



**Ranhill  
SAJ**

# **SPECIFICATION OF FITTINGS FOR HOT TAPPING WORK**

**MATERIAL REQUIREMENTS**

**SPECIFICATION SAJ OT/ HT/ 001  
(REV 1.0/12.2018)**

QUALITY ASSURANCE DEPARTMENT  
RANHILL SAJ SDN BHD

# Ranhill

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## SAJ SPECIFICATION OF FITTINGS FOR HOT TAPPING WORK

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## SAJ SPECIFICATION OF FITTINGS FOR HOT TAPPING WORK

### 1.0 General

- 1.1 The specification is applicable for hot tapping's fittings.
- 1.2 These specifications will provide necessary information on the product dimension and fabrication for water work purposes.

### 2.0 Material

- 2.1 Two types of hot tapping's fittings:-

Type 1 - Sleeve with welded joint.

Type 2 - Sleeve with bolted joint.

- 2.2 The sleeve shall comply with the requirements of **Table 1** for type 1, sleeve with welded joint.

**Table 1 – Type 1 Component and materials**

Component	Materials	Reference
Flange	Ductile Iron Mild Steel	BS EN 1092-2 BS EN 1092-1
Compensation plate	Mild Steel	BS EN 10025
Short piece	Mild Steel Cement Lining	SPAN TS 21827

- 2.3 For type 2, sleeve shall be ductile iron and others requirements as specified in **Table 2** below.

**Table 2 – Type 2 Component and materials**

Component	Materials	Reference
Flange	Ductile Iron	BS EN 109 2-2
Clamp	Ductile Iron	BS EN 545 :2010
Short piece	Ductile Iron	BS EN 545 :2010
Bolts, screws and nuts, washer	Carbon steel (Hot dip galvanized coated)	BS 4190:2014
Gasket (Top and Bottom)	EPDM	MS 672-1 :2012 MS 672-2 :2012

**2.4 Flanges**

Flanges shall be manufactured from the materials specified in BS EN 1092.

**2.5 Compensation Plate**

The compensation plate shall be made from flat products, seamless rolled, pressed and forged. The manufactured shall be machined from rolled or forged bars and forged sectional steel.

**2.6 Short Piece**

The short piece shall be manufactured from tubes accordance with SPAN TS 21827 and shall be protected against corrosion as specified in Item 3.0.

**2.7 Bolts , screws and nuts and washer**

The bolts, screws and nuts and washer shall be cleanly finished, sound and free from defects and shall be hot dip galvanized coated and chosen according to pressure, temperature, flange material and gasket.

**2.8 Gasket**

Gasket shall be of EPDM formulated for water service and has anti oxidant agents and anti-tired to increase shelf life. This specified requirements shall conform to MS 672 : 2012.

**Table 3 – Physical properties of EPDM compounds**

Properties	Requirements	Requirements for Change in Ageing, max
Thickness, mm , min	6	-
Specific Gravity, g/cm <sup>3</sup>	1.40	-
Tensile Strength, MPa , min	11	20%
Hardness, IRHD	66-75	5
Elongation at break, % , min	200	30%
Compression set at 23±2°C for 70h, %, max	15	-
Compression set at 70±2°C for 22h, %, max	20	-

**3.0 Coating**

- 3.1 All machined surfaces shall be thoroughly cleaned by sand blasting and treated with a protective composition before they become affected by rust.
- 3.2 All fitting shall be coated with heavy duty coating of not less than 350 µm thickness for both internally and externally.

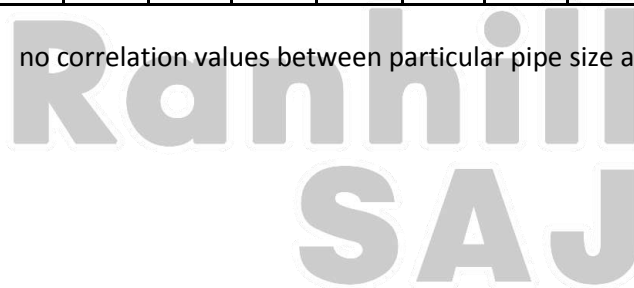
**4.0 Features Required**

4.1 Features required for tapping size with coring, as given in **Table 4** for type 1 and **Table 5** for type 2.

**Table 4- Size of pipe, tapping and coring head for Welded Joint**

Pipe Size (D)-mm	Outlet Branch(d)-mm										
	50	100	150	200	250	300	350	400	450	500	600
	Coring Head Size,min (mm)										
50	46.0										
100	46.0	82.0									
150	46.0	82.0	130.0								
200	46.0	82.0	130.0	180.0							
250	46.0	82.0	130.0	180.0	230.0						
300	46.0	82.0	130.0	180.0	230.0	270.0					
350	46.0	82.0	130.0	180.0	230.0	270.0	320.0				
400	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0			
450	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0		
500	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	
600	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
650	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
700	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
750	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
800	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
850	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
900	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
1000	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0
1200	46.0	82.0	130.0	180.0	230.0	270.0	320.0	350.0	400.0	450.0	550.0

no correlation values between particular pipe size and outlet branch



**Table 5 - Size of pipe, tapping and coring head for Bolted Joint**

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)															
		50				100				150				200			
		DI	UPV C	HDP E	AC	DI	UPV C	HDP E	AC	DI	UPV C	HDP E	AC	DI	C	HDP E	AC
50	DI	46	46	46													
	UPVC	46	46	46													
	HDPE	46	46	46													
	AC																
60	DI	46	46	46													
	UPVC																
	HDPE																
	AC																
63	DI																
	UPVC																
	HDPE	46	46	46													
	AC																
65	DI	46	46	46													
	UPVC	46	46	46													
	HDPE																
	AC																
73	DI																
	UPVC																
	HDPE	46	46	46													
	AC																
80	DI	46	46	46													
	UPVC	46	46	46													
	HDPE																
	AC																
90	DI																
	UPVC																
	HDPE	46	46	46													
	AC																
100	DI	46	46	46		82	82	82	82								
	UPVC	46	46	46		82	82	82	82								
	HDPE																
	AC	46	46	46		82	82	82	82								
110	DI																
	UPVC																
	HDPE	46	46	46		82	82		82								
	AC																
125	DI	46	46	46		82	82		82								
	UPVC	46	46	46		82	82		82								
	HDPE	46	46	46		82	82		82								
	AC																
140	DI																
	UPVC																
	HDPE	46	46	46													
	AC																
150	DI	46	46	46		82			82	130						130	
	UPVC																
	HDPE																
	AC					82	82		82	130						130	
155	DI																
	UPVC	46	46	46		82	82		82	130						130	
	HDPE																
	AC																
160	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130						130	
	AC																

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)															
		50				100				150				200			
		DI	UPVC	HDP E	AC	DI	UPVC	HDP E	AC	DI	UPVC	HDP E	AC	DI	UPVC	HDP E	AC
175	DI																
	UPVC	46	46	46		82	82		82	130			130				
	HDPE																
	AC																
180	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130				
	AC									130			130				
200	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC	46	46	46		82	82		82	130			130	180	180	180	180
225	DI																
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
250	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE	46	46	46		82	82		80	130			130	180	180	180	180
	AC					82	82		82	130			130	180	180	180	180
280	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
300	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE																
	AC					82	82		82	130			130	180	180	180	180
315	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
350	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE																
	AC					82	82		82	130			130	180	180	180	180
355	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
375	DI																
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE																
	AC																
400	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC	46	46	46		82	82		82	130			130	180	180	180	180
450	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC					82	82		82	130			130	180	180	180	180
500	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC	46	46	46		82	82		82	130			130	180	180	180	180



Pipe Size,D (mm)	Type of pipe	Outlet Branch,d (mm)															
		50				100				150				200			
		DI	UPVC	HDP E	AC	DI	UPVC	HDP E	AC	DI	UPV C	HDP E	AC	DI	UP VC	HDPE	AC
560	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
575	DI																
	UPVC	46	46	46		82	82		82	130			130	180	180	180	180
	HDPE																
	AC																
600	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC	46	46	46		82	82		82	130			130	180	180	180	180
630	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
700	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC																
710	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
800	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
900	DI																
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
1000	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC																
1100	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC																
1200	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
1400	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																
1500	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC																
1600	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE	46	46	46		82	82		82	130			130	180	180	180	180
	AC																

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)															
		50				100				150				200			
		DI	UPVC	HDPE	AC	DI	UPVC	HDPE	AC	DI	UPVC	HDPE	AC	DI	UPVC	HDPE	AC
1800	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC																
2000	DI	46	46	46		82	82		82	130			130	180	180	180	180
	UPVC																
	HDPE																
	AC																

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)															
		250				300				350				400			
		DI	UPVC	HDPE	AC	DI	UPVC	HDPE	AC	DI	UPVC	HDPE	AC	DI	UPVC	HDPE	AC
250	DI	230	230	230	230												
	UPVC	230	230	230	230												
	HDPE	230	230	230	230												
	AC	230	230	230	230												
280	DI																
	UPVC																
	HDPE	230	230	230	230												
	AC																
300	DI	230	230	230	230	270	270		270								
	UPVC	230	230	230	230	270	270		270								
	HDPE																
	AC	230	230	230	230	270	270		270								
315	DI																
	UPVC																
	HDPE	230	230	230	230	270	270		270								
	AC																
350	DI	230	230	230	230	270	270		270								
	UPVC	230	230	230	230	270	270		270								
	HDPE																
	AC	230	230	230	230	270	270		270								
355	DI																
	UPVC																
	HDPE	230	230	230	230	270	270		270								
	AC																
375	DI																
	UPVC	230	230	230	230	270	270		270								
	HDPE																
	AC																
400	DI	230	230	230	230	270	270		270				350	350	350	350	350
	UPVC	230	230	230	230	270	270		270				350	350	350	350	350
	HDPE	230	230	230	230	270	270		270				350	350	350	350	350
	AC	230	230	230	230	270	270		270				350	350	350	350	350
450	DI	230	230	230	230	270	270		270				350	350	350	350	350
	UPVC	230	230	230	230	270	270		270				350	350	350	350	350
	HDPE	230	230	230	230	270	270		270				350	350	350	350	350
	AC	230	230	230	230	270	270		270				350	350	350	350	350
500	DI	230	230	230	230	270	270		270				350	350	350	350	350
	UPVC	230	230	230	230	270	270		270				350	350	350	350	350
	HDPE	230	230	230	230	270	270		270				350	350	350	350	350
	AC	230	230	230	230	270	270		270				350	350	350	350	350

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)															
		250				300				350				400			
		DI	UPVC	HDP E	AC	DI	UPVC	HDP E	AC	DI	PVC	HD PE	AC	DI	UP VC	HDPE	AC
560	DI																
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
575	DI																
	UPVC	230	230	230	230	270	270		270					350	350	350	350
	HDPE																
	AC																
600	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE																
	AC	230	230	230	230	270	270		270					350	350	350	350
630	DI																
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
700	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE																
	AC																
710	DI																
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
800	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
900	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
1000	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
1100	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE																
	AC																
1200	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
1400	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																
1500	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE																
	AC																
1600	DI	230	230	230	230	270	270		270					350	350	350	350
	UPVC																
	HDPE	230	230	230	230	270	270		270					350	350	350	350
	AC																

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)																
		250				300				350				400				
		DI	UPVC	HDP E	AC	DI	UP VC	HDPE	AC	DI	UP VC	HDP E	AC	DI	UP VC	HDP E	AC	
180	DI	230	230	230	230	270	270		270						350	350	350	350
	UPVC																	
	HDPE																	
	AC																	
200	DI	230	230	230	230	270	270		270						350	350	350	350
	UPVC																	
	HDPE																	
	AC																	

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)															
		450				500				600							
		DI	UP VC	HDP E	AC	DI	UPV C	HDP E	AC	DI	UPVC	HDPE	AC				
450	DI	400	4000	400	400												
	UPVC	400	4000	400	400												
	HDPE	400	4000	400	400												
	AC	400	4000	400	400												
500	DI	400	4000	400	400	450		450	450								
	UPVC	400	4000	400	400	450		450	450								
	HDPE	400	4000	400	400	450		450	450								
	AC	400	4000	400	400	450		450	450								
560	DI																
	UPVC																
	HDPE	400	4000	400	400	450		450	450								
	AC																
575	DI																
	UPVC	400	4000	400	400	450		450	450								
	HDPE																
	AC																
600	DI	400	4000	400	400	450		450	450	550							550
	UPVC																
	HDPE																
	AC	400	4000	400	400	450		450	450	550							550
630	DI																
	UPVC																
	HDPE	400	4000	400	400	450		450	450	550							550
	AC																
700	DI	400	4000	400	400	450		450	450	550							550
	UPVC																
	HDPE																
	AC																
710	DI																
	UPVC																
	HDPE	400	4000	400	400	450		450	450	550							550
	AC																
800	DI	400	4000	400	400	450		450	450	550							550
	UPVC																
	HDPE	400	4000	400	400	450		450	450	550							550
	AC																
900	DI	400	4000	400	400	450		450	450	550							550
	UPVC																
	HDPE																
	AC																

Pipe Size, D (mm)	Type of pipe	Outlet Branch, d (mm)											
		450				500				600			
		DI	UPVC	HDPE	AC	DI	V C	HDPE	AC	DI	PVC	HDP E	AC
1000	DI	400	4000	400	400	450		450	450	550			550
	UPVC												
	HDPE	400	4000	400	400	450		450	450	550			550
	AC												
1100	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550
1200	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550
1400	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550
1500	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550
1600	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550
1800	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550
2000	DI	400	4000	400	400	450		450	450	550			550
	UPVC	400	4000	400	400	450		450	450	550			550
	HDPE	400	4000	400	400	450		450	450	550			550
	AC	400	4000	400	400	450		450	450	550			550

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4.2 The size and dimension s of bolt and washer for flange shall conform to BS EN 1092 and BS 4190:2014. These details are suitable for hot tapping’s fittings type 2 as shown in **Table 6**.

**Table 6 – The Sizes of bolt and washer**

NORMAL SIZE (mm)	NO. OF BOLT PER SET	NOMINAL SIZE OF BOLT	WIDTH ACROSS FLATS, s (mm)		HEIGHT OF HEAD, k		WASHER FACE DIA METER, min (mm)	THICKNESS OF WASHER, max (mm)
			Max.	Min.	Max.	Min.		
100	8	M16	24.00	23.16	10.45	9.55	22.0	0.8
150	8	M20	30.00	29.16	13.90	12.10	27.7	0.8
200	8	M20	30.00	29.16	13.90	12.10	27.7	0.8
250	12	M20	30.00	29.16	13.90	12.10	27.7	0.8
300	12	M20	30.00	29.16	13.90	12.10	27.7	0.8
350	16	M20	30.00	29.16	13.90	12.10	27.7	0.8
400	16	M24	36.00	35.00	15.90	14.10	33.2	*
450	20	M24	36.00	35.00	15.90	14.10	33.2	*
500	20	M24	36.00	35.00	15.90	14.10	33.2	0.8
600	20	M27	41.00	40.00	17.90	16.10	*	0.8
700	24	M27	41.00	40.00	17.90	16.10	*	*
800	24	M30	46.00	45.00	20.05	17.95	42.7	0.8
900	28	M30	46.00	45.00	20.05	17.95	42.7	0.8
1000	28	M33	50.00	49.00	22.05	19.95	*	*
1100	32	M33	50.00	49.00	22.05	19.95	*	*
1200	32	M36	55.00	53.80	24.05	21.95	51.1	*
1400	36	M39	60.00	58.80	26.05	23.95	*	*
1500	36	M39	60.00	58.80	26.05	23.95	*	*
1600	40	M45	70.00	68.80	29.05	26.95	*	*

(\* ) For other sizes of washer shall be provided by the manufacturer



4.3 The thickness of plate equal to the thickness of pipe. The minimum thickness of plate for type 1 shall be 6.4mm. There are two (2) ways to determine the type of sleeve with welded joint that will be used,

- If branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used.
- If branch ratio,  $d/D \leq 0.50$ , compensation plate shall be used.

(William Jarvis, Williamson Industries Inc.)

4.4 **Table 7** mentioned the dimensions of compensation plate for Type 1, sleeve with welded joint.

**Table 7 – Dimensions of Compensation Plate**

For size, d=50mm to 100mm

Pipe size, D (mm)	Thickness of Plate, t (mm)	Outlet Branch, d (mm)							
		50		65		80		1 00	
		S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>
50	6.4	<sup>1</sup> 78.575	100						
65	6.4	<sup>1</sup> 102.148	100	<sup>1</sup> 102.148	130				
80	6.4	<sup>1</sup> 125.720	100	<sup>1</sup> 125.720	130	<sup>1</sup> 125.720	160		
100	6.4	<sup>1</sup> 157.150	100	<sup>1</sup> 157.150	130	<sup>1</sup> 157.150	160	<sup>1</sup> 157.150	200
125	6.4	<sup>1</sup> 196.438	100	<sup>1</sup> 196.438	130	<sup>1</sup> 196.438	160	<sup>1</sup> 196.438	200
150	6.4	<sup>1</sup> 235.725	100	<sup>1</sup> 235.725	130	<sup>1</sup> 235.725	160	<sup>1</sup> 235.725	200
200	6.4	<sup>1</sup> 314.300	100	<sup>1</sup> 314.300	130	<sup>1</sup> 314.300	160	<sup>1</sup> 314.300	200
250	6.4	<sup>1</sup> 392.875	100	<sup>1</sup> 392.875	130	<sup>1</sup> 392.875	160	<sup>1</sup> 392.875	200
300	6.4	<sup>1</sup> 471.450	100	<sup>1</sup> 471.450	130	<sup>1</sup> 471.450	160	<sup>1</sup> 471.450	200
350	6.4	<sup>1</sup> 550.025	100	<sup>1</sup> 550.025	130	<sup>1</sup> 550.025	160	<sup>1</sup> 550.025	200
400	6.4	<sup>1</sup> 628.600	100	<sup>1</sup> 628.600	130	<sup>1</sup> 628.600	160	<sup>1</sup> 628.600	200
450	6.4	<sup>1</sup> 707.175	100	<sup>1</sup> 707.175	130	<sup>1</sup> 707.175	160	<sup>1</sup> 707.175	200
500	6.4	<sup>1</sup> 785.750	100	<sup>1</sup> 785.750	130	<sup>1</sup> 785.750	160	<sup>1</sup> 785.750	200
600	6.4	<sup>1</sup> 942.900	100	<sup>1</sup> 942.900	130	<sup>1</sup> 942.900	160	<sup>1</sup> 942.900	200
650	6.4	<sup>1</sup> 1021.475	100	<sup>1</sup> 1021.475	130	<sup>1</sup> 1021.475	160	<sup>1</sup> 1021.475	200
700	6.4	<sup>1</sup> 1100.050	100	<sup>1</sup> 1100.050	130	<sup>1</sup> 1100.050	160	<sup>1</sup> 1100.050	200
750	6.4	<sup>1</sup> 1178.625	100	<sup>1</sup> 1178.625	130	<sup>1</sup> 1178.625	160	<sup>1</sup> 1178.625	200
800	7.1	<sup>1</sup> 1257.200	100	<sup>1</sup> 1257.200	130	<sup>1</sup> 1257.200	160	<sup>1</sup> 1257.200	200
850	7.1	<sup>1</sup> 1335.775	100	<sup>1</sup> 1335.775	130	<sup>1</sup> 1335.775	160	<sup>1</sup> 1335.775	200
900	8.0	<sup>1</sup> 1414.350	100	<sup>1</sup> 1414.350	130	<sup>1</sup> 1414.350	160	<sup>1</sup> 1414.350	200
1000	8.0	<sup>1</sup> 1571.500	100	<sup>1</sup> 1571.500	130	<sup>1</sup> 1571.500	160	<sup>1</sup> 1571.500	200
1200	10.0	<sup>1</sup> 1885.800	100	<sup>1</sup> 1885.800	130	<sup>1</sup> 1885.800	160	<sup>1</sup> 1885.800	200
1400	10.0	<sup>1</sup> 2200.100	100	<sup>1</sup> 2200.100	130	<sup>1</sup> 2200.100	160	<sup>1</sup> 2200.100	200
1600	11.0	<sup>1</sup> 2514.400	100	<sup>1</sup> 2514.400	130	<sup>1</sup> 2514.400	160	<sup>1</sup> 2514.400	200

Note: 1) <sup>1</sup> if branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used

2) <sup>1</sup> the value of S shall be 2S

For size, d=125mm to 250mm

Pipe size, D (mm)	Thickness of Plate, t (mm)	Outlet Branch, d (mm)							
		125		150		200		2 50	
		s	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>
125	6.4	<sup>1</sup> 196.438	250						
150	6.4	<sup>1</sup> 235.725	250	<sup>1</sup> 235.725	300				
200	6.4	<sup>1</sup> 314.300	250	<sup>1</sup> 314.300	300	<sup>1</sup> 314.300	400		
250	6.4	<sup>1</sup> 392.875	250	<sup>1</sup> 392.875	300	<sup>1</sup> 392.875	400	<sup>1</sup> 392.875	500
300	6.4	<sup>1</sup> 471.450	250	<sup>1</sup> 471.450	300	<sup>1</sup> 471.450	400	<sup>1</sup> 471.450	500
350	6.4	<sup>1</sup> 550.025	250	<sup>1</sup> 550.025	300	<sup>1</sup> 550.025	400	<sup>1</sup> 550.025	500
400	6.4	<sup>1</sup> 628.600	250	<sup>1</sup> 628.600	300	<sup>1</sup> 628.600	400	<sup>1</sup> 628.600	500
450	6.4	<sup>1</sup> 707.175	250	<sup>1</sup> 707.175	300	<sup>1</sup> 707.175	400	<sup>1</sup> 707.175	500
500	6.4	<sup>1</sup> 785.750	250	<sup>1</sup> 785.750	300	<sup>1</sup> 785.750	400	<sup>1</sup> 785.750	500
600	6.4	<sup>1</sup> 942.900	250	<sup>1</sup> 942.900	300	<sup>1</sup> 942.900	400	<sup>1</sup> 942.900	500
650	6.4	<sup>1</sup> 1021.475	250	<sup>1</sup> 1021.475	300	<sup>1</sup> 1021.475	400	<sup>1</sup> 1021.475	500
700	6.4	<sup>1</sup> 1100.050	500	<sup>1</sup> 1100.050	600	<sup>1</sup> 1100.050	700	<sup>1</sup> 1100.050	800

750	6.4	1178.625	500	1178.625	600	1178.625	700	1178.625	800
800	7.1	1257.200	500	1257.200	600	1257.200	700	1257.200	800
850	7.1	1335.775	500	1335.775	600	1335.775	700	1335.775	800
900	8.0	1414.350	500	1414.350	600	1414.350	700	1414.350	800
1000	8.0	1571.500	500	1571.500	600	1571.500	700	1571.500	800
1200	10.0	1885.800	500	1885.800	600	1885.800	700	1885.800	800
1400	10.0	2200.100	500	2200.100	600	2200.100	700	2200.100	800
1600	11.0	2514.400	500	2514.400	600	2514.400	700	2514.400	800

Note: 1) <sup>1</sup> if branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used  
 2) <sup>1</sup> the value of S shall be 2S

For size, d=300mm to 450mm									
Pipe size, D (mm)	Thickness of Plate, t (mm)	Outlet Branch, d (mm)							
		300		350		400		450	
		s	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>
300	6.4	<sup>1</sup> 471.450	600						
350	6.4	<sup>1</sup> 550.025	600	<sup>1</sup> 550.025	700				
400	6.4	<sup>1</sup> 628.600	600	<sup>1</sup> 628.600	700	<sup>1</sup> 628.600	800		
450	6.4	<sup>1</sup> 707.175	600	<sup>1</sup> 707.175	700	<sup>1</sup> 707.175	800	<sup>1</sup> 707.175	900
500	6.4	<sup>1</sup> 785.750	600	<sup>1</sup> 785.750	700	<sup>1</sup> 785.750	800	<sup>1</sup> 785.750	900
600	6.4	<sup>1</sup> 942.900	600	<sup>1</sup> 942.900	700	<sup>1</sup> 942.900	800	<sup>1</sup> 942.900	900
650	6.4	<sup>1</sup> 1021.475	600	<sup>1</sup> 1021.475	700	<sup>1</sup> 1021.475	800	<sup>1</sup> 1021.475	900
700	6.4	<sup>1</sup> 1100.050	600	<sup>1</sup> 1100.050	700	<sup>1</sup> 1100.050	800	<sup>1</sup> 1100.050	900
750	6.4	<sup>1</sup> 1178.625	600	<sup>1</sup> 1178.625	700	<sup>1</sup> 1178.625	800	<sup>1</sup> 1178.625	900
800	7.1	<sup>1</sup> 1257.200	600	<sup>1</sup> 1257.200	700	<sup>1</sup> 1257.200	800	<sup>1</sup> 1257.200	900
850	7.1	<sup>1</sup> 1335.775	600	<sup>1</sup> 1335.775	700	<sup>1</sup> 1335.775	800	<sup>1</sup> 1335.775	900
900	8.0	<sup>1</sup> 1414.350	600	<sup>1</sup> 1414.350	700	<sup>1</sup> 1414.350	800	<sup>1</sup> 1414.350	900
1000	8.0	<sup>1</sup> 1571.500	600	<sup>1</sup> 1571.500	700	<sup>1</sup> 1571.500	800	<sup>1</sup> 1571.500	900
1200	10.0	<sup>1</sup> 1885.800	600	<sup>1</sup> 1885.800	700	<sup>1</sup> 1885.800	800	<sup>1</sup> 1885.800	900
1400	10.0	<sup>1</sup> 2200.100	600	<sup>1</sup> 2200.100	700	<sup>1</sup> 2200.100	800	<sup>1</sup> 2200.100	900
1600	11.0	<sup>1</sup> 2514.400	600	<sup>1</sup> 2514.400	700	<sup>1</sup> 2514.400	800	<sup>1</sup> 2514.400	900

Note: 1) <sup>1</sup> if branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used  
 2) <sup>1</sup> the value of S shall be 2S

For size, d=500mm to 700mm									
Pipe size, D (mm)	Thickness of Plate, t (mm)	Outlet Branch, d (mm)							
		500		600		650		700	
		s	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>
500	6.4	<sup>1</sup> 785.750	1000						
600	6.4	<sup>1</sup> 942.900	1000	<sup>1</sup> 942.900	1200				
650	6.4	<sup>1</sup> 1021.475	1000	<sup>1</sup> 1021.475	1200	<sup>1</sup> 1021.475	1300		
700	6.4	<sup>1</sup> 1100.050	1000	<sup>1</sup> 1100.050	1200	<sup>1</sup> 1100.050	1300	<sup>1</sup> 1100.050	1400
750	6.4	<sup>1</sup> 1178.625	1000	<sup>1</sup> 1178.625	1200	<sup>1</sup> 1178.625	1300	<sup>1</sup> 1178.625	1400
800	7.1	<sup>1</sup> 1257.200	1000	<sup>1</sup> 1257.200	1200	<sup>1</sup> 1257.200	1300	<sup>1</sup> 1257.200	1400
850	7.1	<sup>1</sup> 1335.775	1000	<sup>1</sup> 1335.775	1200	<sup>1</sup> 1335.775	1300	<sup>1</sup> 1335.775	1400
900	8.0	<sup>1</sup> 1414.350	1000	<sup>1</sup> 1414.350	1200	<sup>1</sup> 1414.350	1300	<sup>1</sup> 1414.350	1400
1000	8.0	<sup>1</sup> 1571.500	1000	<sup>1</sup> 1571.500	1200	<sup>1</sup> 1571.500	1300	<sup>1</sup> 1571.500	1400
1200	10.0	<sup>1</sup> 1885.800	1000	<sup>1</sup> 1885.800	1200	<sup>1</sup> 1885.800	1300	<sup>1</sup> 1885.800	1400
1400	10.0	<sup>1</sup> 2200.100	1000	<sup>1</sup> 2200.100	1200	<sup>1</sup> 2200.100	1300	<sup>1</sup> 2200.100	1400
1600	11.0	<sup>1</sup> 2514.400	1000	<sup>1</sup> 2514.400	1200	<sup>1</sup> 2514.400	1300	<sup>1</sup> 2514.400	1400

Note: 1) <sup>1</sup> if branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used  
 2) <sup>1</sup> the value of S shall be 2S



For size, d=750mm to 900mm									
Pipe size, D (mm)	Thickness of Plate, t (mm)	Outlet Branch, d (mm)							
		750		800		850		900	
		S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>	SS	L <sub>min</sub>
750	6.4	<sup>1</sup> 11788.625	1500						
800	7.1	<sup>1</sup> 12577.200	1500	<sup>1</sup> 1257.200	1600				
850	7.1	<sup>1</sup> 13355.775	1500	<sup>1</sup> 1335.775	1600	<sup>1</sup> 1335.775	1700		
900	8.0	<sup>1</sup> 14144.350	1500	<sup>1</sup> 1414.350	1600	<sup>1</sup> 1414.350	1700	<sup>1</sup> 14144.350	1800
1000	8.0	<sup>1</sup> 15711.500	1500	<sup>1</sup> 1571.500	1600	<sup>1</sup> 1571.500	1700	<sup>1</sup> 15711.500	1800
1200	10.0	1885.800	1500	1885.800	1600	<sup>1</sup> 1885.800	1700	<sup>1</sup> 1885.800	1800
1400	10.0	2200.100	1500	2200.100	1600	2200.100	1700	2200.100	1800
1600	11.0	2514.400	1500	2514.400	1600	2514.400	1700	2514.400	1800

Note: 1) <sup>1</sup> if branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used  
 2) <sup>1</sup> the value of S shall be 2S

For size, d=1000mm to 1600mm									
Pipe size, D (mm)	Thickness of Plate, t (mm)	Outlet Branch, d (mm)							
		1000		1200		1400		1600	
		S	L <sub>min</sub>	S	L <sub>min</sub>	S	L <sub>min</sub>	SS	L <sub>min</sub>
1000	8.0	<sup>1</sup> 15711.500	2000						
1200	10.0	<sup>1</sup> 1885.800	2000	<sup>1</sup> 1885.800	2400				
1400	10.0	<sup>1</sup> 2200.100	2000	<sup>1</sup> 2200.100	2400	<sup>1</sup> 2200.100	2800		
1600	11.0	2514.400	2000	<sup>1</sup> 2514.400	2400	<sup>1</sup> 2514.400	2800	<sup>1</sup> 25144.400	3200

Note: 1) <sup>1</sup> if branch ratio,  $0.50 < d/D \leq 1.00$ , split sleeve shall be used  
 2) <sup>1</sup> the value of S shall be 2S

4.5 The dimensions of height, h of short piece as shown in Table 8 and figure 1.

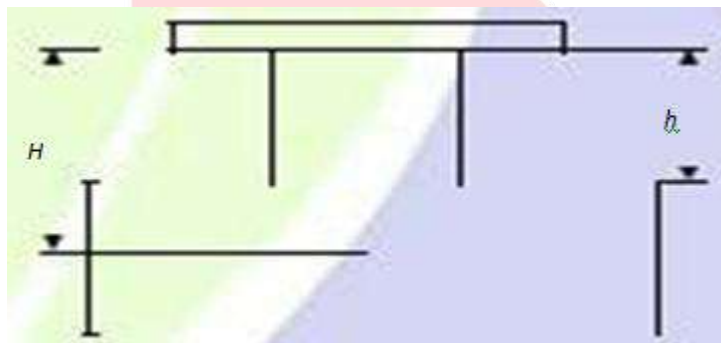


Figure 1 – Short piece diagram.

Table 8 – Short piece dimensions for values of h.

H	h	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
100	210																	
150	215	215																
200	210	210	210															
250	210	175	265	265														
300	220	220	270	270														
350	205	205	255	255	265	305												
400	210	210	280	280	265	310	310											
450	*	205	255	255	265	305	305	305										
500	*	230	260	260	265	310	310	310	310									
550	*	210	260	260	260	310	310	310	310	310								
600	*	210	*	*	260	310	400	310	310	310	*							
650	*	*	*	*	*	*	*	*	*	*	*	*	*					
700	*	*	*	*	*	*	*	*	*	*	*	*	*	*				
750	*	*	*	*	*	*	*	*	*	*	*	325	*	*	*			
800	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
850	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

900	*	*	*	*	*	*	*	*	*	*	325	*	*	*	*	*	*
950	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1000	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	325
1050	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	325
1200	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	325
1350	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	325
1500	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	325

H	h	950	1000	1050	1200	1250	1300	1350	1400	1450	1500	1550	1600
1650	*	*	*	*	491.7	*	*	*	*	*	*	*	*
1800	*	*	*	*	475.0	*	*	*	*	*	*	*	*
2100	*	*	*	*	*	*	*	*	*	*	591.7	*	*
2250	*	*	*	*	*	*	*	*	*	*	591.7	*	*
2400	*	*	*	*	*	*	*	*	*	*	591.7	*	*

(\* ) For other sizes and outlets, h values shall be provided by the manufacturer..

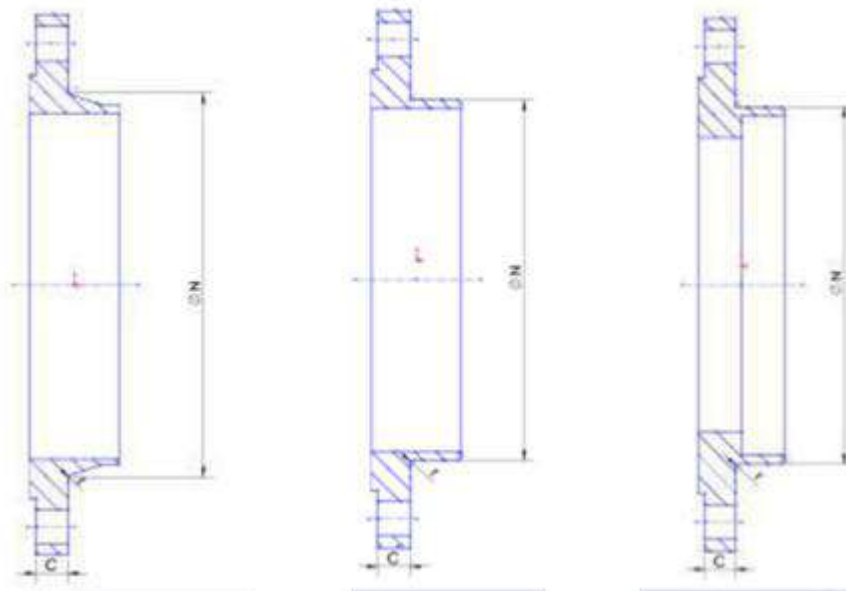


Figure 2 – Dimensions of flange

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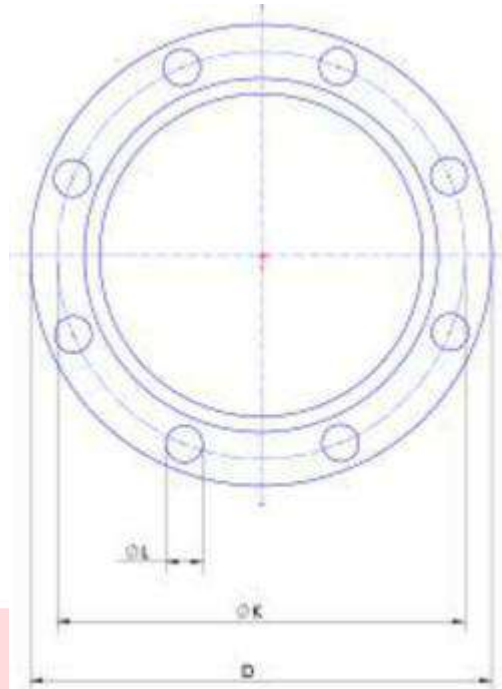


Figure 3 – The diagram illustrates

- 4.6 For details of sleeve with bolted joint, type 2 as shown in Table 8 (see **Figure 2** and **Figure 3**). For **Figure 3**, the diagram illustrates the arrangement but not necessarily the correct number of bolt holes; refer to dimensions of sleeve type 2, sleeve with bolted joint, **Table 9** for the actual number.

Table 9 – The dimensions of sleeve type 2

Nominal Diameter of Pipe, <i>d</i> (mm)	Outside diameter of Flange, <i>D</i> (mm)	Diameter of Bolt Circle, <i>K</i> (mm)	Diameter of Bolt Hole, <i>L</i> (mm)	Flange Thickness, <i>C</i> (mm)	Neck Diameter, <i>N</i> (mm)	Corner Radius, <i>r</i> (mm)
50				19.0	84	5
100	220	180	19	19.0	140	6
150	285	240	23	19.0	190	8
200	340	295	23	20.0	246	8
250	400	355	28	22.0	296	10
300	455	410	28	24.5	350	10
350	520	470	28	26.5	410	10
400	580	525	31	28.0	458	10
450	640	585	31	30.0	516	12
500	715	650	34	31.5	576	12
600	840	770	37	36.0	690	12
700	910	840	37	39.5	760	12
800	1025	950	41	43.0	862	12
900	1125	1050	41	46.5	962	12
1000	1255	1170	44	50.0	1076	12
1200	1485	1390	50	57.0	1282	12
1400	1685	1590	50	60.0	1482	12
1600	1930	1820	57	65.0	1696	12

## 5.0 Design and Dimension

- 5.1 Refer to SAJ's Standard Drawing number SAJ/STD/HT/01 and SAJ/STD/HT/02.
- 5.2 The dimensions of bolts and nuts shall be as specified with track head, or similar neck which located in similarly shaped hole in the sleeve body, thus preventing rotation of the bolts and permitting tightening of the bolts using only one spanner. Refer **Table 6**.

## 6.0 Tests and Inspection

- 6.1 All hot tapping fitting shall comply with tests in accordance with the requirements of specification.
- 6.2 For inspection and testing, the tests shall be carried out by the manufacturer in accordance with their own procedures.
- 6.3 Leakage test and pressure test shall be carried out at site by the contractor with witnessed by SAJ's personnel.

## 7.0 Mandatory Marking

Each set shall have the following markings in raised letters of minimum 50mm high cast on the body.

- a) The Manufacturer's name and trade mark
- b) The year of manufacture (last two digits)
- c) The body material identification
- d) Made in Malaysia
- e) Lettering "SAJ"

## 8.0 Packing

All hot tapping's fitting shall be individually plastic wrapped and protected from damage during transit.

## 9.0 Delivery Inspection and Evaluation

- a) It is the responsibility of the tenderer to inform SAJ for inspection purposes during manufacturing and before delivery
- b) SAJ reserve the right to inspect and witness the testing of product offered.
- c) At anytime, when requested, the supplier shall provide SAJ a sample of the product offered for evaluation purposes. All costs shall be borne by the supplier.
- d) If at any time the supplier fails to deliver the required sample, the products is deemed fail to meet the specifications.