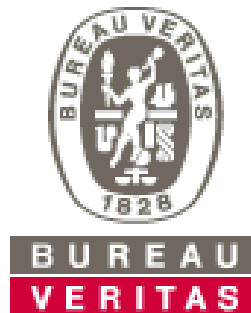


Welcome to Ameritube Quality

Ameritube is proud to announce we have made significant improvements and implemented a new Quality Management System which has yielded us an ISO9001 certification through Bureau Veritas North America.





Standard Comparison

	C70600			C71500			C44300		
	ASTM B-111	ASME SB-111	Mil Spec	ASTM B-111	ASME SB-111	Mil Spec	ASTM B-111	ASME SB-111	Mil Spec
Chemical Composition	Table 1								
Mechanical Properties	ASME Boiler and Pressure Vessel Code								
Grain Size	0.010-0.045mm								
Marking	Upon Customer request	Upon Customer request	>1/2" must be marked with manufacture's name, specification #, alloy, temper, and heat number	Upon Customer request	Upon Customer request	>1/2" must be marked with manufacture's name, specification #, alloy, temper, and heat number	Upon Customer request	Upon Customer request	>1/2" must be marked with manufacture's name, specification #, alloy, temper, and heat number
Microscopical Exam	Magnification 75 diameters and show uniform and complete recrystallization								
Expansion Test	Shall withstand the expansion shown in Table 2 in accordance with Test Method B153, no cracking or rupture visible to the unaided eye								
Flattening Test	Annealed samples 18" in length shall be slowly flattened by one stroke of a press. A micrometer set at 3 times the wall thickness shall pass freely over the flattened sample. The sample shall not show cracking or rupture to the unaided eye.	Each test specimen shall be flattened in a press at 3 places along the length, each new place to be rotated on its axis approximately one third turn from the last flattened area. Each flattened area shall be at least 2" in length. A flattened test-specimen shall allow a micrometer caliper set at 3 times the wall thickness to pass freely over the flattened area. The flattened areas shall be free of defects.		Annealed samples 18" in length shall be slowly flattened by one stroke of a press. A micrometer set at 3 times the wall thickness shall pass freely over the flattened sample. The sample shall not show cracking or rupture to the unaided eye.	Each test specimen shall be flattened in a press at 3 places along the length, each new place to be rotated on its axis approximately one third turn from the last flattened area. Each flattened area shall be at least 2" in length. A flattened test-specimen shall allow a micrometer caliper set at 3 times the wall thickness to pass freely over the flattened area. The flattened areas shall be free of defects.		Annealed samples 18" in length shall be slowly flattened by one stroke of a press. A micrometer set at 3 times the wall thickness shall pass freely over the flattened sample. The sample shall not show cracking or rupture to the unaided eye.	Each test specimen shall be flattened in a press at 3 places along the length, each new place to be rotated on its axis approximately one third turn from the last flattened area. Each flattened area shall be at least 2" in length. A flattened test-specimen shall allow a micrometer caliper set at 3 times the wall thickness to pass freely over the flattened area. The flattened areas shall be free of defects.	



Tensile Test	Table 3								
Mercurous Nitrate Test	NA	NA	NA	NA	NA	NA	The test specimens, cut 6" in length, shall withstand without cracking, an immersion in the standard		
Ammonia Vapor Test	NA	NA	NA	NA	NA	NA	Substitute for Mercurous Nitrate Test. The test specimens, cut 6" in length, shall withstand without cracking, the ammonia vapor test as prescribed in Test Method B 858.	Substitute for Mercurous Nitrate Test. The test specimens, cut 6" in length, shall withstand without cracking, the ammonia vapor test as prescribed in Test Method B 858.	NA
Eddy-Current Test	Each tube shall be passed through an eddy-current testing unit. Testing shall follow procedures of Practice E 243. The depth of the round-bottom transverse notches and the diameters of the drilled holes in the calibrating tube used to adjust the sensitivity of the test unit are shown in Tables 4 and 5 respectively. Tubes that do not actuate the signaling device shall be considered to conform to the requirements of this test. Tubes causing irrelevant signals because of moisture, soil, and like effects may be reconditioned and retested. Tubes causing irrelevant signals because of visible and identifiable handling marks may be retested by the hydrostatic or pneumatic test. Tubes meeting requirements of either test shall be considered to conform if the tube dimensions are within the prescribed limits.								
Hydrostatic Test	USED AS AN ALTERNATIVE TO EDDY-CURRENT. Mil Spec may require if specified on Purchase Order. Each tube shall stand, without showing evidence of leakage, an internal hydrostatic pressure sufficient to subject the material to a fiber stress of 7000psi, determined by the following equation for thin hollow cylinders under tension. The tube need not be tested at a hydrostatic pressure of 1000psi unless so specified. $P=2St/(D-0.8t)$ where P=hydrostatic pressure, psi t=thickness of tube wall, in. D=outside diameter of the tube, in. S=allowable stress of the material, psi								
Pneumatic Test	USED AS AN ALTERNATIVE TO EDDY-CURRENT. Mil Spec may require if specified on Purchase Order. Each tube shall be subjected to an internal air pressure of 60 psig, min, for 5 s without showing evidence of leakage. The test method used shall permit easy visual detection of any leakage, such as by having the tube under water or by the pressure differential method. Any evidence of leakage shall be cause for rejection.								
Diameter	The outside of the tubes shall not vary from that specified by more than the amounts shown in Table 6 as measured by "go" and "no go" ring gages. Mil Spec must all be on the minus side.								
Wall Thickness	Tubes Ordered to Minimum Wall -- No tube wall at its thinnest point shall be less than the specified wall thickness. The maximum plus deviation from the specified wall at any point shall not exceed twice the values shown in Table 7 Tubes Ordered to Nominal Wall -- The maximum plus and minus deviation from the nominal wall at any point shall not exceed the values shown in table 7. Mil spec is always minimum wall.								
Length	The length of the tubes shall not be less than that specified when measured at a temperature of 20 degrees C, but may exceed the specified value by the amounts given in Table 8.								
Squareness of Cut	The departure from squareness of the end of the tube shall not exceed the following: Up to an incl 5/8=0.01" Over 5/8=0.016"								
Sampling	Lot Size - 600 tubes or 10,000lb or fraction of either, whichever constitutes the greater weight. Portion Size - Sample pieces from two individual lengths of finished product. Samples taken for the purpose of the tests prescribed in the specification shall be selected in a manner that will represent correctly the material furnished and avoid needless destruction of finished material when samples representative of the material are available from other sources.								
Temper	As specified by purchase order								

Chemical Composition



Table 1 Chemical Requirements

Alloy	Composition %											
	Copper	Tin	Aluminum	Nickel	Lead	Iron	Zinc	Manganese	Arsenic	Antimony	Phosphorus	Chromium
C10100	99.99min	-	-	-	0.001	-	0.0001max	-	-	-	0.0003max	-
C10200	99.95min	-	-	-	-	-	-	-	-	-	-	-
C10300	99.95min	-	-	-	-	-	-	-	-	-	0.001-0.005	-
C10800	99.95min	-	-	-	-	-	-	-	-	-	0.005-0.012	-
C12000	99.90min	-	-	-	-	-	-	-	-	-	0.004-0.012	-
C12200	99.90min	-	-	-	-	-	-	-	-	-	0.015-0.040	-
C14200	99.40min	-	-	-	-	-	-	-	0.15-0.50	-	0.015-0.040	-
C19200	98.7min	-	-	-	-	0.8-1.2	-	-	-	-	0.01-0.04	-
C23000	84.0-86.0	-	-	-	0.05	0.05max	remainder	-	-	-	-	-
C28000	59.0-63.0	-	-	-	0.3	0.07max	remainder	-	-	-	-	-
C44300	70.0-73.0	0.9-1.2	-	-	0.07	0.06max	remainder	-	0.02-0.06	-	-	-
C44400	70.0-73.0	0.9-1.2	-	-	0.07	0.06max	remainder	-	-	0.02-0.10	-	-
C44500	70.0-73.0	0.9-1.2	-	-	0.07	0.06max	remainder	-	-	-	0.02-0.10	-
C60800	remainder	-	5.0-6.5	-	0.1	0.10max	-	-	0.02-0.35	-	-	-
C61300	remainder	0.20-0.50	6.0-7.5	0.15max	0.01	2.0-3.0	0.10max	0.20max	-	-	0.015max	-
C61400	remainder	-	6.0-8.0	-	0.01	1.5-3.5	0.20max	1.0max	-	-	-	-
C68700	76.0-79.0	-	1.8-2.5	-	0.07	0.06max	remainder	-	0.02-0.10	-	-	-
C70400	remainder	-	-	4.8-6.2	0.05	1.3-1.7	1.0max	0.30-0.8	-	-	-	-
C70600	remainder	-	-	9.0-11.0	0.05	1.0-1.8	1.0max	1.0max	-	-	-	-
C71000	remainder	-	-	19.0-23.0	0.05	0.50-1.0	1.0max	1.0max	-	-	-	-
C71500	remainder	-	-	29.0-33.0	0.05	0.40-1.0	1.0max	1.0max	-	-	-	-
C71640	remainder	-	-	29.0-32.0	0.05	1.7-2.3	1.0max	1.5-2.5	-	-	-	-
C72200	remainder	-	-	15.0-18.0	0.05	0.50-1.0	1.0max	1.0max	-	-	-	0.30-0.70

Expansion Requirements

Table 2 Expansion Requirements

Temper Designation		Copper or Copper Alloy UNS No.	Expansion of Tube Outside Diameter, in Percent of Original Outside Diameter
Standard	Former		
O61	annealed	C19200	30
		C23000	20
		C28000	15
		C44300, C44400, C44500	20
		C60800	20
		C61300, C61400	20
		C68700	20
		C70400	30
		C70600	30
		C71000	30
		C71500	30
		C71640	30
		C72200	30
H55	light-drawn	C10100, C10200, C10300, C10800, C12000, C12200	20
		C14200	20
		C19200	20
		C70400	20
		C70600	20
		C72200	20
HR50	drawn, stress relieved	C71500	20
		C71640	20
-	hard-drawn, end annealed	C10100, C10200, C10300, C10800, C12000, C12200, C14200	30

Tensile Requirements

Table 3 Tensile Requirements

Copper or Copper Alloy UNS No.	Temper Designation		Tensile Strength min ksi	Yield Strength min ksi	Elongation in 2 in., min%
	Standard	Former			
C10100, C10200, C10300, C10800, 12000, C12200, C14200	H55	light-draw n	36	30	-
C10100, C10200, C10300, C10800, 12000, C12200, C14200	H80	hard-draw n	45	40	-
C19200	H55	light-draw n	40	35	-
C19200	H80	hard-draw n	48	43	-
C19200	O61	annealed	38	12	-
C23000	O61	annealed	40	12	-
C28000	O61	annealed	50	20	-
C44300, C44400, C44500	O61	annealed	45	15	-
C60800	O61	annealed	50	19	-
C61300, C61400	O61	annealed	70	30	-
C68700	O61	annealed	50	18	-
C70400	O61	annealed	38	12	-
C70400	H55	light-draw n	40	30	-
C70600	O61	annealed	40	15	-
C70600	H55	light-draw n	45	35	-
C71000	O61	annealed	45	16	-
C71500	O61	annealed	52	18	-
C71500:					
Wall thickness up to 0.048 in., incl	HR50	draw n, stress-relieved	72	50	12
Wall thickness over 0.048 in.	HR50	draw n, stress-relieved	72	50	15
C71640	O61	annealed	63	25	-
C71640	HR50	draw n, stress-relieved	81	58	-
C72200	O61	annealed	45	16	-
C72200	H55	light-draw n	50	30	-

Eddy Current Standard Requirements

Table 4 Notch Depth

Tube Wall Thickness, in.	Tube Outside Diameter, in.		
	Over 1/4 to 3/4, incl	Over 3/4 to 1 1/4, incl	Over 1 1/4 to 3 1/8, incl
Over 0.017-0.032	0.005	0.006	0.007
Incl 0.032-0.049	0.006	0.006	0.0075
Incl 0.049-0.083	0.007	0.0075	0.008
Incl 0.083-0.109	0.0075	0.0085	0.0095
Incl 0.109-0.120	0.009	0.009	0.011

Table 5 Diameter of Drilled Holes

Tube Outside Diameter, in.	Diameter of Drilled Holes, in.	Drill No.
1/4-3/4, incl	0.025	72
Over 3/4-1, incl	0.031	68
Over 1-1 1/4, incl	0.036	64
Over 1 1/4-1 1/2	0.042	58
Over 1 1/2-1 3/4, incl	0.046	56
Over 1 3/4-2, incl	0.052	55

Dimensional Tolerances

Table 6 Diameter Tolerances

Outside Diameter, in.	Wall Thickness, in.				
	0.02	0.032	0.035	0.042	0.049 and over
	0.022				
	0.025				
	0.028				
	Diameter Tolerance, Plus and Minus, in.				
Up to 0.500, incl	0.003	0.0025	0.0025	0.0025	0.0025
Over 0.500-0.740, incl	0.004	0.004	0.004	0.0035	0.003
Over 0.740-1.000, incl	0.006	0.006	0.005	0.0045	0.004
Over 1.000-1.250, incl	-	0.009	0.008	0.006	0.0045
Over 1.250-1.375, incl	-	-	-	0.008	0.005
Over 1.375-2.000, incl	-	-	-	-	0.006
Over 2.000-3.125, incl	-	-	-	-	0.0065

Table 7 Wall Thickness Tolerances, Plus and Minus in.

Wall Thickness, in.	Outside Diameter, in.			
	Over 1/8 to 5/8, incl	Over 5/8 to 1, incl	Over 1 to 2, incl	Over 2 to 3.125, incl
0.020, incl to 0.032	0.003	0.003	-	-
0.032, incl to 0.035	0.003	0.003	0.004	-
0.035, incl to 0.058	0.004	0.0045	0.0045	0.005
0.058, incl to 0.083	0.0045	0.005	0.005	0.0055
0.083, incl to 0.120	0.005	0.0065	0.0065	0.0065
0.120, incl to 0.134	0.007	0.007	0.0075	0.008

Table 8 Length Tolerances

Specified Length, ft	Tolerance, all Plus, in.
Up to 15	3/32
Over 15-20, incl	1/8
Over 20-30, incl	5/32
Over 30-60, incl	3/8
Over 60-100, incl	1/2

Above and Beyond Normal Duties

100% Inspection of O.D. vs. Standard Requirements

- Some of the things we are doing to alleviate most of the procedure variables is inspecting 100% of the tube diameter as well as wall thickness after each finished length cut at the saw by means of go and No-Go gages.
- Every lot of tube will be tested for expansion, flattening, and tensile before tube is cut to final length prior to shipment. No lot of tube failing any of the testing will be shipped to the customer. Failure data will be compiled to ensure consistent performance from lot to lot.
- All Eddy current procedures and personnel have been verified and approved by an ECT level III technician. Tubes will be processed through eddy current 100%. Tubes that do not actuate the alarm signaling device of the eddy current tester shall be considered to conform to the requirements of the governing specification or customer requirements. Tubes causing irrelevant signals because of moisture, soil, and like effects will be reconditioned and retested. Tubes that cause relevant signals but can yield an acceptable tube to the customer's specifications, the acceptable tube to be cut out and the remaining shall be rejected and moved into nonconforming

Ameritube Inspection Process is all performed in House



Method	Frequency	
	Standard Requirement	Ameritube Requirement
Dimensional	2 Tubes per 600 tubes or 10,000 lbs.	100%
Eddy Current Inspection	100%	100%
Hydrostatic or Pneumatic Testing	Per Contract	Per Contract
Ultrasound	Per Contract	Per Contract
Tensile/Yield Strength	2 Tubes per 600 tubes or 10,000 lbs.	2 Tubes Per Lot
Micrographic	2 Tubes per 600 tubes or 10,000 lbs.	2 Tubes Per Lot
Ammonia Vapor/Mercury Nitride	2 Tubes per 600 tubes or 10,000 lbs.	2 Tubes Per Lot
Flattening	2 Tubes per 600 tubes or 10,000 lbs.	2 Tubes Per Lot
Expansion	2 Tubes per 600 tubes or 10,000 lbs.	2 Tubes Per Lot
Hardness	2 Tubes per 600 tubes or 10,000 lbs.	2 Tubes Per Lot
Chemical Composition	Poured Castings or millings from 2 Tubes per 600 tubes or 10,000 lbs.	Poured Castings