

# Stainless Steel Tube – A Guide

## Tube Specifications

ASTM Standards covered in this Section		Page
-	ASTM Tube - General Requirements	3-2
A 450/A 450M - 96	General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes (Incorporated within the ASTM Tube General Requirements subsection)	3-2
A 370 - 96	Mechanical Testing of Steel Products (Incorporated within the ASTM Tube General Requirements subsection)	3-6
A 213/A 213M - 95a	Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater and Heat Exchanger Tubes	3-10
A 249/A 249M - 96a	Welded Austenitic Steel Boiler, Superheater, Heat Exchanger and Condenser Tubes	3-16
A 268/A 268M - 96	Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service	3-22
A 269 - 96	Seamless and Welded Austenitic Stainless Steel Tubing for General Service	3-26
A 270 - 95a	Seamless and Welded Austenitic Stainless Steel Sanitary Tubing	3-30
A 511 - 96	Seamless Stainless Steel Mechanical Tubing	3-33
A 554 - 94	Welded Stainless Steel Mechanical Tubing	3-38
A 632 - 90	Welded, Unannealed Austenitic Stainless Steel Tubular Products	3-43
A 778 - 90a	Welded, Unannealed Austenitic Stainless Steel Tubular Products	3-46
A 789/A 789M - 95	Seamless and Welded Ferritic/Austenitic (Duplex) Stainless Steel Tubing for General Service	3-49
A 791/A 791M - 94	Welded Unannealed Ferritic Steel Tubing	3-53
A 803/A 803M - 96	Welded Ferritic Stainless Steel Feedwater Heater Tubes	3-56

## Grades Available

Types 304L and 316L are the most readily available from stock in a large range of metric and imperial tube sizes and wall thicknesses. A wide range of other sizes and grades including duplex types and nickel alloys are manufactured to order.

## Markings on the tube

The full identification should be continuously marked down the whole length, including:

- ◆ Size – Outside Diameter (O/D) and Wall Thickness
- ◆ Specification
- ◆ Grade
- ◆ Method of Manufacture (Seamless or Welded)
- ◆ Heat Number
- ◆ Manufacturer's Name or Symbol

## Tube Size Ranges

An almost limitless size range is available with non-standards being available only in mill production quantities on long lead times. Given below is an indication of what sizes are most readily available from stock:

- ◆ Hypodermic tube from 0.4mm to 5mm O/D with wall thickness 0.05mm to 0.4mm
- ◆ Instrumentation tube in straight lengths or continuous coils of up to 1,000 metres long: O/Ds 6mm, 8mm, 10mm and 12mm with heavy wall thicknesses, typically 0.5mm, 1mm, 1.5mm or 2mm
- ◆ Metric sizes from 6mm O/D to 610mm O/D with wall thickness 1mm to 6mm
- ◆ Imperial sizes from 1/8" O/D to 6" O/D with wall thickness from 24swg to 10swg
- ◆ Hygienic/Sanitary Tube
  - Imperial sizes to ASTM A270: 3/4", 1", 1 1/2", 2", 2 1/2", 3" & 4" O/D with 16swg wall and 4" O/D with 14swg wall
  - Metric sizes to DIN 11850: 1", 1 1/2", 2", 2 1/2" & 3" O/D with 1.5 mm wall and 4" O/D with 2mm wall
- ◆ Welded Tubes for the water industry from 18mm O/D x 1.5mm wall to 910mm O/D x 5mm wall
- ◆ Welded Tube for automotive exhaust systems, mostly in grade 409 – A limited size range from 35 to 63mm O/D with wall thickness 1.2mm to 2mm
- ◆ Decorative and structural tubes (welded)
  - Round in metric and imperial O/D sizes from 1/2" O/D x 1.2mm wall to 100mm O/D x 3mm wall
  - Square in metric and imperial O/D sizes from 12.7mm O/D x 1.5mm wall to 250mm x 250 x 10mm wall
  - Rectangular in metric sizes from 20mm x 10mm x 1.2mm wall to 300mm x 200 x 10mm wall
  - Other items include Oval, Handrail and Textured - Most common oval size is 60mm x 33mm x 2.0mm wall
  - Note that most decorative tubes are supplied with a polished finish

## Standard Tolerances for welded and seamless tube to ASTM A450 / A450M

### Standard Tolerances for welded and seamless cold finished tube (ASTM A 450/A 450M)

Outside Diameter (OD)		Variations in OD <sup>1</sup>				Variation in $t_{min}$ <sup>2</sup>		Ovality <sup>3</sup> (Thin wall tube only)	
		Under		Over		Under	Over		
in	mm	in	mm	in	mm	%	%	in	m
<1	<25.4	0.004	0.1	0.004	0.1	0	20	0.020	0.5
1	25.4	0.006	0.15	0.006	0.1	0	20	0.020	0.5
>1 to 1½	>25.4 to 38.1	0.006	0.15	0.006	0.15	0	20	0.020 <sup>4</sup>	0.5 <sup>4</sup>
>1½ to <2	>38.1 to <50.8	0.008	0.2	0.008	0.2	0	22	0.020 <sup>4</sup>	0.5 <sup>4</sup>
2	50.8	0.008	0.2	0.008	0.2	0	22	2.0% of OD	
>2 to 2½	>50.8 to 63.5	0.010	0.25	0.010	0.25	0	22	2.0% of OD	
>2½ to 3	>63.5 to 76.2	0.012	0.3	0.012	0.3	0	22	2.0% of OD	
>3 to 4	>76.2 to 101.6	0.015	0.38	0.015	0.38	0	22	2.0% of OD	

**Notes**

- 1 Includes ovality tolerance except for thin wall tube
- 2  $t_{min}$  = minimum wall thickness
- 3 Ovality = Difference between maximum and minimum OD  
Thin wall tube is defined as that with a wall thickness  
 $t \leq 0.020$  in (0.5 mm) for any OD,  
 or  $t \leq 2\%$  of OD if OD  $\leq 2$  in (50.8 mm),  
 or  $t \leq 3\%$  of OD if OD  $> 2$  in (50.8 mm)
- 4 Or 2.0% of OD, if this gives a larger tolerance value.

**For more information plus a complete table of sizes and dimensions as well as full specifications, please visit the Down-Loads page of the Aalco web site and select the Tubular Products Databook.**

**(<http://www.aalco.co.uk/literature/literature.html#stainless>)**