

## Guideline (not under Configuration Control)

# Appendix 11 Standard Pipe and Pipe Fitting Dimensions

Dimensions of standard pipe and pipe fittings for use on ITER vacuum systems. Includes weld bevel for weld preparation.

Approval Process			
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<i>Change Log</i>			
<b>Appendix 11 Standard Pipe and Pipe Fitting Dimensions (2E5PJK)</b>			
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v1.0	In Work	27 Aug 2008	
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v3.0	Approved	19 Jul 2017	Tables 4, 4-a & 4-b added. Reference [4] added. Text modified appropriately.

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# **ITER Vacuum Handbook**

## **Appendix 11**

### **Standard Vacuum Pipe and Pipe Fitting Dimensions for the ITER Project**

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## 11 Introduction

The IO vacuum pipework systems are designed and constructed to the ASME B31.3 (2010) designated for fluid cat. (M) and NF EN13480 codes.

Pipe and pipefittings (tees, elbows etc.) for use on the IO vacuum systems shall meet the technical requirements as specified in the Technical Specifications [1].

### 11.1 Scope

The scope of this document is to detail the dimensions for standard pipe and pipefittings (tees, elbows etc.) for use on the IO vacuum systems and to define the weld preparation to be used in fabrication of IO vacuum pipework systems.

The use of pipe and/or pipefittings with dimensions not listed in this document requires *acceptance* [2].

### 11.2 Dimensions

#### 11.2.1 Standard Pipe

Standard pipe dimensions for use on IO vacuum systems that comply with dimensions as specified in [3] are synopsized in Tables 1, 2, 3.

Standard pipe dimensions for use on IO vacuum systems that comply with dimensions as specified in [4] are synopsized in Table 4 with “Outer Diameter Tolerances” and “Wall Thickness Tolerances” specified in Tables 4-a and 4-b.

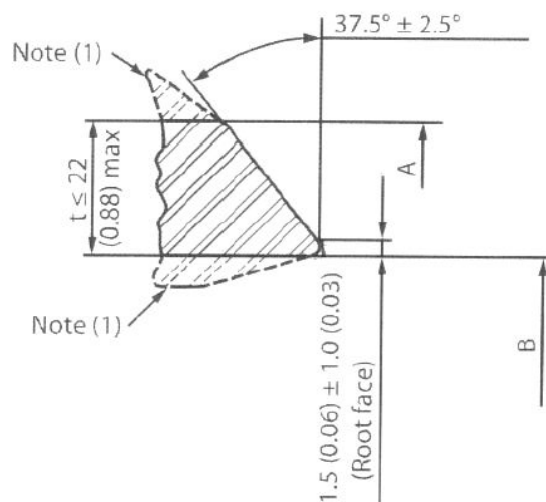
#### 11.2.2 Standard Pipe Fittings

Standard pipe fittings (tees, elbows etc.), for pipe dimensions as specified in [3], for use on IO vacuum systems shall comply with dimensions as specified in [5].

### 11.3 Weld Preparation

The dimensions weld bevels for pipe and pipe fittings shall comply with ASME B16.9 “Plain Bevel” as described in Figure 1.

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**Figure 1 ASME B16.9 Plain bevel**

General Notes:

- a. Dimensions in parenthesis are in inches
- b. Other dimensions are in millimetres.

Note (1) See ASME B16.9 for transition contours

## 11.4 Bibliography

- [1] Supply of Seamless Stainless Steel Pipework and Pipework Components to the ITER IO (ITER\_D\_R22L3M).
- [2] ITER Vacuum Handbook (ITER\_D\_2EZ9UM).
- [3] ASME B36.10M, 2004.
- [4] NF EN ISO 1127, 1996.
- [5] ASME B16.9M, 2012.

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Table 1 Pipe Dimensions Schedule 10s

DN	Sch	Nominal Wall thickness (mm)	Permissible variation in wall thickness (% from nominal), mm		Outer diameter, (mm)	Permissible variation in outer diameter (mm)	
			Over	Under		Over	Under
16 <sup>#</sup> 15		2.11	(20.0), 0.42	(12.5), 0.26	21.30	0.4	0.8
40	10s	2.77	(20.0), 0.55	(12.5), 0.35	48.30	0.4	0.8
63 <sup>*</sup> 65		3.6 3.05	(20.0), 0.72 (20.0), 0.61	(12.5), 0.45 (12.5), 0.38	71.06 73.00	0.8	0.8
100		3.05	(22.5), 0.69	(12.5), 0.38	114.30	0.8	0.8
160 <sup>**</sup> 150		3.0 3.4	(22.5), 0.67 (22.5), 0.76	(12.5), 0.37 (12.5), 0.43	159.00 168.30	1.6	0.8
200		3.76	(22.5), 0.85	(12.5), 0.47	219.10	1.6	0.8
250		4.19	(22.5), 0.94	(12.5), 0.52	273.00	2.4	0.8
300		4.57	(22.5), 1.02	(12.5), 0.57	323.80	2.4	0.8
320		As DN 300					
<sup>#</sup> Where specified in the design that DN 16 pipe is required the dimension of said pipe and/or fittings shall be that of DN15.							
<sup>*</sup> Where specified in the design that DN 63 pipe is required the dimension of said pipe and/or fittings shall be that of DN65.							
<sup>**</sup> Where specified in the design that DN 160 pipe is required the dimension of said and/or fittings pipe shall be that of DN150.							

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Table 2 Pipe Dimensions Schedule 20s

DN	Sch	Nominal Wall thickness (mm)	Permissible variation in wall thickness (% from nominal), mm		Outer diameter, (mm)	Permissible variation in outer diameter (mm)	
			Over	Under		Over	Under
16# 15	20s	2.11	(20.0), 0.42	(12.5), 0.26	21.30	0.4	0.8
40		2.77	(20.0), 0.55	(12.5),0.35	48.30	0.4	0.8
63* 65		3.05	(20.0), 0.61	(12.5), 0.38	71.06 73.00	0.8	0.8
100		6.35	(15.0),	(12.5),	114.30	0.8	0.8
160** 150		6.35	(22.5), 1.42 (22.5), 1.42	(12.5), 0.79 (12.5), 0.79	159.00 168.30	1.6	0.8
200		6.35	(22.5), 1.42	(12.5), 0.79	219.10	1.6	0.8
250		6.35	(22.5), 1.42	(12.5), 0.79	273.00	2.4	0.8
300		6.35	(22.5), 1.42	(12.5), 0.79	323.80	2.4	0.8
320		As DN 300					
# Where specified in the design that DN 16 pipe is required the dimension of said pipe and/or fittings shall be that of DN15.							
* Where specified in the design that DN 63 pipe is required the dimension of said pipe and/or fittings shall be that of DN65.							

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\*\* Where specified in the design that DN 160 pipe is required the dimension of said pipe and/or fittings shall be that of DN150.

### Table 3 Pipe Dimensions Schedule 40s

DN	Sch	Nominal Wall thickness (mm)	Permissible variation in wall thickness (% from nominal), mm		Outer diameter, (mm)	Permissible variation in outer diameter (mm)	
			Over	Under		Over	Under
<b>16<sup>#</sup></b> <b>15</b>	40s	2.769			21.30	0.4	0.8
<b>40</b>		3.68	(20), 0.74	(12.5), 0.46	48.30	0.4	0.8
<b>63<sup>*</sup></b> <b>65</b>		<b>3.6</b> 5.16	<b>(20), 0.72</b> (20), 1.03	<b>(12.5), 0.45</b> (12.5), 0.65	<b>71.06</b> 73.00	0.8	0.8
<b>100</b>		6.02	(15.0), 0.9	(12.5), 0.75	114.30	0.8	0.8
<b>160<sup>**</sup></b> <b>150</b>		<b>3.0</b> 7.11	<b>(22.5), 0.67</b> (22.5), 1.59	<b>(12.5), 0.37</b> (12.5), 0.88	<b>159</b> 168.30	1.6	0.8
<b>200</b>		8.18	(22.5), 1.84	(12.5), 1.02	219.10	1.6	0.8
<b>250</b>		9.27	(22.5), 2.09	(12.5), 1.16	273.00	2.4	0.8
<b>300</b>		10.31	(22.5), 2.32	(12.5), 1.29	323.80	2.4	0.8
<b>320</b>		As DN 300					

Where specified in the design that DN 16 pipe is required the dimension of said pipe and/or fittings shall be that of DN15.



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\* Where specified in the design that DN 63 pipe is required the dimension of said pipe and/or fittings shall be that of DN65.

\*\* Where specified in the design that DN 160 pipe is required the dimension of said pipe and/or fittings shall be that of DN150.

### Table 4 Pipe Dimensions

Outside Diameter (mm)	Wall Thickness (mm)					
	1.0	1.2	1.6	2.0	2.6	3.2
6	Y	Y	-	-	-	-
8	Y	Y	-	-	-	-
10	Y	Y	-	-	-	-
12	Y	-	Y	Y	-	-
14	Y	-	Y	Y	-	-
16	Y	Y	Y	Y	-	-
18	Y	-	Y	Y	-	-
20	Y	Y	Y	Y	-	-
22	Y	-	-	Y	-	-
25	Y	Y	Y	Y	Y	-
30	-	-	Y	Y	-	-
32	-	Y	-	Y	-	-
35	-	Y	-	Y	-	-

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38	-	Y	Y	Y	Y	Y
40	-	Y	Y	-	Y	-

Y indicates availability.

NOTE: Pipes of wall thickness less than 2.0 mm designed to contain cryogenic helium, Electro-Slag Remelted (ESR) or Vacuum Arc Remelted (VAR) material (or equivalent process demonstrated to achieve similar inclusion size and number) shall be used for the pre-extruded material with inclusion limits as specified in [2].

**Table 4-a Outer Diameter Tolerances applicable to Pipe Dimensions presented in Table 4**

Tolerance Class	Tolerance on Outside Diameter
D1	±1.5% with ±0.75 mm min.
D2	±1.0% with ±0.50 mm min.
D3	±0.75% with ±0.30 mm min.
D4	±0.5% with ±0.10 mm min.

**Table 4-b Wall Thickness Tolerances applicable to Pipe Dimensions presented in Table 4**

Tolerance Class	Tolerance on Wall Thickness
T1	±15% with ±0.60 mm min.
T2	±12.5% with ±0.40 mm min.
T3	±10.0% with ±0.20 mm min.
T4	±7.5% with ±0.15 mm min.
T5	±5.0% with ±0.10 mm min.

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