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IRANIAN BABAK COPPER CO.

IBCCO

COPPER TUBE

www.ibcco.midhco.com

Copper tube factory of Iranian Babak Copper Company is pioneer in the green industry, equipped with the newest and most advanced copper tube production line in the world

Introduction

Copper properties:

One of the most important properties of copper is its excellent antibacterial property. In contact with water, it does not change the taste and reduces the number of harmful microorganisms in water. It's also non-flammable and does not emit toxic gases. In the face of direct sunlight and ultraviolet rays, it won't become brittle over time. It has capability of bending, drawing and welding, as well as It has high thermal conductivity and high corrosion and hydrogen embrittlement resistance.

Why Copper Tube?

- Reduces energy consumption in cooling-heating systems due to high thermal conductivity.
- Excellent resistance to corrosion ensures long-life piping and reduces maintenance tube costs.
- Due to the low coefficient of thermal expansion, the safety factor of working with copper pipe is high.
- The smoothness of the inner surface and low friction coefficient of tube ensure a proper flow of fluid inside them, even at low diameters.
- The changes in operating temperature doesn't have significant impact on mechanical properties of copper tube. Due to its non-combustibility, copper tube prevents the spread of fire and as a result, it's a suitable choice for indoor, wall and ceiling piping.
- There is a wide range of copper fittings that facilitate the piping process. Soldering can also be used to make strong and impermeable joints.
- The antibacterial properties of copper prevent the growth of fungi and bacteria inside the tube.

Why Iranian Babak Copper?

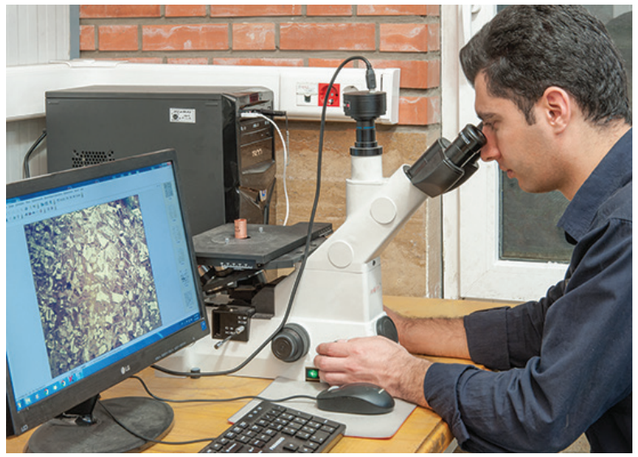
Improving the quality of products along with reducing production costs, pollution in the production process and final price for the customer, has motivated both, Upcast Finland and ASMAG Austria to work together and introduce the latest technology of copper tube production in the world called as Cast & Draw.

1) Casting (furnaces and their equipment by UPCAST Finland):

In this method of copper production, unlike others, the primary mother-tube does not go through preheating, extrusion, scalping and rolling stages instead of that, it upward casted directly and continuously (UPCAST) and then enters the drawing stage. Therefore, all production costs in the middle stages are eliminated. The raw material used in this casting method is copper cathode in accordance with GRADE A ASTM B115 standard.

Advantages of UPCAST method:

A. Easy quality control of the melt in terms of harmful impurities and a significant increase in the quality of the mother- tube since no scraps are charged.
B. Protection of the tube surface in a neutral atmosphere unlike other methods, to prevent the formation of oxide.
C. Reducing delivery time by reducing production steps.
D. Decreasing production expenses and cost price.



2) Drawing (equipment by ASMAG Austria):

the quality of the input tube, type of drawing devices, drawing tools and the process of reducing the diameter and thickness to reach the final product. In this section, an attempt has been made to use the most up-to-date technology in the field of equipment selection. The drawing tools are designed by an Italian company that is the designer of drawing tools of Buntmetall Austria (a member of Weiland industrial group, Germany).

3) Quality control and laboratory:

With the help of accurate laboratory equipment, Iranian Babak Copper Company produces, tubes with the highest quality level and in accordance with world standards (ASTM B88, ASTM B75, ASTM B68, EN12735, EN12449, EN1057, ASTM B743, ASTM B280) and finally deliver them to customers. This laboratory is designed to control raw materials, products and production processes and therefore, following tests are performed in accordance with national and international standards:

Eddy current test (by Forrester Germany): This test sorts out non-uniform and defective products to ensure the integrity of the tube. It performs when whole tube passes through eddy current according to the Iran national standard (INSO 16927) and ASTM E243 as well.

A) Defectomat testing device detects non-uniformities, spot defects and cavities.
B) Rotating testing device detects non-uniformities, linear and longitudinal defects.

Elemental chemical analysis: It is performed by Belec quantum meter according to ASTM E255 standard. The amount of oxygen and hydrogen is also measured by the German 900 Eltra OH device.

Tensile test: In order to determine elongation ability and also the strength of products according to ASTM E8M standard, the test is performed by Centam tensile testing machine.

Hardness test: It is performed by Innovatest Nexus 7501 hardness tester according to ASTM E18 and EN65071- standards.

Metallographic test and grain size determination: It is performed according to ASTM E112 standard by Dewinter light microscope.

Dimensional control (dimensional measurement): The diameter and thickness is measured by micrometer and thickness gauge to control dimensional accuracy and compliance with the tolerances listed in ASTM B280, ASTM B251, ASTM B75, ASTM B35, INSO 16927, EN57, EN127.

Expansion, Bending, Hydrostatic and Pneumatic Pressure tests: The bending, expansion, hydrostatic and pneumatic pressure tests are performed according to EN1057, ASTM B153 and ASTM B75 standards, to meet customers needs.

4) Certificates:

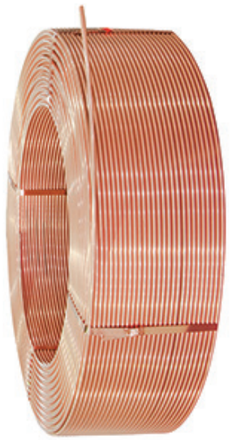
Quality certificates from TUV NORD Germany, national standards of Iran ISO14001, ISO9001, ISO18001, ISO/ IEC 17025 and HSE-MS standard from SGS Iran.

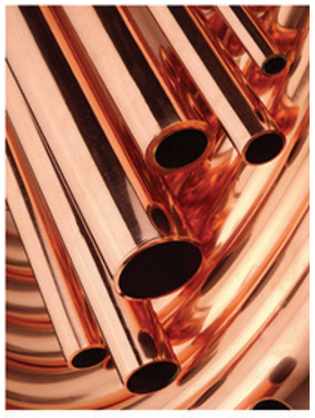
Chemical Composition:
DHP alloy contains 150-400 ppm (0.015- 0.040 weight percent) of phosphorus.

Standard Conformity							
Alloy	Denomination	ASTM B5	GIS H3300	DIN 1708	BS 2870	EN 12449	NF A 51-050
DHP	Deoxidized High Phosphorous	C12200	C1220	SF-Cu (2.0090)	C106	Cu-DHP (CW024A)	Cu-b1

Mechanical Properties:

Standard	No	Temper (Annealing Type)		Minimum Tensile Strength MPa	Minimum Relative Elongation (%) (Min)	Grain Size (µm)	Hardness			
							Vickers	Rockwell		
								Thickness mm	Scale	Amount
ASTM	B68 B75 B88 B280 B743	O60	Soft Anneal	205	40	40 min	-	0.381 from 0.889 to	15T	60 max
								0.889 from And more	F	50 max
		O50	Light Anneal	205	40	40 max	-	0.381 from 0.889 to	15T	65 max
								0.889 from And more	F	55 max
	B819	H58	Hard (drawn)	250	-	-	-	all	30T	30 min
EN	1057	R250	Half Hard	250	30a	-	75-100 (HV5)	-	-	-
					20b					





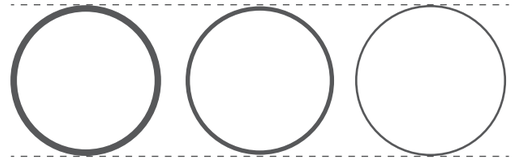
a: when tube diameter is less than or equal to 66.7 mm or thickness is less than 1 mm then $\frac{\text{diameter}}{\text{thickness}^2} > 24$

b: when tube diameter is greater than 66.7 mm or thickness is greater than or equal to 1 mm then $\frac{\text{diameter}}{\text{thickness}^2} \leq 24$

Tube Dimension:
Rang of products.

Products and Dimension Range	Shape		Outer Diameter		Thickness		Length (m)		
			from	to	from	to	from	to	
	Straight	in	$\frac{3}{8}$	$1\frac{1}{8}$	0.013	0.059	2.5	6	
		mm	9.52	28.57	0.33	1.5			
	Pancake	in	$\frac{1}{4}$	$\frac{7}{8}$	0.016	0.056	15	30	50
		mm	6.35	22.22	0.4	1.42			
	Coil (LWC)	in	$\frac{3}{16}$	$\frac{3}{4}$	0.013	0.056			
		mm	4.76	19.05	0.33	1.42			

Dimensions of Types K, L, M:



K L M

Nominal O.D (in)	Nominal O.D (mn)	Actual O.D (in)	Actual O.D (in)	Type K		Type L		Type M	
				Green		Blue		Red	
				Wall Thickness		Wall Thickness		Wall Thickness	
				(in)	(mm)	(in)	(mm)	(in)	(mm)
$^1/_4$	6.35	$^3/_8$	9.52	0.035	0.9	0.030	0.75	-	-
$^3/_8$	9.52	$^1/_2$	12.7	0.049	1.24	0.035	0.9	0.025	0.63
$^1/_2$	12.7	$^5/_8$	15.87	0.049	1.24	0.040	1	0.028	0.7
$^5/_8$	15.87	$^3/_4$	19.05	0.049	1.24	0.042	1.07	-	-
$^3/_4$	19.05	$^7/_8$	22.22	0.065	1.65	0.045	1.14	0.032	0.8
1	25.4	$1^1/_8$	28.57	0.065	1.65	0.050	1.27	0.035	0.9

Dimensional Tolerances:

ASTM B75				
	O.D (mm)			
Wall Thickness (mm)	3<OD ≤16	16<OD≤25	25<OD≤50	
W.T≤0.4	±0.03	±0.04	±0.05	Wall Thickness Tolerances (mm)
0.4<W.T≤0.6	±0.05	±0.05	±0.06	
0.6<W.T≤0.9	±0.06	±0.06	±0.08	
0.9<W.T≤1.5	±0.08	±0.09	±0.09	
1.5<W.T≤2	±0.09	±0.10	±0.10	
	±0.05	±0.06	±0.08	Average OD Tolerances (mm)

Calculation of tolerable

Pressure for copper tube:

P: Hydrostatic pressure (bar)
S: Fiber tension for annealed or drawn tubes
T: Minimum thickness (mm)
D: Maximum actual outer diameter (mm)

$$P = \frac{2St}{D-0.8\,t}$$

Safe operating pressure for the most frequently used dimensions:

O.D (mm)	W.T (mm)	Tolerable Pressure (bar) at 37.7 °c		Tolerable Pressure (bar) at 65.5 °c		Tolerable Pressure (bar) at 93.3 °c	
		Annealed	Hard	Annealed	Hard	Annealed	Hard
6.35	0.50	61.7	105.8	52.4	105.8	50.3	105.8
	0.63	79.4	136.2	67.4	136.2	64.8	136.2
	0.75	97.7	167.5	82.9	167.5	79.7	167.5
	0.80	105.5	180.9	89.6	180.9	86.1	180.9
9.52	0.50	40.5	69.4	34.3	69.4	33.0	69.4
	0.63	51.8	88.8	44.0	88.8	42.3	88.8
	0.75	63.4	108.6	53.8	108.6	51.7	108.6
	0.80	68.2	117.0	57.9	117.0	55.7	117.0
12.7	0.50	29.0	49.8	24.6	49.8	23.7	49.8
	0.63	37.0	63.5	31.4	63.5	30.2	63.5
	0.75	45.2	77.5	38.4	77.5	36.9	77.5
	0.80	48.6	83.3	41.3	83.3	39.7	83.3
15.87	0.50	23.3	39.9	19.8	39.9	19.0	39.9
	0.63	29.7	50.9	25.2	50.9	24.2	50.9
	0.75	36.1	61.9	30.7	61.9	29.5	61.9
	0.80	38.8	66.6	33.0	66.6	31.7	66.6
19.05	0.50	19.9	34.1	16.9	34.1	16.2	34.1
	0.63	25.3	43.4	21.5	43.4	20.6	43.4
	0.75	30.8	52.8	26.1	52.8	25.1	52.8
	0.80	33.1	56.7	28.1	56.7	27.0	56.7
22.22	0.50	17.0	29.2	14.4	29.2	13.9	29.2
	0.63	21.6	37.1	18.4	37.1	17.6	37.1
	0.75	26.3	45.1	22.3	45.1	21.5	45.1
	0.80	28.3	48.1	24.0	48.5	23.1	48.5

Technical properties

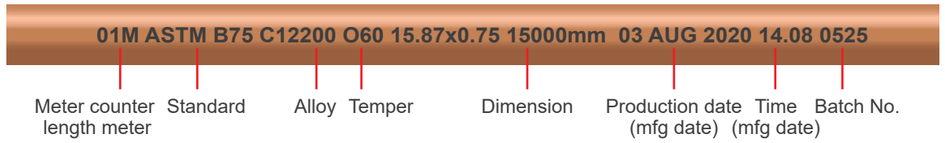
O.D (mm)	W.T (mm)	Tolerable Pressure (bar) at 121.1 °c		Tolerable Pressure (bar) at 148.8 °c		Tolerable Pressure (bar) at 176.6 °c		Tolerable Pressure (bar) at 204.4 °c	
		Annealed	Hard	Annealed	Hard	Annealed	Hard	Annealed	Hard
6.35	0.50	49.3	105.8	48.3	102.7	41.1	99.7	30.8	96.6
	0.63	63.5	136.2	62.1	132.2	52.9	128.3	39.7	124.3
	0.75	78.1	167.5	76.5	162.7	65.1	157.8	48.8	152.9
	0.80	84.3	180.9	82.6	175.7	70.3	170.4	52.7	165.1
9.52	0.50	32.3	69.4	31.7	67.4	27.0	65.4	20.2	63.3
	0.63	41.4	88.8	40.5	86.2	34.5	83.7	25.9	81.1
	0.75	50.6	108.6	49.6	105.5	42.2	102.3	31.6	99.2
	0.80	54.5	117.0	53.4	113.6	45.5	110.2	34.1	106.8
12.7	0.50	23.2	49.8	22.7	48.3	19.3	46.9	14.5	45.4
	0.63	29.6	63.5	29.0	61.7	24.7	59.8	18.5	58.0
	0.75	36.1	77.5	35.4	75.2	30.1	73.0	22.6	70.7
	0.80	38.3	83.3	38.0	80.9	32.4	78.5	24.3	76.1
15.87	0.50	18.6	39.9	18.2	38.8	15.5	37.6	11.6	36.4
	0.63	23.2	50.9	23.2	49.4	19.8	47.9	14.8	46.4
	0.75	28.9	61.9	28.3	60.1	24.1	58.3	18.0	56.5
	0.80	31.0	66.6	30.4	64.7	25.9	62.7	19.4	60.8
19.05	0.50	15.9	34.1	15.6	33.1	13.2	32.1	9.9	31.1
	0.63	20.2	43.4	19.8	42.1	16.9	40.9	12.6	39.6
	0.75	24.6	52.8	24.1	51.3	20.5	49.7	15.4	48.2
	0.80	26.4	56.7	25.9	55.1	22.0	53.3	16.5	51.8
22.22	0.50	13.6	29.2	13.3	28.3	11.3	27.5	8.5	26.6
	0.63	17.3	37.1	16.9	36.0	14.4	34.9	10.8	33.9
	0.75	21.0	45.1	20.6	43.8	17.5	42.5	13.1	41.2
	0.80	22.6	48.5	22.1	47.0	18.8	45.6	14.1	44.2

Type of Products:
Pancake

Dimension

W.T / O.D	mm	0.40	0.45	0.50	0.60	0.63	0.70	0.75	0.80	0.90	1.0	1.24	1.42
mm	in	0.016	0.018	0.020	0.024	0.025	0.028	0.030	0.031	0.035	0.039	0.049	0.055
6.35	1/4		✓	✓		✓	✓	✓	✓		✓		
7.93	5/16			✓		✓					✓		
9.52	3/8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
12.70	1/2		✓	✓	✓	✓	✓	✓	✓	✓	✓		
15.87	5/8					✓	✓	✓	✓	✓	✓		
16.00													
18.00													
19.05	3/4					✓	✓	✓	✓	✓	✓	✓	
22.22	7/8								✓	✓	✓		

IBCCO is capable of producing other sizes within, demanding period of time according to customers order.
Iranian Babak Copper Company is the only manufacturer of copper tube in Iran that in addition to technical specifications, engraved the length meter by meter on the tube in order to facilitate the use of pancake tube.



Weight table for frequently used dimensions:

Outer Diameter		Thickness		Length	Weight/m
mm	in	mm	in	m	kg
6.35	1/4	0.63	0.25	15 / 30 / 50	0.1
9.52	3/8				0.15
12.7	1/2				0.21
15.87	5/8				0.26
19.05	3/4				0.32
6.35	1/4	0.7	0.28		0.111
9.52	3/8				0.17
12.7	1/2				0.23
15.87	5/8				0.29
19.05	3/4				0.36
6.35	1/4	0.75	0.30		0.118
9.52	3/8				0.18
12.7	1/2				0.25
15.87	5/8				0.31
19.05	3/4				0.35

Packaging:

Outer Diameter (mm)	Thickness (mm)	Length (mm)	With Styrofoam				Whitout Styrofoam			
			No. of Pancakes in Carton	Carton Weight	Carton Dimension	Pallet Dimension	No. of Pancakes in Carton	Carton Weight	Carton Dimension	Pallet Dimension
6.35	0.63	15	13	19.6	58*58	60*120	15	22.6	58*58	60*120
9.52			8	18.7	58*58	60*120	10	23.4	58*58	60*120
12.7			6	19.1	63*63	70*140	9	28.7	63*63	70*140
15.87			5	20.1	73*73	80*160	7	28.1	73*73	80*160
19.05			6	29.1	80*80	80*160	7	34	80*80	80*160
6.35	0.63	50	3	30.2	58*58	60*120	4	20.1	58*58	60*120
9.52			3	23.4	58*58	60*120	3	23.5	58*58	60*120
12.7			2	21.2	63*63	70*140	2	21.2	63*63	70*140
15.87			2	26.8	73*73	80*160	2	26.8	73*73	80*160
19.05			1	16.3	90*90	95*190	1	16.2	90*90	95*190
6.35	0.7	15	13	21.5	58*58	60*120	15	24.8	58*58	60*120
9.52			8	20.7	58*58	60*120	10	25.9	58*58	60*120
12.7			6	21.1	63*63	70*140	9	31.7	63*63	70*140
15.87			5	22.2	73*73	80*160	7	31.9	73*73	80*160
19.05			6	21.9	80*80	80*160	7	37.7	80*80	80*160
6.35	0.7	50	3	33.1	58*58	60*120	4	22.1	58*58	60*120
9.52			3	25.8	58*58	60*120	3	25.9	58*58	60*120
12.7			2	23.4	63*63	70*140	2	23.4	63*63	70*140
15.87			2	29.6	73*73	80*160	2	29.7	73*73	80*160
19.05			1	17.9	90*90	95*190	1	17.9	90*90	95*190
6.35	0.75	15	13	22.8	58*58	60*120	15	26.4	58*58	60*120
9.52			8	22	58*58	60*120	10	27.5	58*58	60*120
12.7			6	22.5	63*63	70*140	9	33.8	63*63	70*140
15.87			5	23.7	73*73	80*160	7	33.3	73*73	80*160
19.05			6	34.5	80*80	80*160	7	40.2	80*80	80*160
6.35	0.75	50	6	35.2	58*58	60*120	4	23.4	58*58	60*120
9.52			3	27.5	58*58	60*120	3	27.5	58*58	60*120
12.7			2	25	63*63	70*140	2	25	63*63	70*140
15.87			2	31.6	73*73	80*160	2	31.7	73*73	80*160
19.05			1	19.1	90*90	95*190	1	19.1	90*90	95*190

IRANIAN BABAK COPPER CO.

LWC
COPPER TUBE

LWC (Level Wound Coil):
Dimension

O.D \ W.T	mm	0.33	0.35	0.40	0.45	0.50	0.60	0.63	0.70	0.75	0.80	0.90	1.0	1.14	1.24	1.42
mm	in	0.013	0.014	0.016	0.018	0.020	0.024	0.025	0.028	0.030	0.031	0.035	0.039	0.045	0.049	0.055
4.8	3/16							✓	✓							
6.35	1/4		✓	✓	✓	✓		✓	✓	✓	✓		✓			
7.93	5/16			✓	✓	✓		✓			✓		✓			
9.52	3/8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
12.00							✓			✓			✓			
12.70	1/2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
14.00							✓									
15.87	5/8					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
16.00												✓				
18.00									✓	✓	✓	✓				
19.05	3/4							✓	✓	✓	✓	✓	✓	✓	✓	✓

IBCCO is capable of producing other sizes within demanding period of time according to customer's orders.

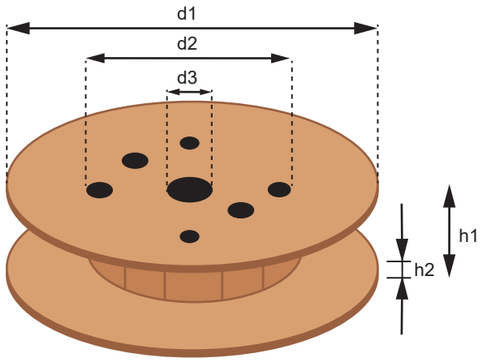
Weight table for frequently used dimensions:

Thickness		Thickness		Weight/m
mm	in	mm	in	kg
4.76	3/16	0.63	0.025	0.073
		0.7	0.028	0.08
6.35	1/4	0.4	0.016	0.067
		0.5	0.020	0.075
		0.63	0.025	0.101
		0.75	0.030	0.118
7.93	5/16	0.4	0.016	0.084
		0.45	0.018	0.094
		0.5	0.020	0.104
		0.63	0.025	0.129
9.52	3/8	0.35	0.013	0.09
		0.5	0.020	0.126
		0.63	0.025	0.157
		0.75	0.030	0.184
12.7	1/2	0.5	0.020	0.171
		0.63	0.025	0.213
		0.75	0.030	0.251
15.87	5/8	0.5	0.020	0.215
		0.63	0.025	0.269
		0.75	0.030	0.318
19.05	3/4	0.5	0.020	0.26
		0.63	0.025	0.325
		0.75	0.030	0.385
		0.9	0.035	0.485
		1.24	0.045	0.619
		1.42	0.055	0.702

Packaging:

Bobbin Dimensions						Bobbin net Weight
Outer dia. (d1)	Inner dia. (d2)	Decoiler dia. (d3)	Flange Thickness (h2)	Height (h1)	Distance of wounded coil from bobbin edge	
mm						kg
1080	600	130	10	300	50	100-250

Wooden Pallet	Length (mm)	Width (mm)	Height (mm)	Number of bobbins on each pallet	Pallet Weight (kg)
	1130	1130	100	5-6	500-1000



IBCCO is capable of producing other dimensions for bobbins based on request by customers.

IRANIAN BABAK COPPER CO.

STRAIGHT
COPPER TUBE

Straight:
Dimension

W.T / O.D	mm	0.35	0.40	0.45	0.50	0.55	0.60	0.63	0.70	0.75	0.80	0.90	1.0	1.14	1.24	1.42
mm	in	0.014	0.016	0.018	0.020	0.022	0.024	0.025	0.028	0.030	0.031	0.035	0.039	0.045	0.049	0.055
9.52	3/8				✓		✓	✓	✓	✓	✓	✓	✓		✓	
10.00													✓			
12.00			✓				✓						✓			
12.70	1/2	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	
14.00									✓							
15.00													✓			
15.87	5/8				✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
16.00												✓				
18.00						✓			✓	✓	✓	✓				
19.05	3/4				✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
22.00								✓					✓		✓	
22.22	7/8										✓	✓	✓	✓	✓	
23.00										✓						
28.00													✓			
28.57	1 1/8												✓			

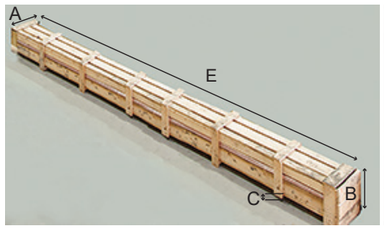
IBCCO is capable of producing other sizes within demanding period of time according to customer's orders.

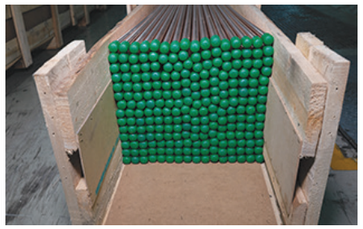
Weight table for frequently used dimensions:

Outer Diameter		Thickness		Length	Weight/m
mm	in	mm	in	m	kg
9.52	3/8	0.5	0.020	2.5 to 6	0.126
		0.63	0.025		0.157
		0.75	0.030		0.184
12.7	1/2	0.5	0.020		0.171
		0.63	0.025		0.213
		0.75	0.030		0.251
15.87	5/8	0.5	0.020		0.215
		0.63	0.025		0.269
		0.75	0.030		0.318
		0.8	0.031		0.338
		1	0.039		0.417
19.05	3/4	0.5	0.020		0.26
		0.63	0.025		0.325
		0.75	0.030		0.385
		0.8	0.031		0.409
		1	0.039		0.506
		1.24	0.049		0.619
22.22	7/8	0.8	0.031		0.48
		1	0.039		0.595
		1.24	0.049		0.729
28.57	1 1/8	1	0.039		0.773

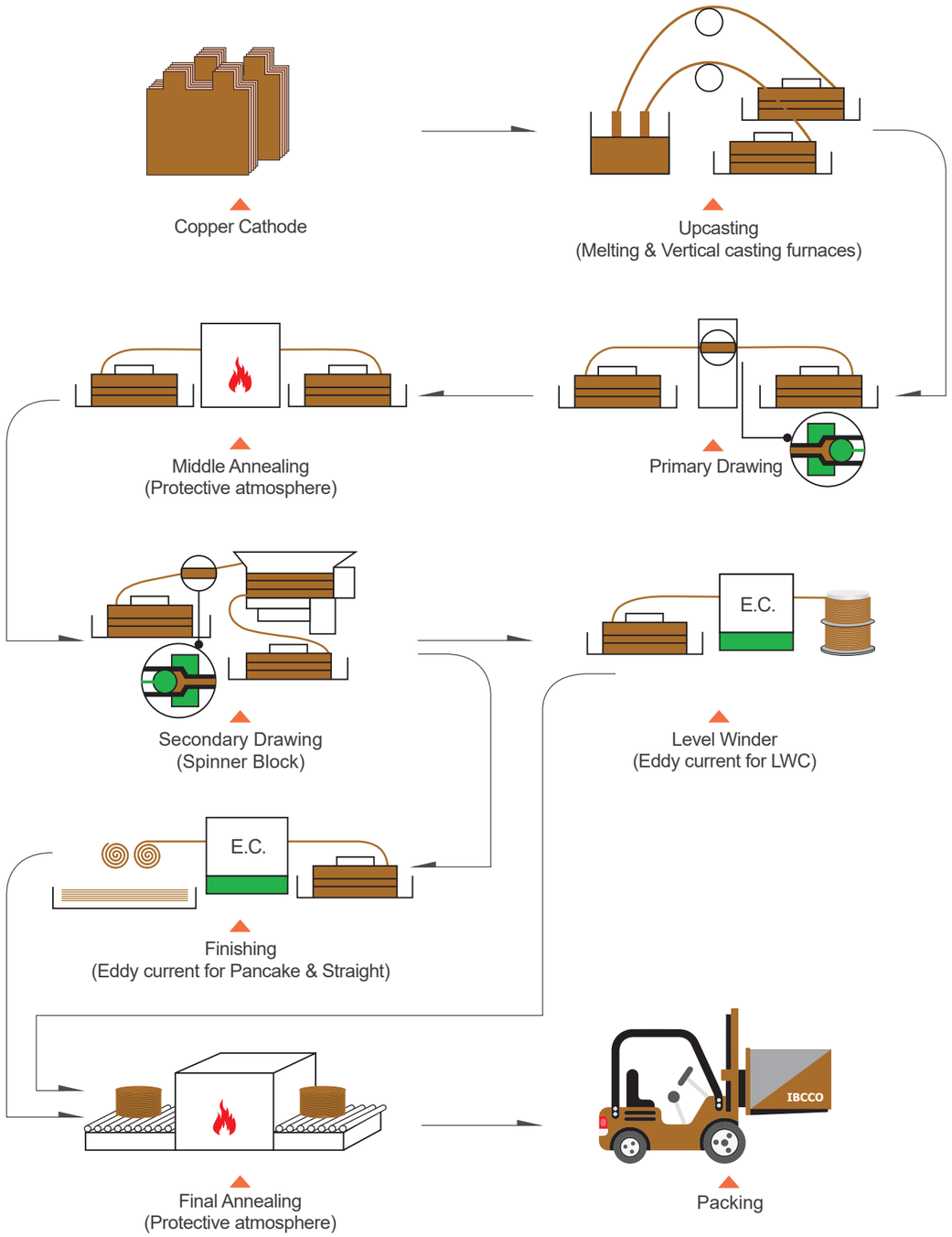
Packaging:

Packaging Type	Pallet Dimension				Pallet Weight	
	Length (E)	Width (A)	Height (B)	Wood Lath (C)	Minimum	Maximum
	mm				kg	
Wooden Pallet	6080	440	420	80	80	90
Metal Pallet	6080	440	420	80	95	110





Production steps of copper pipe



[Note]