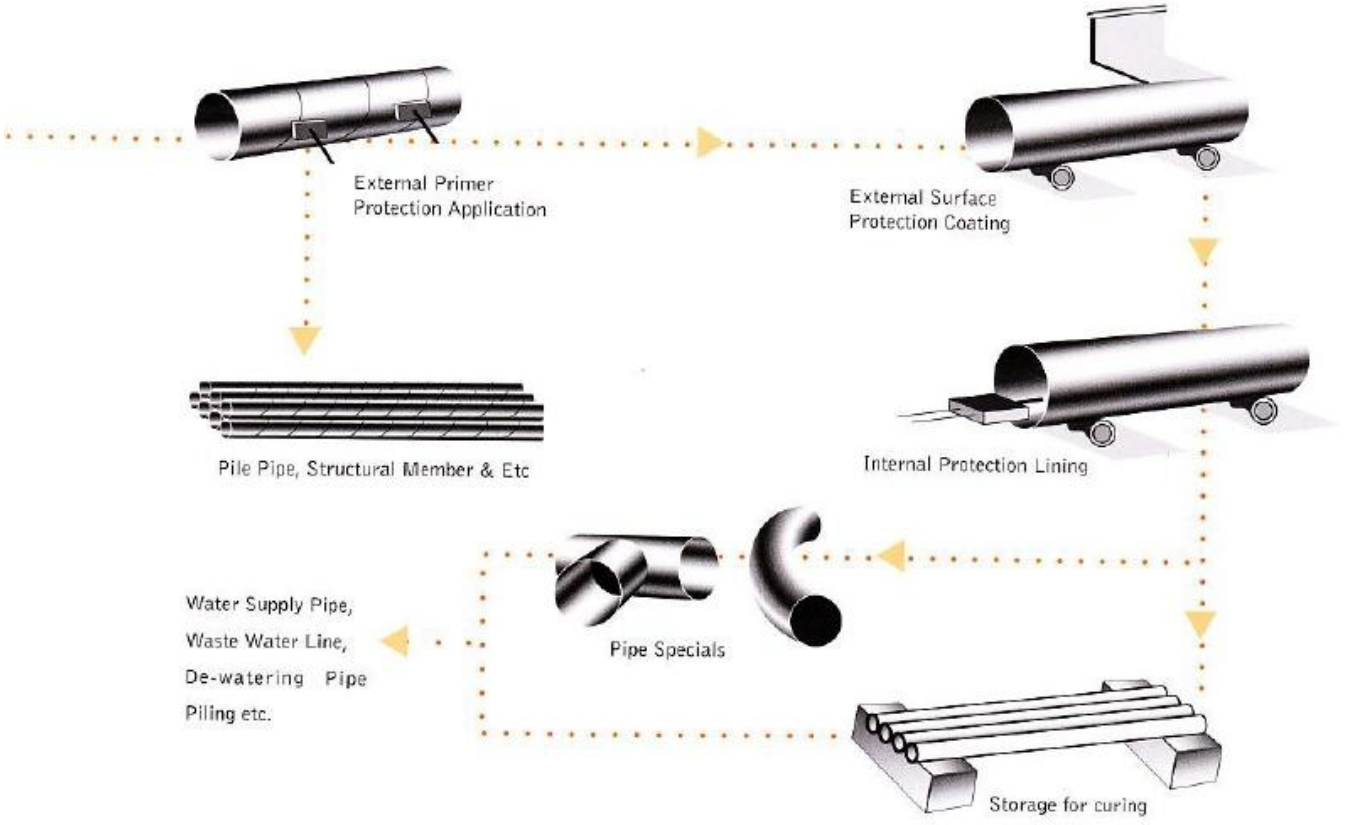
Most spiral-welded steel pipes are made to order. This enables our pipes to be specifically designed for any project in terms of pipe diameter, length, thickness, steel strength, pressure requirements, linings, coatings, etc.

Hot-Rolled Coils are loaded on the decoiler of the Spiral Pipe machine. The tail end of one coil is welded to the leading end of the next, thus forming an endless strip. This strip is then cleaned on both sides in preparation for the welding. The strip is finally formed into a tubular shape pipe.

Applying the Submerged – Arc Welding process, the pipe is welded from inside and then followed by the outside. The endless pipe strand so produced is conveyed through the traveling cut-off unit where it is automatically cut to lengths required. Finally , the pipe lengths are conveyed for quality checks prior to Hydrostatic Testing and the other remaining operations.

The main advantages of spiral weld pipes are :

- **High quality pipes are produced economically and in various diameters and thicknesses.**
- **Spiral pipes are characterized as having excellent dimensional accuracy relating to roundness and straightness. These pipes obtain their final shape on the machine without any need for further treatment such as straightening, calibrating etc.**
- **The greater strength of submerged arc welded seams adds to the stability of the pipes. This results from the reinforcement of the weld, and the fact that hoop stresses in a spiral seam tube are less than those in straight seam tube due to the "bandage effect" and distributed forces.**
- **All these factors provide advantages not only during construction and installation, but also to withstand the rigors of routine maintenance and future rehabilitation.**



Manufacturing Standards

KKBIS manufactures steel pipes generally in accordance with BS 3601-1987 Steel Pipes and Tubes for Pressure Purposes and BS 534 -1990 - Steel Pipes, Joints And Specials for Water and Sewage. Pipes complying with American Water Works Authority (AWWA), American Petroleum Institute (API) Standard, Australian Standard (AS), Japanese Industrial Standard (JIS), Singapore Standard (SS) or other specifications and standards can also be supplied

TABLE I : GRADE OF STEEL

STANDARDS	GENERAL APPLICATIONS	GRADE		CHEMICAL COMPOSITION (%)				
				C Max	Si Max	Mn Max	P Max	S Max
API 5L Note: EW: electric welded CW: continuous welded NE: non expanded CE: cold expanded	High strength oil & gas pipelines, refinery piping & etc	A25 Cl I	EW/CW	0.21	-	0.6	0.03	0.03
		A25 Cl II	EW/CW	0.21	-	0.6	0.08	0.03
		A	NE/CE	0.21	-	0.9	0.03	0.03
		B	NE/CE	0.26	-	1.15	0.03	0.03
		X42	NE/CE	0.28	-	1.25	0.03	0.03
		X46	NE	0.30	-	1.35	0.03	0.03
			CE	0.28	-	1.25	0.03	0.03
		X52	NE	0.03	-	1.35	0.03	0.03
			CE	0.28	-	1.25	0.03	0.03
		X56	NE/CE	0.26	-	1.35	0.03	0.03
		X60	NE/CE	0.26	-	1.35	0.03	0.03
		X65	NE/CE	0.26	-	1.40	0.03	0.03
		X70	NE/CE	0.23	-	1.6	0.03	0.03
		X80	NE/CE	0.18	-	1.80	0.03	0.018
BS4360 1986	Water & sewage systems. General applications	43A		0.25	0.50	1.60	0.05	0.05
		43B		0.21	0.50	1.50	0.05	0.05
		43C		0.18	0.50	1.50	0.04	0.04
		50B		0.20	0.50	1.50	0.05	0.05
		50C		0.20	0.50	1.50	0.04	0.04
JIS G3101 - 1991	Water & sewage systems. General applications	SS 400		-	-	-	0.05	0.05
		SS 490		-	-	-	0.05	0.05
ASTM A 252	Piling	1		-	-	-	0.050	-
		2		-	-	-	0.050	-
		3		-	-	-	0.050	-
DIN 17100 - 1980	Piling	st44-2		0.21	-	-	0.05	0.05
		st52-3		0.20	-	-	0.04	0.04

Grade Of Steel

The grade of steel most commonly used in the manufacturing of steel pipes, specials and fittings is BS 4360:1986 Grade 43A. If higher strength of steel is required, then Grade 50B of BS 4360:1986 or API-5L X Grades can be used.

Table 1 lists out the specifications of steel to BS 4360:1986, DIN 17100:1980 and JIS G3101 requirements that are widely used. Pipes manufactured from materials to other international standard for particular application can also be supplied if required.

	TENSILE TEST		
OTHERS	Y.S. (MIN) N/mm²	T.S. N/mm²	ELONGATION (MIN)
-	173	310	E= 625,000 A= Transverse area in sq inches U= SM.T.S in Psi E= Elongation in 2 inches
-			
-	207	332	
Ti, V, Nb	241	414	
Ti, V, Nb	289	414	
Ti, V, Nb Ti, V, Nb	317	435	
Ti, V, Nb Ti, V, Nb	360	455	
Ti, V, Nb	356	490	
Ti, V, Nb	414	517	
Ti, V, Nb	448	532	
-	483	566	
-	552	621	
-	Up to and incl. 16mm - 275	430 ~ 580	GL= 200mm GL= 5.65√So
-	Over 16mm up to/and incl. 40mm - 265		
-			
Nb: 0.003 - 0.10 V: 0.003 - 0.10	Up to and incl. 16mm - 355 Over 16mm up to/and incl.	490 ~ 620	GL= 200mm GL= 5.65√So
-	Up to and incl. 16mm - 245 Over 16mm up to 40mm - 235	400 ~ 510	For thickness up to 50mm 21 - 26
-	Up to and incl. 16mm - 285 Over 16mm up to 40mm - 275	490 ~ 610	For thickness up to 50mm 17 - 21
-	207	345	t≤ 0.312" E = 48t + 15.00 t > 0.312" E = 30 (GL 2")
-	241	414	t≤ 0.312" E = 40t + 12.50 t > 0.312" E = 25 (GL 2")
-	310	455	t≤ 0.312 E = 32t + 10.00 t > 0.312" E = 20 (GL 2")
-	Up to 16mm - 275 Over 16mm up to 40mm -265	410 ~ 540	3≤ t≤ 40 L - 22; C - 20
-	Up to 16mm - 355 Over 16mm up to 40mm - 265	490 ~ 630	3≤ t≤ 40 L - 22; C - 20

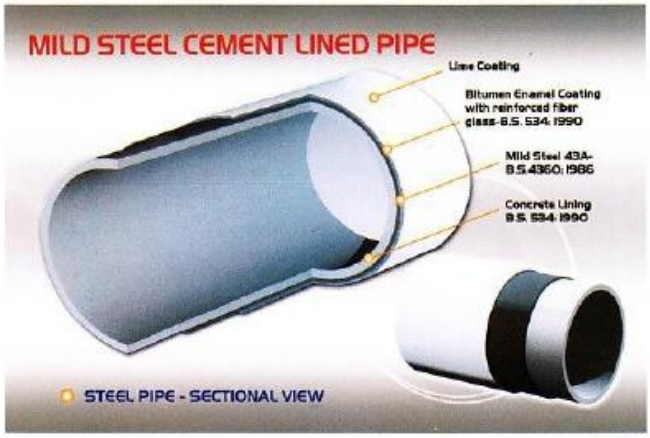
External & Internal
Corrosion Protection System

External Surface Protection Systems include:

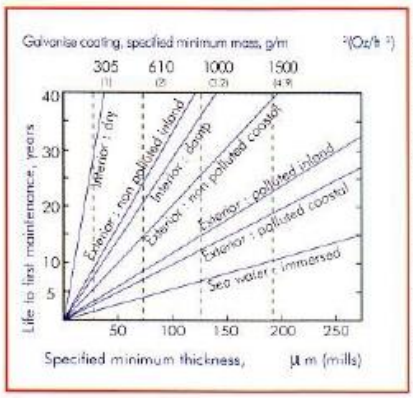
- Reinforced Bitumen Enamel Coating
- Reinforced Coal Tar Enamel Coating
- Organic and Inorganic Zinc Rich Coating
- Coal Tar Epoxy and other Epoxy Coating
- Primer Coat Painting eg. Red Lead Oxide
- Tape Coating System
- Hot Dip Galvanising

Internal Surface Corrosion Protection Systems:

- Centrifugal Spun-In Concrete Lining
- Centrifugal Spun-In Bitumen Lining
- Centrifugal Spun-In Coal Tar Lining
- Epoxy and Coal Tar Epoxy Lining
- Paint Systems
- Hot Dip Galvanising



Hot-Dip Galvanising



Eventhough steel is a strong material for fabrication of structural member, it still has to be protected from corrosion. There are many ways to protect it from corrosion but the most economical way is to coat with zinc using Hot Dip Galvanisng (HDG) process. Generally, galvanising is carried out to conform to BS EN 1461:1999 (ISO) specifications.

Advantages

The advantages of Hot-Dip Galvanising are:

- Extend the age of steel or iron, for example: Galvanised coating thickness for 610g/m² is free for maintenance for over 30 years in rural and 15 - 25 years in urban area. (Please refer to the above diagram)
- It will not peel off easily because it is metallic bonded to base metal so the following activites e.g. fabrication work and transportation will not damage the coating.
- Galvanised coating corrodes preferentially to steel, providing sacrificial or cathodic protection to small area of steel exposed through damage to the coating area.
- Giving a comprehensive protection including sharp indentations and inaccessible areas.
- Even in cases where the initial cost of galvanising is higher than a comparable alternative, galvanising is almost invariably cheapest in the long term.
- The use of galvanising considerably reduces maintenance for very long periods compared with other coatings for steel.

Steel Pipe Specials
Fittings & Joints

KKBIS' usage of the latest state-of-the-art engineering software is capable of preparing detailed drawings of all sorts of pipe specials and fittings in a record time. This gives an added advantage to execute a project more efficiently and ultimately satisfy the customer.

Fabricated steel pipe specials, fittings and joints such as bends, reducing bends, tapers, crosses, y-pieces, off-take tees, level invert tees, access manhole tees, joint harness, manifolds, ring girder supports, stiffener rings, expansion joints, flexible couplings, flanged adapters, butt straps, collars, ring and blank flanges etc. are manufactured to British Standards, American Water Works Association Standards and other International Standard to suit client requirement.

The internal lining and external coating of these items are also carried out to suit the requirements of the particular service application they are subjected to.

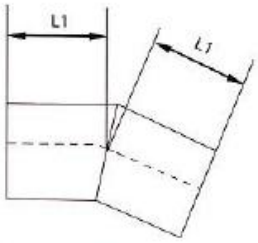


Figure 1. Gusseted bend type 1, not more than 30°

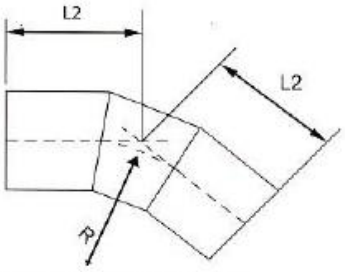


Figure 2. Gusseted bend type 2, over 30° up to 60°

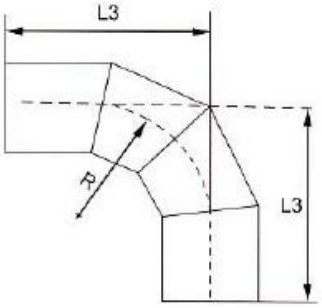


Figure 3. Gusseted bend type 3, over 60° up to 90°

TABLE 2 : Dimensions of Gussetted Bend Sizes 100mm to 2200mm Dia. Inclusive.

Pipe OD	Type 1	Type 2				Type 3	
	Not more than 30°	Over 30° to 45°		Over 45° to 60°		Over 60° to 90°	
mm	L_1 mm	R mm	L_2 mm	R mm	L_2 mm	R mm	L_3 mm
114.3	175	150	200	150	250	150	300
139.7	200	200	250	200	250	200	350
168.3	225	225	300	225	300	225	400
193.7 *	275	275	300	275	300	275	400
219.1	300	300	350	300	400	300	500
244.5 *	300	350	350	350	400	350	550
273	375	375	450	375	500	375	650
323.9	375	450	450	450	500	450	700
355.6	450	525	550	525	600	525	800
406.4	450	675	600	450	600	450	850
457	450	675	600	450	600	450	850
508	450	750	600	500	600	500	850
559	450	825	650	550	600	550	850
610	550	900	750	600	750	600	1000
660	550	975	750	600	750	600	1000
711	550	1050	800	700	750	700	1100
762	600	1125	850	750	850	750	1100
813	600	1200	850	800	850	800	1200
864	600	1275	850	850	850	850	1200
914	600	1350	900	900	900	900	1300
1016	750	1500	1100	1000	1100	1000	1500
1219	850	1800	1200	1200	1200	1200	1700
1420	850	2100	1300	1400	1300	1400	1900
1628	900	2400	1400	1600	1400	1600	2100
1829	900	2700	1500	1800	1500	1800	2200
2032	1000	3000	1600	2000	1600	2000	2500
2235	1000	3300	1700	2200	1700	2200	2600

Welded Steel
Pipe Specials

For reference Table 2 show details and dimensions commonly used. KKBIS can manufacture and supply a comprehensive range of specials, fittings and other appurtenances associated with pipeline construction to suit client's specification and requirement. Whilst all diagrams show specials and as plain ended, we can manufacture and weld plate type, flat or raised face flanges to any standards to the pipe ends. Puddle flanges, tie ring thrust flanges, and harness lugs can be welded onto the pipe specials if required. Bends of all angles up to 90° are manufactured by gusseting and welding. The number of gussets can be increased to give a smoother flow.

External & Internal
Corrosion Protection System

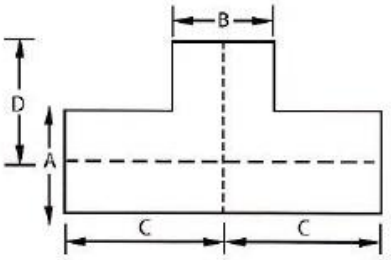


Figure 4. Plain end tee for slip-on type coupling and butt welded joint

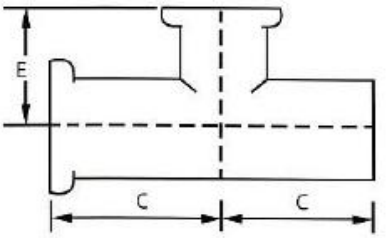


Figure 5. Sleeve joint tee for welding

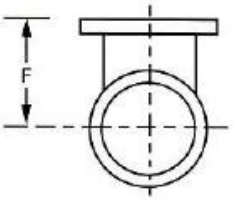
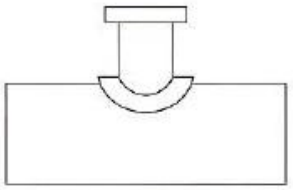


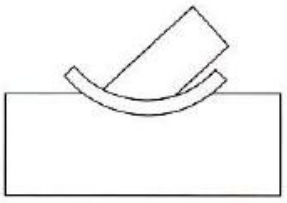
Figure 6. Tee with flanged branch

(A)



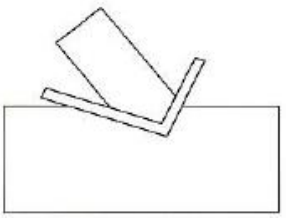
COMPENSATING PLATE TYPE

(B)



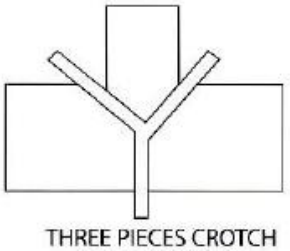
ONE PIECE CROTCH PLATE WYE TYPE

(C)



TWO PIECES CROTCH PLATE WYE TYPE

(D)



THREE PIECES CROTCH PLATE WYE TYPE

TABLE3 : Dimensions of tee. sizes 60mm to 2200mm nominal diameter inclusive.

Barrel		Branch			
Outside diamater A	C	Outside diamater B	D	E	F
			0.5 times o.d.of barrel 'A' plus		
mm	mm	mm	mm	mm	mm
60.3	240	60.3	200	100	100
76.1	240	76.1	200	100	100
88.9	250	88.9	200	100	110
114.3	270	114.3	200	100	130
139.7	280	139.7	200	110	140
168.3	290	168.3	200	110	140
193.7*	300	193.7*	200	110	150
219.1	370	219.1	250	110	150
244.5*	380	244.5*	250	130	160
273	410	273	250	130	160
323.9	450	323.9	250	130	160
355.6	530	355.6	300	150	200
406.4	600	406.4	300	150	230
457 to 711	1.5 times o.d. of branch 'B' but with a minimum of 0.5 times o.d. of barrel 'A'	457 to 711	300	230	300
762 to 914		762 to 914	380	300	300
1016 to 2235		1016 to 2235	380	380	380

Note:

The diagrams above show details and dimensions of unreinforced tees only. If design criteria or operating conditions require that the tees or Y-branches be provided with proper reinforcement, KKBIS can supply them with reinforcements to the requirements of AWWA M11 or as specified by client. Typical Reinforcement details of tees and angle branches are as above.

Tapers

The provision of the straight parallel sections at both ends allows either welding directly into the adjoining pipes with collar joints or attachment of flanges couplings or flanged adapters for stronger and faster connection.

Figure 7. Concentric Tapers

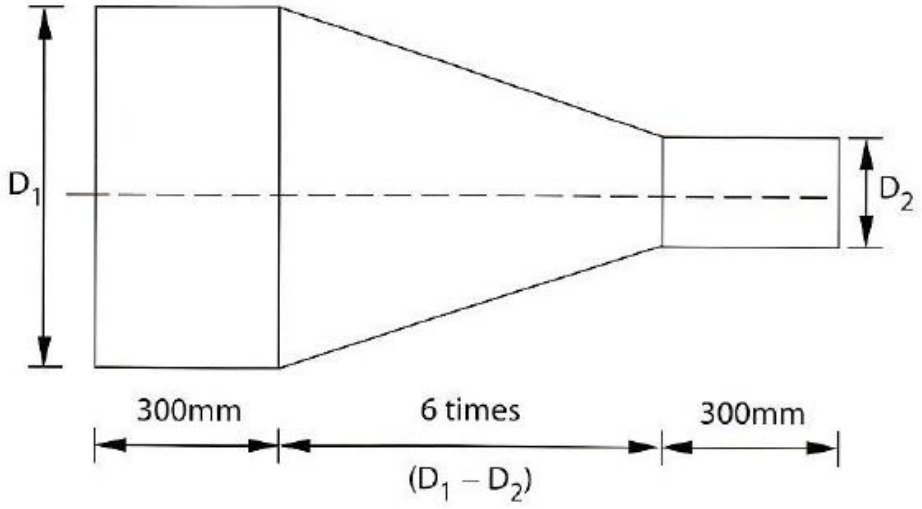
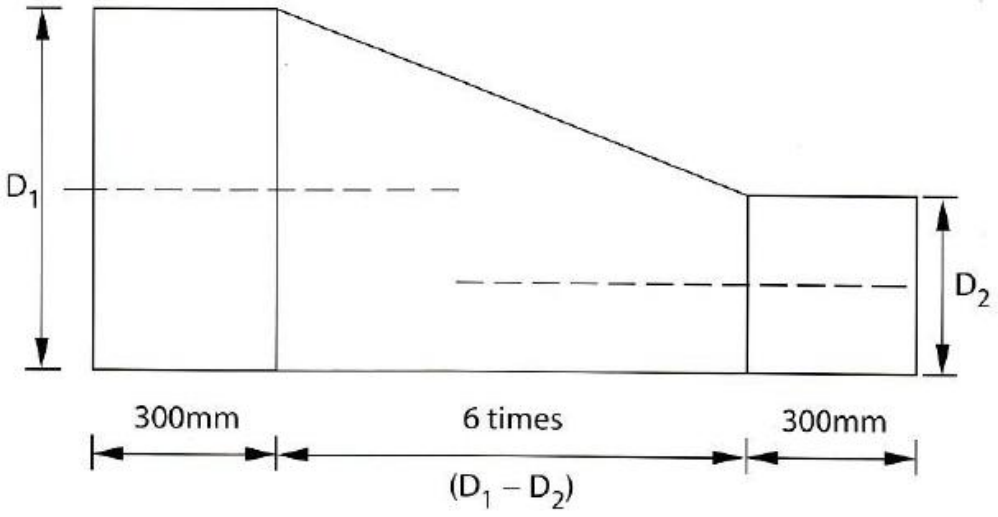


Figure 8. Eccentric or Flat Taper



Joint Details
For Use With Steel Pipes

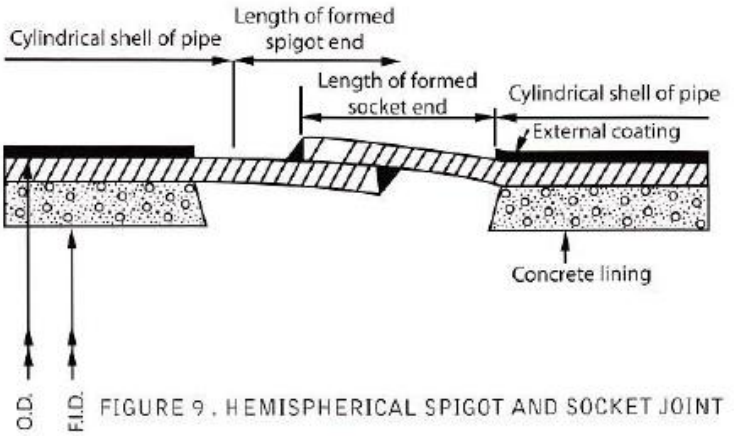


FIGURE 9 . HEMISPHERICAL SPIGOT AND SOCKET JOINT

Hemispherical Spigot & Socket Joint

Available in all sizes of steel pipes and very commonly used in Malaysia. Able to accommodate an angular deflection of up to 2^0 per joint. For diameters above 610mm both internal and external fillet welding at site. Easy slip-in and does not require sophisticated and elaborate techniques for assembly. Another version available is the parallel sleeve type where the spigot end is plain ended.

Spherical Spigot & Socket Joint

Available in sizes from 610mm to 2200mm diameters. Able to accommodate an angular deflection of 5^0 per joint. Air testing of completed joint allows the whole pipeline to be immediately backfilled.

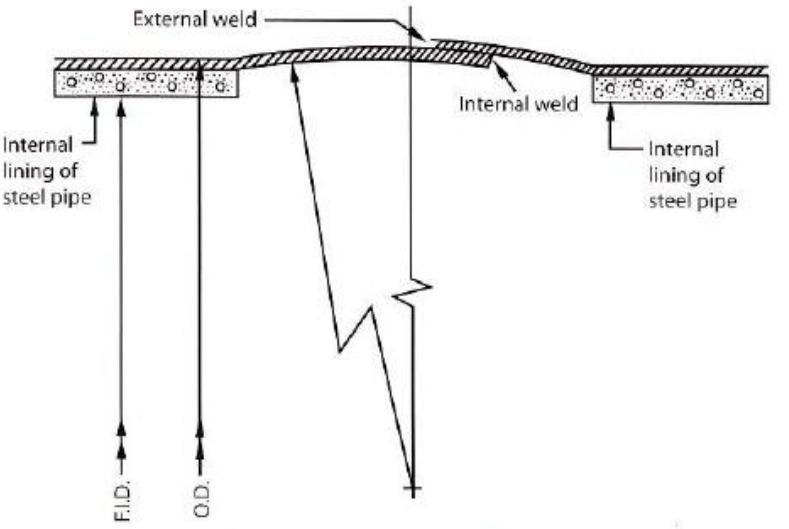


FIGURE 10 . SPHERICAL SPIGOT AND SOCKET JOINT

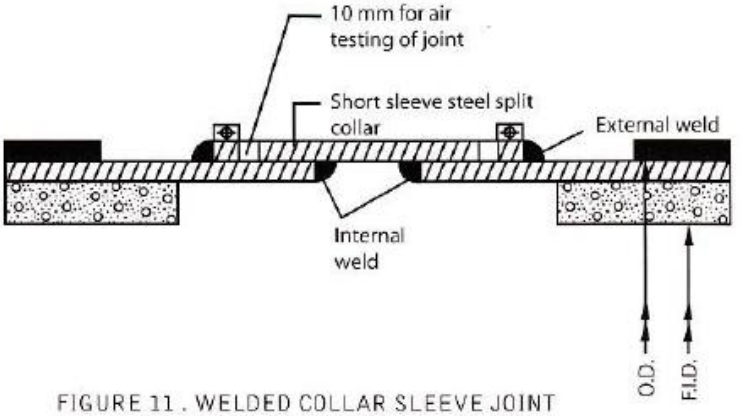


FIGURE 11 . WELDED COLLAR SLEEVE JOINT

Collar Joint

Suitable for closing lengths or even whole pipeline. Provide rigid joint. Available in split type and make it easier to align pipes for welding. Both internally and externally fillet welded for 711mm OD and above. On sizes smaller than 711mm OD the joint should be welded.

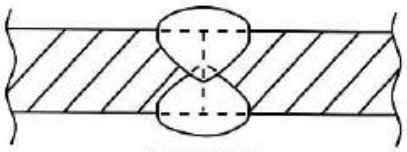


FIGURE 12 . BUTT ENDS JOINT

Butt Ends Joint

Pipe ends can be of single or double Vee or square butt depending on the thickness of plates and will withstand longitudinal extension loading caused by settlement or other disjointed forces.

Flanged Joint

Dimensions usually to BS 4504. Provide rigid joint and suitable for permanent or temporary installation and can be assembled faster. Used in joining pipes to valves, flowmeters, terminal connections or pipes which are to be installed vertically, in steeply inclined position or above ground on widely spaced supports.

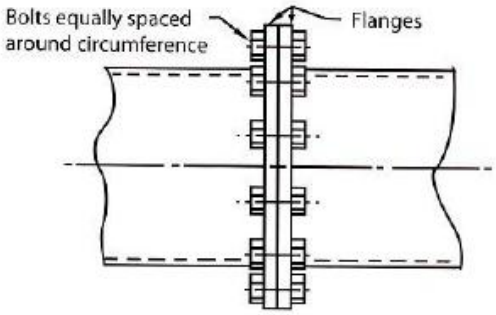


FIGURE 13 . FLANGED JOINT

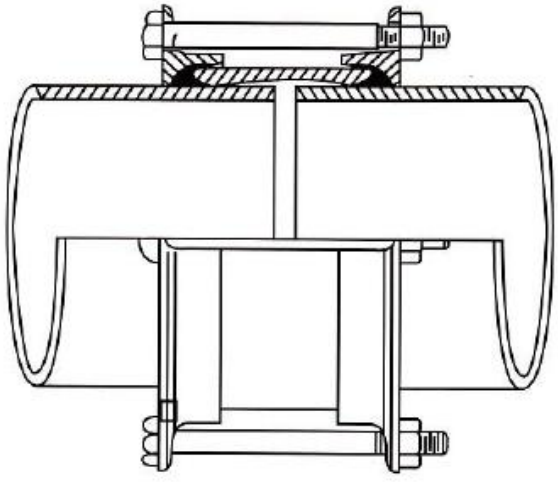


FIGURE 14 . SLIP-ON FLEXIBLE COUPLING

Slip-On Flexible Coupling

Available for all sizes of steel pipes. It is especially suitable for smaller diameter pipes which are difficult or impossible for cement lining to the inside of the pipes. It provides tightness and strength with flexibility and relieve expansion and contraction forces in a pipeline.

Negotiating Long Radius Curves
Using Spherical Spigot & Socket Welded Straight Pipes

Long radius curves can be negotiated by deflecting the joints of spherical spigot and socket steel pipes. The radius of curves for given angles of deflection or the angle of deflection required to produce a given radius may be calculated from the following formula.

$$R = \frac{L}{2 \sin \frac{\emptyset}{2}} \quad \text{or} \quad \emptyset = 2 \sin^{-1}\left(\frac{L}{2R}\right)$$

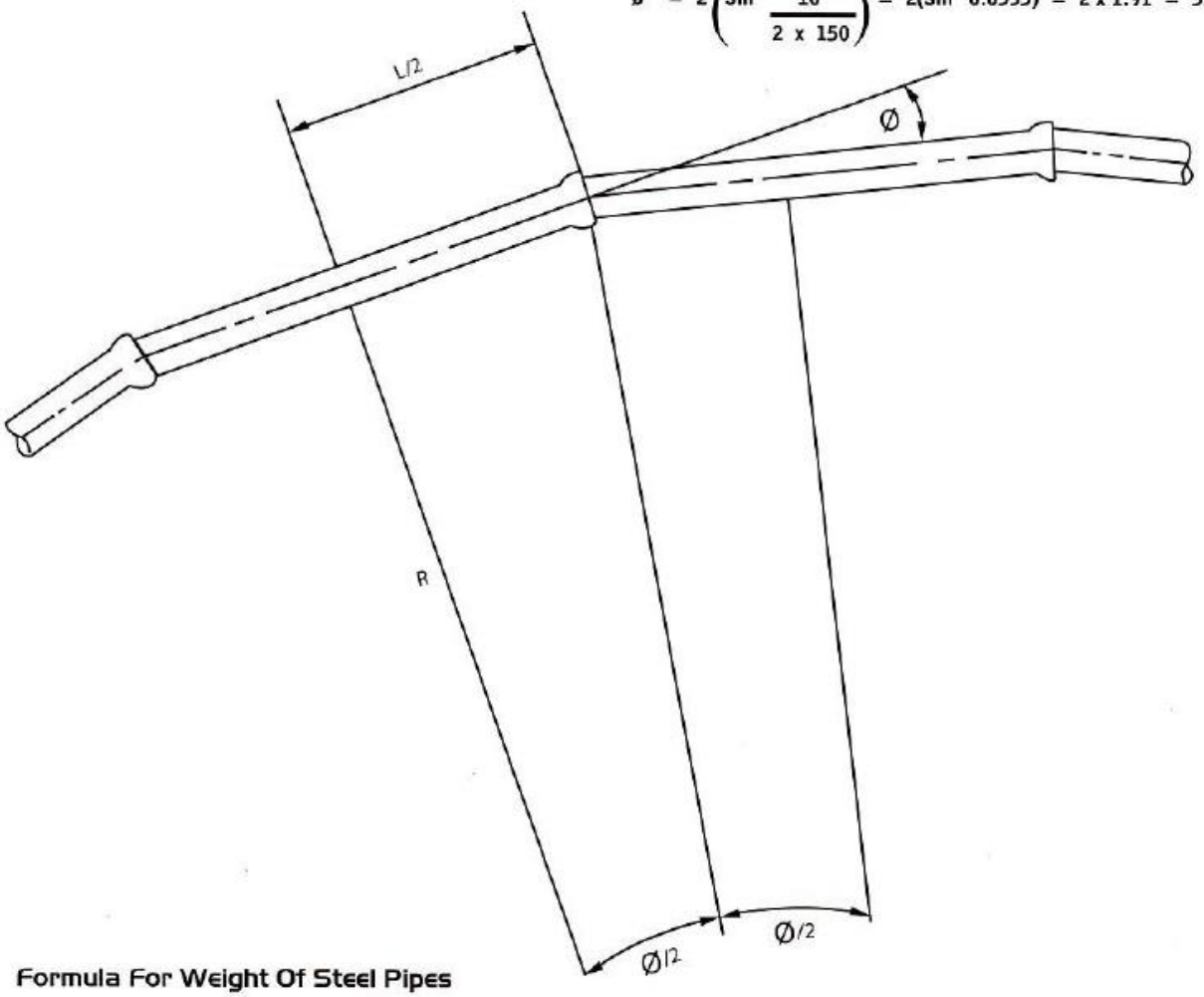
Examples

1. What radius of curvature would result if the joints of standard 10 m long pipes are deflected 5^0?

$$R = \frac{10}{2 \sin \frac{5}{2}} = \frac{10}{2 \sin 2.5} = \frac{10}{2 \times .04362} = 114.6 \text{ m}$$

2. What angle of deflection is required at the joints of standard 10 m long pipes to produce a radius of 150 m?

$$\emptyset = 2\left(\sin^{-1}\frac{10}{2 \times 150}\right) = 2(\sin^{-1} 0.0333) = 2 \times 1.91 = 3.82^0$$



Formula For Weight Of Steel Pipes

Wpe	=	0.02466 x (OD - Ts) x Ts
Wcl	=	0.00728 x (FID + Tc) x Tc
Wbw	=	0.00424 x (OD + Twb) x Twb
Wbl	=	0.00424 x (FID + Tbl) x Tbl

Note:

OD	=	Specified outside diameter of steel shell (mm)
FID	=	Specified finished internal diameter of pipe (mm)
Ts	=	Specified thickness of steel plate (mm)
Tbw	=	Specified thickness of bitumen coating (mm)
Tbl	=	Specified thickness of bitumen lining (mm)
Tcl	=	Specified thickness of concrete lining (mm)
Wpe	=	Calculated weight of plain ended steel shell (Kg/M)
Wbw	=	Calculated weight of bitumen coating (Kg/M)
Wcl	=	Calculated weight of concrete lining (Kg/M)
Wbl	=	Calculated weight of bitumen lining (Kg/M)

Brief Theoretical Aspects
To Be Considered In The design of Steel Pipes

The famous Hazen-Williams Formula determining the mean velocity of flow V and the head loss (hf) in a pipeline are given as follow:-

$$V = 1.318\, C r^{0.63} S^{0.54} \qquad (1)$$

$$hf = \frac{4.72\, Q^{1.852} L}{C^{1.852} D^{4.87}} \qquad (2)$$

Where **C = Hazen-Williams Coefficient**
D = diameter of pipe (ft)
L = length of pipe (ft)
Q = discharge (Cfs)
r = hydraulic radius of pipe (ft)
S = $\frac{H}{1000\, L}$ = Slope of hydraulic gradient
H = head loss (ft) in 1000 ft. of pipe
D = diameter of pipe (in)

Flow measurements show that for new pipe with smooth interior linings the average value of C may be approximately by the formula

$$C = 140 + 0.17d \qquad (3)$$

However, in view of long-term lining deterioration a lower design value is recommended

$$C = 130 + 0.16d \qquad (4)$$

Having established the required diameter on hydraulic and economic factors the wall thickness has to be determined.

When designing for internal pressure, the minimum wall thickness of a pipe should be selected to limit the hoop stress to a certain level. A design stress equals to 50 percent of the specified minimum yield strength is often accepted for steel water pipe

$$T = \frac{Pd}{20s}$$

t = wall thickness (mm)

P = pressure (bar)

D = outside diameter of pipe (mm) (excluding coating thickness)

S = Allowable hoop stress (N/mm²)

For steel pipes manufactured from plates conforming to BS 4360 Grade 43A which has a minimum yield stress of 275 N/mm² the maximum working pressure P_{wmax} based on internal pressure only is :-

$$P_{wmax} = \frac{20\, t\, S}{D}$$

$$= \frac{20 \times t \times 0.5 \times 275}{D}$$

$$= 2750\, \frac{t}{D}\ \text{Bar}$$

And hydraulic test pressure P tmax according to BS3601 - 1987 is :-

$$P_{tmax} = 20 \times t \times 0.8 \times \frac{275}{D}\ \text{Bar}$$

$$= 4400\, \frac{t}{D}\ \text{Bar}$$

A table of recommended maximum working and test pressures based on the above is listed on Page 21 but it should be remembered that these figures are given as guide only and due considerations must be given to other factors like surge, external loading, external pressure in actual design.

Dimension Of Steel Pipes

Outside Diameter of pipe (mm)	Wall thickness (mm)	Cement lining thickness (mm)	APPROXIMATE MASS PER METRE			Maximum test pressure (BAR)	Maximum working pressure (BAR)
			Bare steel shell (KG)	Cement lining (KG)	Bitumen enamel wrapping (KG)		
114.3	3.6	6	9.83	4.42	1.49	70.0	70.0
139.7	3.6	6	12.1	5.53	1.82	70.0	70.0
168.3	3.6	6	14.6	6.77	2.18	70.0	58.8
193.7	4.0	10	18.7	12.8	2.50	70.0	56.8
219.1	4.0	10	21.2	14.6	2.83	70.0	50.2
244.5	4.0	10	23.7	16.5	3.15	70.0	45.0
273.0	4.0	10	26.5	18.6	3.51	64.5	40.3
323.9	4.0	10	31.6	22.3	4.16	54.3	34.0
355.6	4.5	13	39.0	31.6	4.56	55.7	34.8
406.4	4.5	13	44.6	36.4	5.21	48.7	30.5
457.0	5.0	13	55.7	41.1	5.85	48.2	30.1
508.0	5.0	13	62.0	45.9	6.50	43.4	27.1
559.0	6.3	13	85.9	50.5	7.15	49.6	31.0
610.0	6.3	13	93.8	55.3	7.80	45.4	28.4
660.0	6.3	19	102.0	86.9	8.43	42.1	26.3
711.0	6.3	19	109.0	94.0	9.08	39.0	24.4
762.0	6.3	19	117.0	101.0	9.73	36.3	22.7
813.0	7.1	19	141.0	108.0	10.40	38.4	24.0
864.0	7.1	19	150.0	115.0	11.0	36.2	22.6
914.0	7.1	19	159.0	122.0	11.70	34.2	21.4
1016.0	7.1	19	177.0	136.0	13.0	30.7	19.2
1219.0	8.0	19	239.0	164.0	15.6	28.8	18.0
1420.0	8.8	25	306.0	251.0	18.1	27.2	17.0
1626.0	10.0	25	398.5	287.0	20.6	27.0	16.9
1829.0	11.0	25	493.2	323.0	23.2	26.4	16.5
2032.0	12.5	25	622.5	356.0	25.7	27.0	16.9
2235.0	14.2	25	777.7	394.0	28.3	28.0	17.5

Note:

(1) Outside Diameter and wall thickness are based on Table 1 of BS 534 - 1990 and can be varied according to project requirements

(2) The wall thickness given are the minimum considered suitable for general use under normal conditions

(3) Cement lining thickness is based on Table 13 BS 534 - 1990

(4) Mass for bitumen enamel is based on thickness of 3mm as specified by Clause 26.4 of BS 534 - 1990

Steel Pipe Piles

Similar to H-Piles, Pipe Piles are also designed to transfer structural loads through the foundation to soils below. Where H-Piles are typically classified as point bearing, Pipe Piles are most efficient as friction piles. Pipe Piles have substantial surface area that interacts with the surrounding soil to provide great frictional load resistance.

Pipe Piles are also used in conjunction with sheet piles to add lateral stiffness and bending resistance where loads exceed the capacity of sheet piles alone.

The steel pipe piles are manufactured in accordance with British Standards, JIS, DIN, ASTM or other applicable National Standards. The diameter range available is from 100mm to 2500mm. Normal thickness ranges from 5mm to about 38mm or as per specified.

These tubular steel piles are used extensively as foundation piles for high rise buildings, machinery structures, bridges, wharf pier, breakwater berth construction, offshore marine structures and other construction projects.

The pipe piles are normally manufactured from steel plates, which comply with Grade 43 or 50 of BS 4360, SS 41 or 50 of JIS G3101 or St. 44 or St. 52 of DIN 17100 with properties in accordance with the specifications as listed in Table 1.

These steel pipe piles are usually supplied in length of 10 or 12m but longer length of up to 20m can be supplied. We can fabricate a 200 ton capacity rotator-manipulator of our own design that is capable of joining up pipe piles up to 90M length at site by employing automatic submerged arc welding.

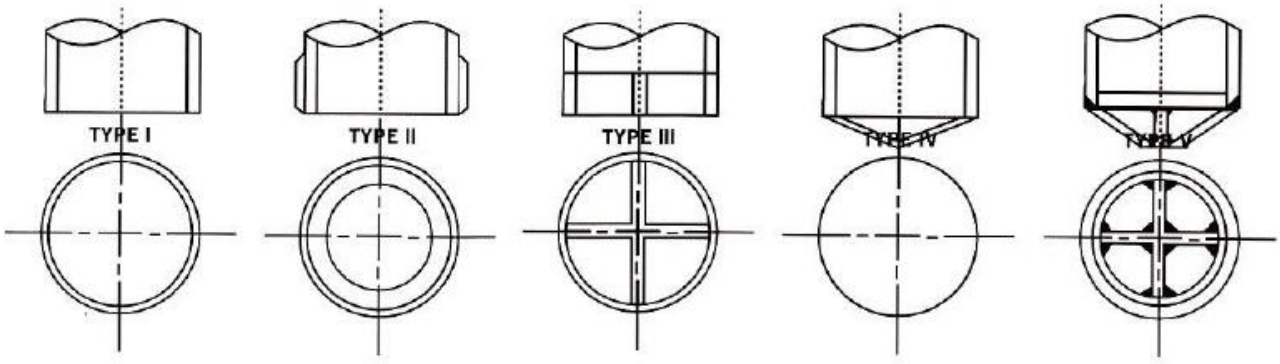
The use of automatic submerged arc welding for pile lengthening at site will ensure consistent good quality welding as factory welding compares with the normal manual arc welding at site. Furthermore there will be a substantial time saving in joining extension piles especially for pipes with thick walls.

The pipe piles are normally supplied bare and uncoated unless otherwise specified. Depending on the client's specification for protection against corrosion, the following can be applied.

Protective Coating Systems:

(a) Coal tar enamel coating with white wash
(b) Slip layer coating to reduce negative friction
(c) Inorganic zinc rich coating followed by epoxy or coal tar epoxy coating systems or polyurethane system
(d) Organic zinc rich coating followed by sealer coats
(e) Or any other coating systems specified by clients or recommended by coating manufacturers

Typical Pile Shoes :



Formula For Section Properties

Unit Weight $W = 0.02466\,(D - t)\,t$ kg/m.

Cross Sectional Area $A = \pi\, t\,(D - t)$ cm²

Bearing Area $A^1 = \frac{\pi D^2}{4}$ cm²

Circumferential Length $CL = \pi D$ m

Modulus of Sectional $Z = \frac{\pi}{32D}(D^4 - d^4)$ cm³

Radius of Gyration $K = \frac{1}{4}\sqrt{D^2 + d^2}$ cm

Moment of Inertia $I = \frac{\pi}{64}(D^4 - d^4)$ cm⁴

TABLE 4 : STEEL PIPES FOR STRUCTURES - SECTION PROPERTIES

OD	Thickness	ID	Unit Weight	Section area	Bearing area	CL	Modulus of Section	Radius of Gyration	Moment of Inertia
D mm (inch)	t (mm)	d (mm)	w (kg/m)	A (cm²)	A^1 (cm²)	(m)	Z (cm³)	K (cm)	I (cm⁴)
254.0	4.5	245.0	28	35.27	506.7	0.798	216.2	8.82	2,746
	6.0	242.0	37	46.75	506.7	0.798	283.2	8.77	3,596
	7.0	240.0	43	54.32	506.7	0.798	326.4	8.74	4,146
304.8	4.5	295.8	33	42.45	729.7	0.958	314.1	10.62	4,787
	6.0	292.8	44	56.32	729.7	0.958	412.6	10.57	6,288
	8.0	288.8	59	74.59	729.7	0.958	539.4	10.50	8,220
355.6	4.5	346.6	39	49.64	993.1	1.117	430.2	12.41	7,650
	6.0	343.6	52	65.90	993.1	1.117	566.4	12.36	10,071
	8.0	339.6	69	87.36	993.1	1.117	742.5	12.29	13,201
406.4	6.0	394.4	59	75.47	1,297.2	1.277	744.5	14.16	15,128
	7.0	392.4	69	87.83	1,297.2	1.277	862.2	14.12	17,519
	8.0	390.4	79	100.13	1,297.2	1.277	978.0	14.09	19,874
	9.0	388.4	88	112.36	1,297.2	1.277	1,092.2	14.05	22,193
457.2	6.0	445.2	67	85.05	1,641.7	1.436	946.9	15.95	21,647
	7.0	443.2	78	99.00	1,641.7	1.436	1,097.5	15.92	25,089
	8.0	441.2	89	112.90	1,641.7	1.436	1,246.0	15.88	28,484
	9.0	439.2	99	126.73	1,641.7	1.436	1,392.6	15.85	31,834
508.0	6.0	496.0	74	94.62	2,026.8	1.596	1,173.7	17.75	29,812
	7.0	494.0	86	110.18	2,026.8	1.596	1,361.2	17.71	34,574
	8.0	492.0	99	125.66	2,026.8	1.596	1,546.5	17.68	39,280
	9.0	490.0	111	141.09	2,026.8	1.596	1,729.5	17.65	43,928
558.8	6.0	546.8	82	104.20	2,452.5	1.756	1,424.8	19.55	39,808
	7.0	544.8	95	121.35	2,452.5	1.756	1,653.3	19.51	46,193
	8.0	542.8	109	138.43	2,452.5	1.756	1,879.3	19.48	52,508
	9.0	540.8	122	155.45	2,452.5	1.756	2,102.8	19.44	58,753
	10.0	538.8	135	172.41	2,452.5	1.756	2,323.9	19.41	64,930
	11.0	536.8	149	189.31	2,452.5	1.756	2,542.5	19.37	71,038
	12.0	534.8	162	206.14	2,452.5	1.756	2,758.7	19.34	77,079
609.6	7.0	595.6	104	132.52	2,918.6	1.915	1,973.7	21.31	60,159
	8.0	593.6	119	151.20	2,918.6	1.915	2,244.6	21.27	68,415
	9.0	591.6	133	169.82	2,918.6	1.915	2,512.7	21.24	76,587
	10.0	589.6	148	188.37	2,918.6	1.915	2,778.1	21.20	84,677

Please feel free to contact us for sizes other than those listed above.

TABLE 4 : STEEL PIPES FOR STRUCTURES - SECTION PROPERTIES

OD	Thickness	ID	Unit Weight	Section area	Bearing area	CL	Modulus of Section	Radius of Gyration	Moment of Inertia
D mm (inch)	t (mm)	d (mm)	w (kg/m)	A (cm^2)	A^1 (cm^2)	(m)	Z (cm^3)	K (cm)	I (cm^4)
609.6	11.0	587.6	162	206.86	2,918.6	1.915	3,040.8	21.17	92,685
	12.0	585.6	177	225.29	2,918.6	1.915	3,300.9	21.13	100,612
660.4	7.0	646.4	113	143.69	3,425.3	2.075	2,322.6	23.10	76,691
	8.0	644.4	129	163.97	3,425.3	2.075	2,642.3	23.07	87,248
	9.0	642.4	145	184.18	3,425.3	2.075	2,959.0	23.03	97,708
	10.0	640.4	160	204.33	3,425.3	2.075	3,272.9	23.00	108,070
	11.0	638.4	176	224.42	3,425.3	2.075	3,583.7	22.96	118,335
	12.0	636.4	192	244.44	3,425.3	2.075	3,891.7	22.93	128,505
711.2	8.0	695.2	139	176.73	3,972.6	2.234	3,072.4	24.86	109,255
	9.0	693.2	156	198.54	3,972.6	2.234	3,441.9	24.83	122,393
	10.0	691.2	173	220.29	3,972.6	2.234	3,808.1	24.79	135,417
	11.0	689.2	190	241.97	3,972.6	2.234	4,171.2	24.76	148,329
	12.0	687.2	207	263.59	3,972.6	2.234	4,531.2	24.72	161,129
762.0	8.0	746.0	149	189.50	4,560.4	2.394	3,535.0	26.66	134,683
	9.0	744.0	167	212.91	4,560.4	2.394	3,961.2	26.62	150,921
	10.0	742.0	185	236.25	4,560.4	2.394	4,383.9	26.59	167,028
	11.0	740.0	204	259.53	4,560.4	2.394	4,803.3	26.55	183,006
	12.0	738.0	222	282.74	4,560.4	2.394	5,219.3	26.52	198,855
812.8	8.0	796.8	159	202.27	5,188.7	2.553	4,030.0	28.46	163,778
	9.0	794.8	178	227.27	5,188.7	2.553	4,517.0	28.42	183,570
	10.0	792.8	198	252.21	5,188.7	2.553	5,000.3	28.39	203,212
	11.0	790.8	217	277.08	5,188.7	2.553	5,480.0	28.35	222,706
	12.0	788.8	237	301.89	5,188.7	2.553	5,956.0	28.32	242,053
863.6	8.0	847.6	169	215.04	5,857.5	2.713	4,557.4	30.25	196,789
	9.0	845.6	190	241.63	5,857.5	2.713	5,109.2	30.22	220,617
	10.0	843.6	210	268.17	5,857.5	2.713	5,657.2	30.18	244,277
	11.0	841.6	231	294.64	5,857.5	2.713	6,201.2	30.15	267,769
	12.0	839.6	252	321.05	5,857.5	2.713	6,741.4	30.11	291,095
	12.7	838.2	266	339.49	5,857.5	2.713	7,117.3	30.09	307,324
914.4	8.0	898.4	179	227.80	6,566.9	2.873	5,117.3	32.05	233,961
	9.0	896.4	201	256.00	6,566.9	2.873	5,738.0	32.01	262,341
	10.0	894.4	223	284.13	6,566.9	2.873	6,354.6	31.98	290,532
	11.0	892.4	245	312.19	6,566.9	2.873	6,967.1	31.94	318,535
	12.0	890.4	267	340.20	6,566.9	2.873	7,575.5	31.91	346,350
	12.7	889.0	282	359.76	6,566.9	2.873	7,998.9	31.88	365,709
965.2	9.0	947.2	212	270.36	7,316.9	3.032	6,403.2	33.81	309,020
	10.0	945.2	236	300.08	7,316.9	3.032	7,092.6	33.77	342,287
	11.0	943.2	259	329.75	7,316.9	3.032	7,777.5	33.74	375,343
	12.0	941.2	282	359.35	7,316.9	3.032	8,458.1	33.70	408,190

Please feel free to contact us for sizes other than those listed above.

TABLE 4 : STEEL PIPES FOR STRUCTURES - SECTION PROPERTIES

OD	Thickness	ID	Unit Weight	Section area	Bearing area	CL	Modulus of Section	Radius of Gyration	Moment of Inertia
D mm (inch)	t (mm)	d (mm)	w (kg/m)	A (cm^2)	A^1 (cm^2)	(m)	Z (cm^3)	K (cm)	I (cm^4)
965.2	12.7	939.8	298	380.03	7,316.9	3.032	8,932.0	33.68	431,058
	13.0	939.2	305	388.89	7,316.9	3.032	9,134.4	33.67	440,828
1,016.0	10.0	996.0	248	316.04	8,107.3	3.192	7,871.1	35.57	399,850
	11.0	994.0	273	347.30	8,107.3	3.192	8,632.5	35.53	438,534
	12.0	992.0	297	378.50	8,107.3	3.192	9,389.5	35.50	476,985
	12.7	990.6	314	400.30	8,107.3	3.192	9,916.6	35.47	503,762
	13.0	990.0	322	409.63	8,107.3	3.192	10,141.8	35.46	515,204
	14.0	988.0	346	440.70	8,107.3	3.192	10,889.6	35.43	553,192
1,066.8	10.0	1,046.8	261	332.00	8,938.3	3.351	8,690.1	37.37	463,529
	11.0	1,044.8	286	364.86	8,938.3	3.351	9,532.2	37.33	508,446
	12.0	1,042.8	312	397.65	8,938.3	3.351	10,369.4	37.30	553,105
	12.7	1,041.4	330	420.57	8,938.3	3.351	10,952.6	37.27	584,214
	13.0	1,040.8	338	430.38	8,938.3	3.351	11,201.9	37.26	597,508
	14.0	1,038.8	363	463.05	8,938.3	3.351	12,029.5	37.23	641,656
1,117.6	10.0	1,097.6	273	347.96	9,809.9	3.511	9,549.7	39.16	533,635
	11.0	1,095.6	300	382.41	9,809.9	3.511	10,476.4	39.13	585,420
	12.0	1,093.6	327	416.80	9,809.9	3.511	11,398.0	39.09	636,922
	12.7	1,092.2	346	440.84	9,809.9	3.511	12,040.2	39.07	672,806
	13.0	1,091.6	354	451.13	9,809.9	3.511	12,314.7	39.06	688,143
	14.0	1,089.6	381	485.39	9,809.9	3.511	13,226.2	39.02	739,082
1,168.4	10.0	1,148.4	286	363.92	10,721.9	3.671	10,449.8	40.96	610,475
	11.0	1,146.4	314	399.97	10,721.9	3.671	11,465.2	40.92	669,796
	12.0	1,144.4	342	435.95	10,721.9	3.671	12,475.3	40.89	728,806
	12.7	1,143.0	362	461.10	10,721.9	3.671	13,179.2	40.86	769,930
	13.0	1,142.4	370	471.87	10,721.9	3.671	13,480.1	40.85	787,509
	14.0	1,140.4	399	507.73	10,721.9	3.671	14,479.7	40.82	845,903
1,219.2	10.0	1,199.2	298	379.88	11,674.5	3.830	11,390.4	42.75	694,359
	11.0	1,197.2	328	417.52	11,674.5	3.830	12,498.6	42.72	761,912
	12.0	1,195.2	357	455.10	11,674.5	3.830	13,601.2	42.68	829,128
	12.7	1,193.8	378	481.37	11,674.5	3.830	14,369.7	42.66	875,979
	13.0	1,193.2	387	492.62	11,674.5	3.830	14,698.3	42.65	896,008
	14.0	1,191.2	416	530.07	11,674.5	3.830	15,789.9	42.61	962,551
1,270.0	11.0	1,248.0	342	435.08	12,667.7	3.990	13,576.5	44.51	862,110
	12.0	1,246.0	372	474.25	12,667.7	3.990	14,775.7	44.48	938,259
	12.7	1,244.6	394	501.64	12,667.7	3.990	15,611.7	44.45	991,345
	13.0	1,244.0	403	513.37	12,667.7	3.990	15,969.1	44.44	1,014,041
	14.0	1,242.0	434	552.42	12,667.7	3.990	17,156.8	44.41	1,089,459
1,371.6	12.0	1,347.6	402	512.56	14,775.6	4.309	17,270.7	48.07	1,184,427
	14.0	1,343.6	469	597.10	14,775.6	4.309	20,061.0	48.00	1,375,782

Please feel free to contact us for sizes other than those listed above.

TABLE 4 : STEEL PIPES FOR STRUCTURES - SECTION PROPERTIES

OD	Thickness	ID	Unit Weight	Section area	Bearing area	CL	Modulus of Section	Radius of Gyration	Moment of Inertia
D mm (inch)	t (mm)	d (mm)	w (kg/m)	A (cm^2)	A^1 (cm^2)	(m)	Z (cm^3)	K (cm)	I (cm^4)
1,371.6	16.0	1,339.6	535	681.40	14,775.6	4.309	22,826.4	47.93	1,565,435
	18.0	1,335.6	601	765.44	14,775.6	4.309	25,567.2	47.86	1,753,397
	20.0	1,331.6	667	849.24	14,775.6	4.309	28,283.4	47.79	1,939,677
1,524.0	12.0	1,500.0	447	570.01	18,241.5	4.788	21,378.1	53.46	1,629,010
	14.0	1,496.0	521	664.13	18,241.5	4.788	24,842.8	53.39	1,893,024
	16.0	1,492.0	595	758.00	18,241.5	4.788	28,279.9	53.32	2,154,928
	18.0	1,488.0	668	851.62	18,241.5	4.788	31,689.4	53.25	2,414,734
	20.0	1,484.0	742	944.99	18,241.5	4.788	35,071.6	53.18	2,672,454
1,625.6	12.0	1,601.6	477	608.31	20,754.7	5.107	24,359.5	57.05	1,979,944
	14.0	1,597.6	556	708.82	20,754.7	5.107	28,314.5	56.98	2,301,402
	16.0	1,593.6	635	809.07	20,754.7	5.107	32,239.8	56.91	2,620,455
	18.0	1,589.6	714	909.08	20,754.7	5.107	36,135.8	56.84	2,937,114
	20.0	1,585.6	792	1,008.83	20,754.7	5.107	40,002.4	56.77	3,251,392
1,778.0	12.0	1,754.0	523	665.77	24,828.7	5.586	29,196.5	62.44	2,595,573
	14.0	1,750.0	609	775.85	24,828.7	5.586	33,947.6	62.37	3,017,943
	16.0	1,746.0	695	885.68	24,828.7	5.586	38,666.2	62.30	3,437,426
	18.0	1,742.0	781	995.26	24,828.7	5.586	43,352.5	62.23	3,854,036
	20.0	1,738.0	867	1,104.58	24,828.7	5.586	48,006.6	62.16	4,267,787
1,879.6	12.0	1,855.6	553	704.07	27,747.3	5.905	32,664.4	66.03	3,069,804
	14.0	1,851.6	644	820.53	27,747.3	5.905	37,986.8	65.96	3,569,998
	16.0	1,847.6	735	936.75	27,747.3	5.905	43,274.7	65.89	4,066,961
	18.0	1,843.6	826	1,052.71	27,747.3	5.905	48,528.5	65.82	4,560,706
	20.0	1,839.6	917	1,168.42	27,747.3	5.905	53,748.1	65.75	5,051,248
1,981.2	12.0	1,957.2	583	742.37	30,828.1	6.224	36,326.9	69.62	3,598,543
	14.0	1,953.2	679	865.22	30,828.1	6.224	42,253.0	69.55	4,185,578
	16.0	1,949.2	775	987.82	30,828.1	6.224	48,142.7	69.48	4,769,018
	18.0	1,945.2	871	1,110.16	30,828.1	6.224	53,996.3	69.41	5,348,876
	20.0	1,941.2	967	1,232.26	30,828.1	6.224	59,813.9	69.34	5,925,168
2,032.0	12.0	2,008.0	598	761.52	32,429.3	6.384	38,231.1	71.42	3,884,280
	14.0	2,004.0	697	887.56	32,429.3	6.384	44,471.2	71.35	4,518,271
	16.0	2,000.0	795	1,013.35	32,429.3	6.384	50,674.0	71.28	5,148,477
	18.0	1,996.0	894	1,138.89	32,429.3	6.384	56,839.7	71.21	5,774,913
	20.0	1,992.0	992	1,264.18	32,429.3	6.384	62,968.5	71.14	6,397,595
2,540.0	12.0	2,516.0	748	953.03	50,670.7	7.980	59,948.5	89.38	7,613,461
	14.0	2,512.0	872	1,110.99	50,670.7	7.980	69,774.6	89.31	8,861,379
	16.0	2,508.0	996	1,268.70	50,670.7	7.980	79,553.9	89.24	10,103,349
	18.0	2,504.0	1119	1,426.16	50,670.7	7.980	89,286.5	89.17	11,339,392
	20.0	2,500.0	1243	1,583.36	50,670.7	7.980	98,972.6	89.10	12,569,525

Please feel free to contact us for sizes other than those listed above.

Applications

CONSTRUCTION
- Water Pipe
- Dewatering & drainage
- Exhaust & intake
- Foundation Piling
- Cassions & tank supports
- Piling

MINING & QUARRYING
- Water Pipe
- Ventilation pipe
- Tailings or Slurry Pipelines
- Sand, gravel & other product lines

DREDGING
- Available in abrasion resistant steel
- Shore pipe
- Sand & gravel conveying lines
- All type of dredging connections

MATERIALS HANDLING
- Sludge lines
- Fly ash disposal pipe
- Pneumatic Conveyors

POLLUTION CONTROL
- Filtration Plant Piping
- Waste Water lines
- Air Purfication pipe

SEWAGE DISPOSAL
- Force mains
- Disposal plant aeration piping
- Siphons
- Sewer by-pass lines

PAPER MILLS
- Stock lines
- Pulp lines
- Vacuum lines
- Hot & cold water lines white water lines
- Ventilating pipe
- Exhaust steam
- Compressed air lines
- Bark, chips & trim disposal

AGRICULTURE
- Surface & underground main lines for irrigation
- Water well casing
- Water supply & dewatering

INDUSTRIAL PLANTS
- Airlines
- Water Supply
- Ventilating lines
- Gas piping and manifolds
- Chimney

PRODUCT COMPONENTS
- Pipe section furnished as component parts of manufactured products
- Structural members

FABRICATIONS
- Standard fittings
- Precision fabrications to met specifications for special or complex layout are available

HYDRO ELECTRIC STATION
- Penstocks for supplying hydro-electric turbines

TELECOMMUNICATION INDUSTRIES
- Pylons for transmission tones / telecommunications

AS PER REQUIREMENT
- Oil and gas
- Land and subsea pipeline
- Water distribution
- Large diameter water mains
- Power Generation
- Cooling Water Intake and Outfalls
- Marine and Civil Construction
- Piling for Jetties Berths and foundation

Steel Pipes Q & A

If you have any questions regarding steel pipes, please contact our Head Office.

Here are some of the most frequently asked questions.

Q : CAN STEEL PIPES BE USED IN "HOT SOILS"?

A : Although the term "hot soils" is relative, steel pipes can be designed for virtually any soil type or condition.

Q : IS THERE A PRESSURE LIMIT TO STEEL PIPE?

A : Steel pipes can be designed to handle a wide range of pressure applications. Steel pipes are used for "gravity" applications as well as pressure operating in excess of 800 psi.

Q : DO I HAVE TO DESIGN MY PIPES ALIGNMENT TO FIT STANDARD DIMENSION FITTINGS SUCH AS 22.5° AND 45° BENDS?

A : No, one of the many great advantages to steel pipes is the ability to design it to a specific project needs. Fittings can be produced to an infinite number of angles or layouts.

Steel Fabrication

With the expertise in steel fabrication for over 40 years, KKB Engineering Berhad has expanded and extended its wing to its subsidiary in Sabah, KKB Industries (Sabah) Sdn Bhd to carry out steel fabrication activities.

KKB Industries (Sabah) Sdn Bhd has invested in a fully automated conveyonised shot blasting equipment to cater for steel structures and products with dimensions of inlet/outlet 2.5m (width) x 0.5m (height).

Activities under this division include all types of steel fabrication and installation of steel structures including piping and storage tanks.

Hot-Dip Galvanising

KKB Industries (Sabah) Sdn Bhd has a galvanizing bath size of 11m (length) x 1.2m (width) x 1.5m (depth) to provide additional services to its steel fabrication activities. It is also fully supported by its Kuching Plant with more than 14 years experience in Hot-Dip Galvanising processes. The Hot-Dip Galvanising activities will be synergistic to its newly established steel fabrication plant and offer a "one-stop" business package.

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