

CATALOG C-CF-698



COPPER FITTINGS



NIBCO. Worldwide Choice In Flow Control

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SPECIFICATIONS

All of the advantages found in copper as a metal have been capitalized to the utmost in the manufacture of NIBCO Fittings. Because of the accuracy of construction and design, copper plumbing is more efficient and less expensive.

NIBCO manufactures nine general types of fittings: Wrot Pressure; Cast Pressure; Wrot Drainage; Cast Drainage; Flanges; Flared Tube; Threaded Bronze; Insert Fittings for PEX; Barbed Insert Fittings for polybutylene. Each has its particular place and use and each offers its own advantages when used for the proper service requirement.

ALLOY AND FINISH – NIBCO Fittings are made from highest quality raw materials available – Cast Fittings are made from Copper Alloy C84400 which consists of 81% Copper, 7% Lead, 3% Tin, and 9% Zinc per ASTM Specifications B75 Alloy C12200.

NIBCO fittings are produced to meet requirements of applicable standards wherever practicable.

NIBCO brand wrot and cast fittings are manufactured in the U.S.A. and Mexico. The manufacturing plants at South Glens Falls, NY, Stuarts Draft, VA, and Reynosa, Mexico are registered to ISO 9002 quality standards.

Following is suggested phrasing to be incorporated in your specifications or bills of material for Copper Tube Fittings.

WROT SOLDER JOINT FITTINGS – “Wrot Solder Joint Fittings shall be produced to one of the following specifications:

1. Material and workmanship shall be in accordance with ASME/ ANSI B16.22; Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.”
2. The dimensional, material and workmanship shall meet the requirements of MSS SP- 104; Wrought Copper Solder Joint Pressure Fittings.”
3. The dimensional, material and workmanship of 5” – 12” copper fittings shall meet the requirements of MSS SP – 109 “Welded Fabricated Copper Solder Joint Pressure Fittings.”
4. Certified to ANSI/ NSF 61.

CAST COPPER ALLOY SOLDER JOINT FITTINGS – “Cast Copper Alloy Solder Joint Fittings shall be in accordance with ANSI Std. B16.18.”

WROT DRAINAGE FITTINGS – “Wrot Drainage Fittings shall be in accordance with ASME/ ANSI Std. B16.29.”

CAST COPPER ALLOY SOLDER JOINT DRAINAGE FITTINGS – “Cast Copper Alloy Solder Joint Drainage Fittings shall be in accordance with ASME Std. B16.23.”

CAST COPPER ALLOY FLARED TUBE FITTINGS – “Cast Copper Alloy Flared Tube Fittings shall be in accordance with ASME/ ANSI Std. B16.26.

CAST COPPER ALLOY FLANGES AND FLANGED FITTINGS-

- CLASS 150- Cast Copper Alloy Flanges and Flanged Fittings shall meet the requirements of MSS SP – 106 and/or the workmanship and dimensions of Federal Specifications WW-F-406 or ASME Std. B 16.24.
- CLASS 125 – Material, workmanship and dimensions of flanges shall be in accordance with MSS SP – 106.

CAST BRONZE THREADED FITTINGS – “Cast Bronze Threaded Fittings shall be in accordance with ANSI/ ASME B16.15”

POLYBUTYLENE COPPER INSERT TYPE VALVES AND FITTINGS – “Wrot Copper Insert Fittings shall be manufactured per the following specifications: MSS SP – 103 or ASTM F1380.”

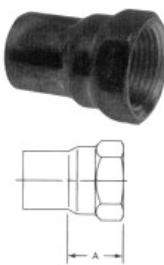
NIBCO Cooper Tube Fittings are all produced to above Standards.

For technical information and dimensions refer to the engineering section contained in this catalog.


WROT AND CAST PRESSURE FITTINGS



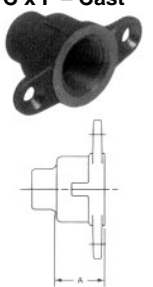
600Series – Wrot
700 Series – Cast

ADAPTERS


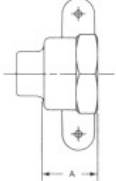

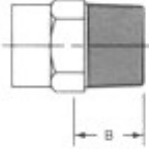

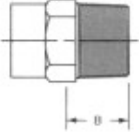

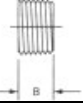

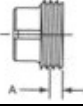

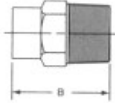
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
603 Adapter C x F – Wrot 	1/8	0.03	13/32
	1/8 x 1/4	0.03	1/2
	1/4	0.03	5/8
	1/4 x 3/8	0.05	21/32
	3/8	0.04	11/16
	3/8 x 1/2	0.09	29/32
	3/8 x 1/4	0.03	9/16
	1/2	0.09	27/32
	1/2 x 3/4	0.14	1
	1/2 x 3/8	0.04	17/32
	1/2 x 1/4	0.05	1/2
	5/8 x 3/4	0.12	29/32
	5/8 x 1/2	0.11	3/4
	3/4	0.15	29/32
	3/4 x 1	0.21	1 1/8

	3/4 x 1/2	0.10	5/8
	1	0.24	31/32
	1 x 1 1/4	0.28	1 7/32
	1 x 3/4	0.19	25/32
	1 x 1/2	0.24	5/8
	1 1/4	0.33	1 3/32
	1 1/4 x 1 1/2	0.40	1 1/4
	1 1/4 x 1	0.27	31/32
	1 1/2	0.44	1 1/8
	1 1/2 x 2	0.50	1 1/32
	2	0.63	1 3/32
	2 x 1 1/2	0.74	1 3/16
	2 1/2	1.13	-
	3	1.94	-
703 Adapter	*1/4 x 1/2	0.13	27/32
	1/2 x 1	0.30	1


C x F – Cast			
	3/4 x 1 1/4	0.55	1 1/8
	*3/4 x 3/8	0.17	3/4
	1 x 1 1/2	0.68	13/32
	1 1/4 x 2	0.98	15/32
	1 1/4 x 1	0.27	31/32
	1 1/4 x 3/4	0.29	3/4
	*1 1/4 x 1/2	0.33	3/4
	1 1/2 x 2	0.78	1 1/32
	*1 1/2 x 1	0.37	25/32
	1 1/2 x 1 1/4	0.47	1 1/4
	*2 x 1 1/4	0.76	27/32
	2 1/2	1.62	1 3/8
	3	2.34	1 1/2
	4	4.05	1 9/16
5	8.20	1 15/16	
6	13.57	2 1/32	


Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
603 – 2			
Fitting Adapter	*1/4	0.03	1 3/32
Ftg x F – Wrot	*3/8	0.06	1 3/16
	1/2	0.09	1 7/16
	1/2 x 3/8	0.05	1 1/4
	3/4	0.13	1 11/16
	1	0.27	2 1/32
	1 1/4	0.31	2 1/8
	1 1/2	0.43	2 5/16
	2	0.61	2 17/32
703 – 2			
Fitting Adapter	*1/2 x 3/4	0.18	1 7/16
Ftg x F – Cast	1/2 x 1/4	0.11	1 7/32
	3/4 x 1/2	0.12	1 9/16
	1 x 3/4	0.38	1 31/32
	1 x 1/2	0.15	1 7/16
	*2 1/2	1.65	2 15/16
	3	2.47	3 1/4
703 – 5			
Special Drop Adapter	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
	1/2	0.16	3/4
	3/4	0.24	31/32
C x F – Cast			

*Made to order. Consults price sheet for minimum order quantities.

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
703 – 5B Drop Adapter C x F – Cast  	1/2	0.15	3/4	704 Adapter C x M – Cast  	3/4 x 1 1/2	0.60	1 17/32
					3/4 x 1 1/4	0.38	1 7/32
3/4 x 3/8	0.19	13/16					
1 x 2	1.15	-					
1 x 1 1/2	0.64	29/32					
1 1/4 x 2	0.88	1 9/32					
1 1/4 x 3/4	0.30	31/32					
1 1/2 x 2	0.77	1 1/8					
2 x 2 1/2	1.57	1 15/32					
2 x 1 1/2	0.71	1 1/8					
2 x 1 1/4	1.08	-					
2 1/2	1.48	1 21/32					
2 1/2 x 2	1.83	1 11/16					
3	1.96	1 1/2					
4	3.66	1 11/16					
5	8.60	2 5/8					
6	10.73	2					
604 Adapter C x M – Wrot  	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	704-F Flush Adapter C x M – Cast  	1/2	0.03	9/16
	1/4	0.03	23/32		*3/4	0.03	19/32
	3/8	0.04	15/32				
	*3/8 x 3/4	0.15	1 5/16				
	3/8 x 1/2	0.09	1				
	1/2	0.07	5/8				
	1/2 x 1	0.25	1 1/2				
	1/2 x 3/4	0.15	13/16				
	1/2 x 3/8	0.05	19/32				
	1/2 x 1/4	0.07	5/8				
	5/8 x 3/4	0.16	1 1/8				
	5/8 x 1/2	0.08	3/4				
	3/4	0.14	13/16				
	3/4 x 1	0.26	1 7/16				
	3/4 x 1/2	0.10	27/32				
	1	0.21	31/32				
	1 x 1 1/2	0.54	29/32				
	1 x 1 1/4	0.38	1 1/2				
	1 x 3/4	0.18	29/32				
	1 x 1/2	0.18	31/32				
1 1/4	0.35	15/16					
1 1/4 x 1 1/2	0.51	1 19/32					
1 1/4 x 1	0.27	1 5/32					
1 1/2	0.44	31/32					
1 1/2 x 2	0.81	1 1/8					
1 1/2 x 1 1/4	0.38	1 3/16					
1 1/2 x 1	0.37	1 3/32					
2	0.81	1 3/32					
2 x 1 1/2	0.64	1 1/8					
2 1/2	1.48	1 21/32					
3	1.69	-					
704 – H Hose Adapter C x Hose – Cast  	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches				
	1/2	0.09	9/32				
				NOTE: Fits 1/2", 5/8" and 3/4" Garden Hose			
604 – 2 Fitting Adapter Ftg x M – Wrot  	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches				
	1/8	0.02	1 1/8				
	*3/8	0.04	1 1/4				
	1/2	0.09	1 15/32				
	*1/2 x 3/4	0.16	1 13/16				
	*1/2 x 3/8	0.04	1 11/32				
	3/4	0.17	1 15/16				
1	0.25	2 1/4					


*Made to order. Consults price sheet for minimum order quantities.


Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
704 - 2 Fitting Adapter Ftg x M - Cast 	3/4 x 1	0.27	1 31/32
	3/4 x 1/2	0.12	1 23/32
	1 x 3/4	0.24	1 15/16
	1 1/4	0.43	2 27/32
	1 1/2	0.54	2 13/32
	2	0.89	2 3/4
	2 1/2	1.55	3 3/8
3	2.21	3 23/32	

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
704 - 2 - H Hose Adapter Ftg x Hose - Cast 	3/4 F x 1/2 H	0.16	1 5/8

NOTE: Fits 1/2", 5/8" and 3/4" Garden Hose.


AIR CHAMBERS



Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. L Inches
619 Air Chamber Ftg. - Wrot 	1/2 x 6	0.21	1	6
	1/2 x 12	0.41	1	12
	1/2 x 14	0.78	1 1/8	14
	*3/4 x 12	0.40		12

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. L Inches
620 - L Air Chamber or Stub - Out Ftg - Wrot 	1/2 x 6	0.14	6
	1/2 x 8	0.19	8
	*1/2 x 10	0.24	10
	1/2 x 12	0.28	12
	*3/4 x 8	0.31	8
	*3/4 x 12	0.46	12
	*1 x 10	0.55	10
	*1 x 15	0.82	15

As Air Chamber, just solder one joint. When used as Stub - Out, simply pressure test system then cut off stub - out (save piece for future use) and install valve or fixture.



BULKHEAD FITTINGS

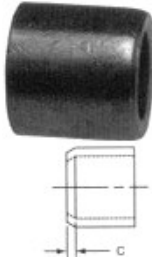
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. B Inches
750 Bulkhead Fitting C x C - Cast 	*1/2	0.48	1 1/4	1
	*3/4	0.77	1 9/32	1 1/4
	1	1.30	1 1/2	1 5/8
	*1 1/2	2.87	1 1/2	2 3/8
	*2	3.82	2 1/32	2 5/8

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. B Inches
750 - 3 Bulkhead Fitting C x F - Cast 	1/2	0.48	1 15/16	1
	3/4	0.79	2 1/16	1 1/4
	1	1.43	2 15/32	1 5/8
750 - 4 Bulkhead Fitting C x M - Cast 	*1/2	0.40	1 31/32	1
	*3/4	0.79	2 5/32	1 1/4


* Made to order. Consults price sheet for minimum quantities.



BUSHINGS

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
718 - 3 Flush Bushing Ftg x F - Cast 	*3/4 x 3/8	0.06	1 31/32
	1 x 1/2	0.13	31/32
	*1 1/4 x 3/4	0.18	1 1/32
	1 1/2 x 1	0.25	1 5/32
618 - 3 Flush Bushing Ftg x F - Wrot 	1/2 x 1/8	0.03	9/16
	1/2 x 1/4	0.03	9/16

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches
618 Flush Bushing Ftg x C - Wrot 	1/4 x 1/8	0.01	1/16
	3/8 x 1/4	0.01	1/16
	1/2 x 3/8	0.02	3/32
	1/2 x 1/4	0.04	1/4
	5/8 x 1/2	0.03	1/16
	3/4 x 5/8	0.22	3/16
	3/4 x 1/2	0.08	3/32
	3/4 x 3/8	0.11	7/16
	1 x 3/4	0.12	1/8
	1 x 1/2	0.22	15/32
	1 1/4 x 1	0.17	3/32
	1 1/2 x 1 1/4	0.22	5/32
	2 x 1 1/2	0.66	1/8

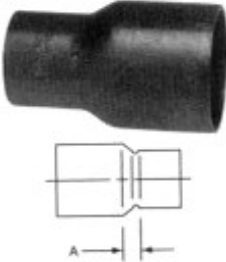
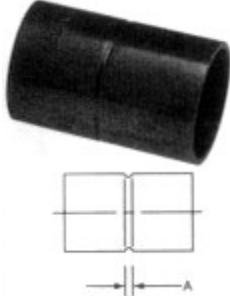

CAPS

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. N Inches
617 Tube Cap C - Wrot 	1/8	0.01	1/32
	1/4	0.01	3/32
	3/8	0.01	3/32
	1/2	0.02	3/32
	5/8	0.03	1/8
	3/4	0.04	1/8
	1	0.07	5/32
	1 1/4	0.10	3/32
	1 1/2	0.16	1/8
	2	0.27	5/32
	2 1/2	0.50	7/32
3	0.78	7/32	
4	1.66	1/4	

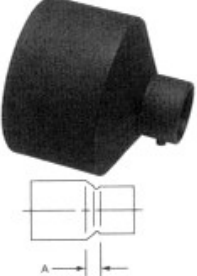
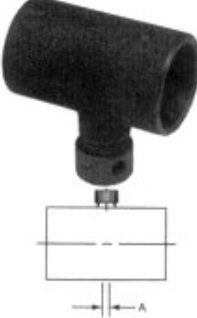

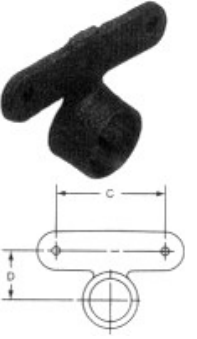
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. N Inches
717 Tube Cap C - Cast 	5	5.48	7/16
	6	9.07	17/32
717 - D Drain Cap - Cast 	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
	*1/2	0.06	21/32
	*3/4	0.10	21/32
	*1	0.16	11/16

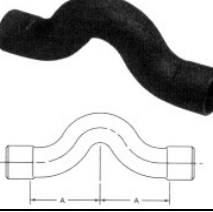


*Made to order. Consult price sheet for minimum order quantities.

COUPLINGS

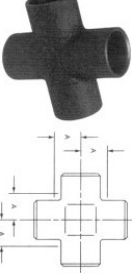
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
600 Reducing Coupling C x C – Wrot 	1/8x 3/16OD	0.01	5/32	600 – RS Coupling with Rolled Tube Stop C x C – Wrot 	1/8 OD	0.01	1/16
	5/16OD x1/8	0.01	3/16		3/16 OD	0.01	3/32
	1/4x5/16OD	0.01	3/16		1/8	0.01	1/16
	1/4 x 1/8	0.01	3/16		5/16 OD	0.01	3/32
	3/8 x 1/4	0.02	3/16		1/4	0.01	1/16
	*3/8x5/16OD	0.01	1/4		3/8	0.01	3/32
	3/8 x 1/8	0.01	1/4		1/2	0.03	3/32
	1/2 x 3/8	0.03	3/16		5/8	0.04	3/32
	1/2 x 1/4	0.02	1/4		3/4	0.06	3/32
	1/2 x 1/8	0.03	11/32		7/8	0.09	3/32
	5/8 x 1/2	0.05	3/16		1	0.11	3/32
	5/8 x 3/8	0.04	11/32		1 1/4	0.16	1/8
	5/8 x 1/4	0.03	13/32		1 1/2	0.23	1/8
	3/4 x 5/8	0.07	3/16		2	0.41	1/8
	3/4 x 1/2	0.06	9/32		2 1/2	0.65	1/8
	3/4 x 3/8	0.06	3/8		3	0.93	1/8
	3/4 x 1/4	0.05	11/32		3 1/2	1.45	5/32
	1 x 3/4	0.11	11/32		4	1.93	7/32
	1 x 5/8	0.09	3/8				
	1 x 1/2	0.10	11/32				
	1 x 3/8	0.10	13/32				
	1 1/4 x 1	0.16	5/16				
	1 1/4 x 3/4	0.18	17/32				
	*1 1/4 x 5/8	0.18	5/8				
	1 1/4 x 1/2	0.14	7/16				
	1 1/2 x 1 1/4	0.23	5/16				
	1 1/2 x 1	0.22	9/16				
	1 1/2 x 3/4	0.20	3/8				
	1 1/2 x 1/2	0.19	1/2				
	2 x 1 1/2	0.41	9/16				
2 x 1 1/4	0.35	11/16					
2 x 1	0.37	7/16					
2 x 3/4	0.34	17/32					
2 x 1/2	0.35	23/32					
2 1/2 x 2	0.59	9/16					
2 1/2 x 1 1/2	0.65	11/16					
2 1/2 x 1 1/4	0.65	13/16					
2 1/2 x 1	0.73	29/32					
3 x 2 1/2	0.98	1/2					
3 x 2	1.06	15/16					
3 x 1 1/2	1.04	1 1/32					
3 1/2 x 3	1.52	1/2					
*4 x 3 1/2	2.12	19/32					
4 x 3	2.08	27/32					
4 x 2 1/2	2.11	1					
4 x 2	2.16	1 1/4					
5 x 4	3.50	3 31/32					
5 x 3	3.18	1 15/32					
5 x 2 1/2	3.50	13/16					
5 x 2	3.09	2 1/32					
6 x 5	5.70	1 1/8					
6 x 4	5.24	1 1/2					
6 x 3	5.04	2					
6 x 2 1/2	5.13	2 1/4					
6 x 2	4.89	2 1/2					
8 x 6	13.06	1 19/32					
8 x 4	12.22	2 19/32					
8 x 3	11.79	3 3/32					
8 x 2 1/2	12.64	3 3/8					
				601 Coupling without Stop C x C – Wrot 	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
					*5/16 OD	0.01	21/32
					*1/4	0.01	11/16
					*3/8	0.01	27/32
					1/2	0.03	1
					*5/8	0.04	1 11/32
					3/4	0.06	1 19/32
					1	0.11	1 29/32
					1 1/4	0.16	2 1/16
					1 1/2	0.23	2 5/16
					2	0.41	2 13/16
					2 1/2	0.64	2 15/16
					3	0.86	3 5/16
				*3 1/2	1.40	3 13/16	
				4	1.84	4 5/16	
				5	3.50	5 5/16	
				6	5.60	6 3/16	
				8	13.68	8 3/32	

*Made to order. Consult price sheet for minimum order quantities.

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
701 Reducing Coupling C x C – Cast 	3 x 1 1/4 3 x 1	1.35 1.64	23/32 27/32
701 – D Drain Coupling C x C – Cast 	1/2 3/4 1	0.08 0.14 0.22	1/4 1/4 1/4
702 Eccentric Coupling C x C – Cast 	*3/4 x 1/2 *1 x 3/4 *1 x 1/2 *1 1/4 x 1 *1 1/4 x 3/4	0.10 0.18 0.21 0.25 0.24	17/32 1/4 9/32 1/4 9/32
724 – 5 – A Hy – Set Hanger Coupling C – Cast 	Nom. Size 1/2 3/4 1	Approx. Net Wt./Lbs. 0.05 0.09 0.13	Dim. C Inches 1 5/8 1 5/8 1 5/8 Dim. D Inches 23/32 27/32 1

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
736 Cross-Over Coupling C x C – Cast 	1/2 3/4	0.27 0.60	1 7/16 1 29/32
7701- DW Deep Well Coupling F x F – Cast 	*1 *1 1/4	0.78 0.97	2 1/2 2 1/2
7701 – DWHP Deep Well Coupling “Lead Free” F x F – Cast 	1 1 1/4	0.78 0.97	2 1/2 2 1/2

CROSSES



Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
735 Cross C x C x C x C – Cast 	*3/8 1/2 3/4 1 1 1/4 1 1/2 2 *2 1/2	0.09 0.15 0.30 0.54 0.78 1.05 2.00 2.96	3/8 7/16 9/16 23/32 7/8 1 1 1/4 1 1/2

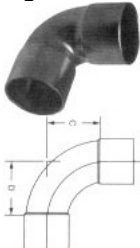



*Made to order. Consult price sheet for minimum order quantities.

ELBOWS


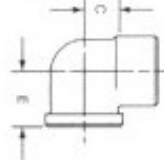
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. D Inches	Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. D Inches
606 45° Elbow C x C – Wrot 	1/8	0.01	1/4	1/4	607 90° Elbow – Close Rough C x C – Wrot 	1/8	0.01	13/32	13/32
	*1/4	0.02	9/32	9/32		1/4	0.02	9/32	9/32
	3/8	0.03	3/16	3/16		3/8	0.03	1/2	1/2
	1/2	0.04	9/32	9/32		1/2	0.04	3/8	3/8
	5/8	0.09	15/32	15/32		1/2x3/8	0.04	9/16	21/32
	3/4	0.10	11/32	11/32		3/4	0.10	17/32	17/32
	*7/8	0.20	11/16	11/16		3/4x5/8	0.12	29/32	7/8
	1	0.16	3/8	3/8		3/4x1/2	0.10	17/32	3/4
	1 1/4	0.25	17/32	17/32		1	0.21	23/32	23/32
	1 1/2	0.35	19/32	19/32		1 x 3/4	0.16	23/32	5/8
	2	0.65	25/32	25/32		1 1/4	0.31	1 1/32	1 1/32
	2 1/2	1.07	29/32	29/32		1 1/4x1	0.31	1 5/8	115/32
	3	1.58	1 1/8	1 1/8		1 1/2	0.46	1 7/32	1 7/32
4	3.35	1 7/16	1 7/16	1 1/2x1 1/4	0.35	1 5/32	1 3/32		
5	11.05	1 9/16	1 9/16	2	0.84	1 1/2	1 1/2		
6	16.95	2	2	2 x 1 1/2	0.58	1 7/16	1 1/4		
8	23.00	2 9/32	2 9/32	2 1/2	1.41	1 27/32	127/32		
606 – 2 45° Fitting Elbow Ftg x C – Wrot 	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	Dim. C Inches	707 90° Elbow – Close Rough C x C – Cast 	1 1/4x1	0.42	1 5/8	115/32
	1/4	0.02	9/16	1/4		1 1/4x3/4	0.34	9/16	13/16
	1/2	0.04	3/4	7/32		1 1/4x1/2	0.28	15/32	27/32
	5/8	0.08	1 1/8	13/32		1 1/2 x 1	0.54	11/16	1
	3/4	0.10	1 1/16	5/16		1 1/2x3/4	0.42	19/32	31/32
	1	0.16	1 7/32	15/32		*1 1/2x1/2	0.40	5/8	29/32
	1 1/4	0.25	1 19/32	17/32		2x1 1/4	0.86	7/8	1 1/4
	1 1/2	0.35	1 25/32	19/32		2 x 1	0.78	3/4	1 1/4
	2	0.65	2 3/16	25/32		*2x 3/4	0.69	5/8	1 1/4
	2 1/2	1.07	2 3/16	29/32		2 1/2x2	2.16	1 3/16	19/32
3	1.55	2 19/32	1 5/32	*3x 2 1/2	2.26	1 11/16	1 1/2		
706 – 2 45° Fitting Elbow Ftg x C – Cast 	4	4.31	3 11/32	15/16	607 – I 90° Elbow – Intermediate Radius C x C – Wrot 	1/2	0.06	19/32	
				5/8		0.09	7/8		
				3/4		0.14	13/16		
				1		0.24	1 1/16		


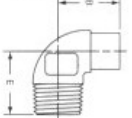
*Made to order. Consult price sheet for minimum order quantities.


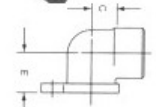
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. D Inches
607 – LT 90° Elbow – Long Radius C x C – Wrot 	3/16OD	0.01	13/32	13/32
	1/8	0.01	13/32	13/32
	5/16OD	0.02	9/16	9/16
	1/4	0.02	17/32	17/32
	1/4x1/8	0.01	19/32	1/2
	3/8	0.04	23/32	23/32
	1/2	0.08	7/8	7/8
	1/2x3/8	0.06	13/16	13/16
	1/2x1/4	0.03	25/32	21/32
	5/8	0.10	1 3/32	1 3/32
	5/8x1/2	0.09	1 1/16	1 1/16
	3/4	0.16	1 1/8	1 1/8
	3/4x5/8	0.13	1 1/4	1 3/32
	3/4x1/2	0.10	1 1/8	1 1/16
	7/8	0.28	1 19/32	119/32
	1	0.28	1 7/16	1 7/16
	1 x 3/4	0.20	1 1/4	1 1/8
*1 x 5/8	0.15	1 13/32	1 3/32	
*1 x 1/2	0.13	1 9/32	1 1/16	
1 1/4	0.42	1 7/8	1 7/8	
*1 1/4 x 1	0.33	1 25/32	1 1/2	
1 1/2	0.66	2 1/4	2 1/4	
*1 1/2 x 1 1/4	0.49	2 1/4	2 3/32	
2	1.23	2 15/16	215/16	
2 1/2	1.96	3 11/16	311/16	
3	2.93	4 1/32	4 1/32	
4	5.95	5 1/4	5 1/4	
607 – 2 90° Fitting Elbow – Close Rough Ftg x C – Wrot 	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	Dim. C Inches
	1/4	0.02	3/4	3/8
	3/8	0.03	15/16	1/2
	1/2	0.04	31/32	3/8
	5/8	0.07	1 7/32	17/32
	3/4	0.10	1 11/32	17/32
	1	0.20	1 3/4	27/32
	1 1/4	0.33	2 1/8	1 1/32
	1 1/2	0.46	2 13/32	1 7/32
	2	0.84	2 27/32	1 1/2
	2 1/2	1.39	3 15/32	129/32
3	2.10	3 13/16	2 3/32	
4	4.00	4 3/4	225/32	

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	Dim. C Inches
607 – 2 – I 90° Fitting Elbow – Intermediate Radius Ftg x C 	1/2	0.06	1 5/32	19/32
	5/8	0.09	1 9/16	7/8
	3/4	0.14	1 5/8	13/16
	1	0.24	2 1/32	1 1/16
607 – 2 – LT 90° Fitting Elbow – Long Radius Ftg x C – Wrot 	*1/8	0.01	13/32	1/2
	1/4	0.02	1 1/8	3/4
	3/8	0.05	1 1/8	7/8
	*3/8x1/2	0.06	1 1/8	29/32
	1/2	0.08	1 9/16	1 3/32
	*1/2x3/8	0.06	1 5/16	13/16
	*1/2x1/4	0.03	1 1/4	5/8
	5/8	0.10	1 25/32	1 3/32
	3/4	0.16	1 15/16	1 1/8
	1	0.31	2 1/2	121/32
	1 1/4	0.43	2 29/32	1 7/8
	1 1/2	0.66	2 13/32	2 1/4
	*1 1/2x1 1/4	0.50	3 3/8	2 3/32
2	1.27	4 11/32	231/32	
2 1/2	2.16	5 7/32	311/16	
3	3.10	5 3/4	4 1/32	
607 – 2 – 2 90° Fitting Elbow – Close Rough Ftg x Ftg – Wrot 	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	
	1/2	0.04	1 1/16	
	3/4	0.12	1 15/32	
	1	0.20	1 23/32	
	*1 1/4	0.33	2 1/8	
	1 1/2	0.46	2 13/32	
	*2	0.82	2 27/32	
3	2.12	3 7/8		
607 – 2 – 2 – LT 90° Fitting Elbow – Long Radius Ftg x Ftg – Wrot 	*1/8	0.01	11/16	
	1/4	0.02	27/32	
	3/8	0.04	1 1/8	
	1/2	0.08	1 19/32	
	5/8	0.10	1 11/16	
	3/4	0.16	1 15/16	
	1	0.31	2 1/2	
	1 1/4	0.43	2 29/32	
	1 1/2	0.65	3 7/16	
2	1.25	4 11/32		

*Made to order. Consult price sheet for minimum order quantities.


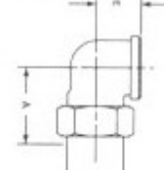
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. E Inches
707 - 3 90° Elbow C x F - Cast  	*1/4	0.06	13/32	9/16
	*3/8	0.09	7/16	11/16
	*3/8x1/2	0.13	9/16	13/16
	1/2	0.12	7/16	13/16
	1/2x3/4	0.18	11/16	15/16
	1/2 x3/8	0.09	1/2	13/16
	*1/2x1/4	0.10	3/8	23/32
	3/4	0.18	21/32	15/16
	3/4 x 1	0.35	13/16	1 1/8
	3/4x1/2	0.20	9/16	15/16
	1	0.43	25/32	1 1/4
	1 x 3/4	0.35	11/16	1 3/16
	1 x 1/2	0.26	9/16	1 1/8
	1 1/4	0.67	1	1 1/2
	*1 1/4x1	0.53	13/16	1 7/16
*1 1/4 x 3/4	0.47	9/16	1 11/16	
1 1/2	0.89	1 1/8	1 5/8	
2	1.46	1 3/8	1 15/16	


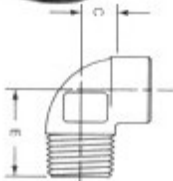
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	Dim. E Inches
707 - 2 - 4 90° Fitting Elbow Ftg x M - Cast  	*1/2	0.12	7/8	25/32
	*3/4	0.22	1 7/16	111/32
	*1	0.40	1 27/32	119/32


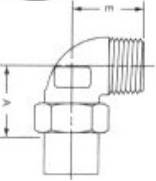
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. E Inches
707 - 3 - 5 - A 90° Hy - Set Elbow C x F - Cast  	1/2	0.21	9/16	7/8

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. C Inches	Dim. E Inches
707 - 3 - 5 90° Drop Elbow C x F - Cast  	*3/8	0.12	11/32	7/16	11/16
	*3/8 x 1/2	0.18	11/32	9/16	13/16
	1/2	0.15	13/32	9/16	7/8
	1/2 x 3/8	0.17	3/8	1/2	13/16
	3/4	0.28	17/32	21/32	15/16
	3/4 x 1/2	0.24	17/32	9/16	15/16
	1	0.49	5/8	25/32	1 1/4

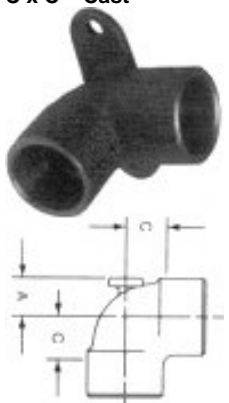
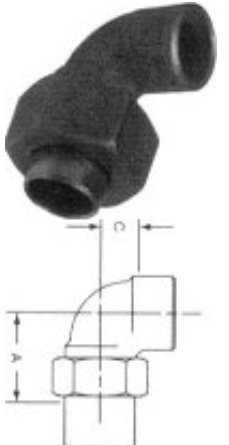
Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. C Inches	Dim. E Inches
*3/8	0.12	11/32	7/16	11/16
*3/8 x 1/2	0.18	11/32	9/16	13/16
1/2	0.15	13/32	9/16	7/8
1/2 x 3/8	0.17	3/8	1/2	13/16
3/4	0.28	17/32	21/32	15/16
3/4 x 1/2	0.24	17/32	9/16	15/16
1	0.49	5/8	25/32	1 1/4

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. E Inches
707 - 3 - 6 90° Union Elbow C x F - Cast  	*1/2	0.31	1 1/8	7/8
	3/4	0.49	1 7/16	1
	*1	0.79	1 7/8	1 1/4

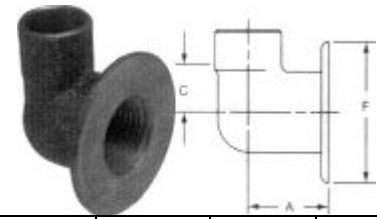
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. E Inches
707 - 4 90° Elbow C x M - Cast  	*3/8	0.08	5/16	7/8
	1/2	0.12	7/16	1 5/32
	1/2 x3/4	0.18	9/16	1 5/32
	*1/2 x 3/8	0.10	5/16	15/16
	3/4	0.21	9/16	1 11/32
	*3/4 x 1	0.33	21/32	1 13/32
	3/4x 1/2	0.18	7/16	1 7/32
	1	0.43	23/32	1 5/8
	1 1/4	0.58	7/8	1 11/16
	1 1/2	0.81	1	1 31/32
	2	1.38	1 1/4	2 9/32

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. E Inches
707 - 4 - 6 90° Union Elbow C x M - Cast  	3/8	0.21	1 3/32	1 3/16
	1/2	0.30	1 1/32	1 1/2
	3/4	0.49	1 5/16	1 13/16
	1	0.72	1 23/32	1 5/8
	*1 1/4	1.16	1 3/4	1 27/32
	*1 1/2	1.59	2 3/16	2 3/16
	*2	2.98	2 21/32	2 1/2

*Made to order. Consult price sheet for minimum order quantities.

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. C Inches
707 - 5 90° Drop Elbow C x C - Cast 	1/2	0.13	13/32	7/16
	3/4	0.24	17/32	9/16
707 - 6 90° Union Elbow C x C - Cast 	*3/8	0.17	31/32	5/16
	1/2	0.24	1	7/16
	3/4	0.39	1 17/32	9/16
	*1	0.64	1 21/32	23/32
	*1 1/4	1.07	1 19/32	23/32

708
90° Flanged Sink Elbow
C x F - Cast

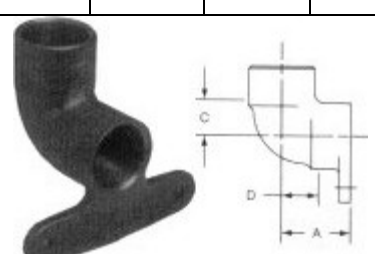


Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. C Inches	Dim. F Inches
1/2	0.20	7/8	9/16	1 3/4
*3/4	0.30	1	11/16	1 3/4

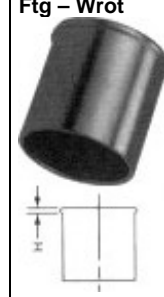
Nom. Size	Approx. Net Wt./Lbs.	Dim. C Inches	Dim. D Inches
1x3/4 x3/4	0.33	3/4	21/32

PLUGS

707 - 5 - A
90° Hy - Set Elbow
C x C - Cast




Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches	Dim. C Inches	Dim. D Inches
1/2	0.13	31/32	7/16	15/32
*3/4	0.21	1 5/16	9/16	9/16

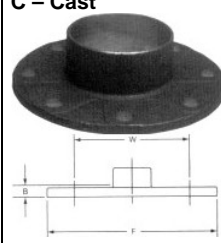
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. H Inches
616 Fitted Plug Ftg - Wrot 	*3/8	0.01	1/16
	1/2	0.02	3/32
	3/4	0.04	1/8

*Made to order. Consult price sheet for minimum order quantities.

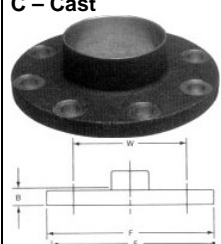
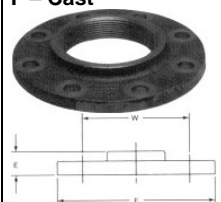
FITTING REDUCERS

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
600 - 2 Fitting Reducer Ftg x C - Wrot 	1/4 x 1/8	0.01	15/32
	3/8 x 1/4	0.01	19/32
	3/8 x 1/8	0.01	25/32
	1/2 x 3/8	0.03	11/16
	1/2 x 1/4	0.02	25/32
	5/8 x 1/2	0.04	7/8
	5/8 x 3/8	0.04	31/32
	*5/8 x 1/4	0.03	1 1/32
	3/4 x 5/8	0.06	31/32
	3/4 x 1/2	0.06	1 1/8
	3/4 x 3/8	0.05	1 1/8
	*3/4 x 1/4	0.05	1 3/32
	1 x 3/4	0.10	1 7/32
	1 x 5/8	0.09	1 3/8
	1 x 1/2	0.09	1 1/4
	*1 x 3/8	0.08	1 9/32
	1 1/4 x 1	0.15	1 5/16
	1 1/4 x 3/4	0.16	1 1/2
	1 1/4 x 1/2	0.13	1 3/8
	1 1/2 x 1 1/4	0.23	1 13/32
	1 1/2 x 1	0.21	1 5/8
	1 1/2 x 3/4	0.20	1 7/8
	1 1/2 x 1/2	0.16	1 19/32
	2 x 1 1/2	0.40	1 31/32
	2 x 1 1/4	0.34	2 3/32
	2 x 1	0.35	1 27/32
	2 x 3/4	0.35	1 27/32
	2 x 1/2	0.34	1 31/32
	2 1/2 x 2	0.65	1 31/32
	2 1/2 x 1 1/2	0.65	2 3/8
	2 1/2 x 1 1/4	0.60	2 7/32
	2 1/2 x 1	0.78	2 9/32
	3 x 2 1/2	1.03	2 1/4
	3 x 2	0.99	2 9/16
3 x 1 1/2	1.06	2 19/32	
3 x 1 1/4	1.29	3 1/4	
3 1/2 x 3	1.48	2 11/32	
4 x 3 1/2	2.09	2 5/8	
4 x 3	2.00	3 1/32	
4 x 2 1/2	1.95	3 1/32	
4 x 2	1.95	3 13/32	
5 x 4	3.30	3 9/16	
5 x 3	2.97	4 1/16	
5 x 2 1/2	3.30	4 11/32	
5 x 2	2.88	4 11/16	
6 x 5	5.56	4 3/16	
6 x 4	5.09	4 9/16	
6 x 3	4.67	5 1/16	
6 x 2 1/2	4.47	5 11/32	
6 x 2	4.51	5 19/32	
8 x 6	12.33	5 15/32	
8 x 5	10.35	5 15/16	
8 x 4	11.10	6 7/16	
8 x 3	10.63	6 15/16	
8 x 2 1/2	11.41	7 3/16	
8 x 2	10.86	7 7/16	

FLANGES CLASS 125


Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	Dim. F Inches	Dim. W Inches
741 Companion Flange C - Cast 	*1/2	0.49	1/8	3 1/2	2 3/8
	*3/4	0.71	1/8	3 7/8	2 3/4
	1	0.99	1/8	4 1/4	3 1/8
	1 1/4	1.14	1/8	4 5/8	3 1/2
	1 1/2	1.76	1/8	5	3 7/8
	2	2.76	1/8	6	4 3/4
	2 1/2	3.65	1/8	7	5 1/2
	3	4.81	1/8	7 1/2	6
	4	6.46	1/8	9	7 1/2
	5	9.04	1/8	10	8 1/2
6	12.68	1/8	11	9 1/2	
8	24.50	1/8	13 1/2	11 3/4	


FLANGES CLASS 150

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches	Dim. F Inches	Dim. W Inches
771 Companion Flange C - Cast 	*3/4	1.15	1/8	3 7/8	2 3/4
	1	1.59	1/8	4 1/4	3 1/8
	1 1/4	1.91	1/8	4 5/8	3 1/2
	1 1/2	2.43	1/8	5	3 7/8
	2	3.67	1/8	6	4 3/4
	2 1/2	5.78	1/8	7	5 1/2
	3	7.22	1/8	7 1/2	6
	4	10.35	1/8	9	7 1/2
	5	15.69	1/8	10	8 1/2
	6	17.91	1/8	11	9 1/2
775 Threaded Companion Flange F - Cast 	*2	4.31	1	6	4 3/4
	2 1/2	6.30	1 1/8	7	5 1/2
	3	7.13	1 3/16	7 1/2	6
	4	10.20	1 5/16	9	7 1/2


*Made to order. Consult price sheet for minimum order quantities.


RETURN BENDS

Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. E Inches	Dim. J Inches
638 Return Bend C x C – Wrot 	1/8	0.02	21/32	1
	1/4	0.04	21/32	1 1/2
	3/8	0.08	1 1/32	1 1/2
	1/2	0.13	1 1/2	2
	3/4	0.26	1 19/32	2 1/2
	1	0.44	2 3/32	3
	1 1/4	0.70	2 3/4	4
	1 1/2	1.04	3 5/32	4 1/2
	2	1.92	3 29/32	5 1/2


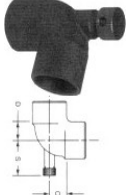
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. E Inches	Dim. J Inches
739 Return Bend – Closed C x C – Cast 	*1/2	0.14	7/8	1
	*3/4	0.29	1 5/32	1 5/16
	*1	0.78	1 25/32	1 3/4


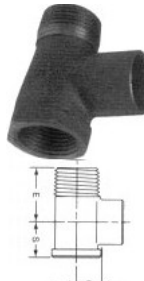
STRAPS

Description	Size	Approx. Net Wt./Lbs.
623 Copper Hanger Strap 	3/4" Wide x 25 Ft. Roll	1.93

Description	Nom. Size	Approx. Net Wt./Lbs.
624 Tube Strap 	1/8	0.01
	1/4	0.01
	3/8	0.01
	1/2	0.01
	5/8	0.02
	3/4	0.02
	1	0.02
	1 1/4	0.03
	1 1/2	0.03
	2	0.04

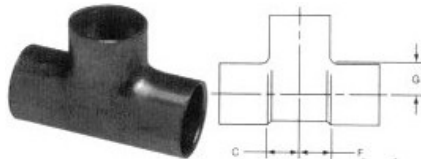
TEES

Description	Nom. Size	Approx Net Wt./Lb	Dimensions Inches		
			C	D	E
705 Baseboard Tee C x F x C – Cast 	1/2 x 1/8 x 3/4	0.15	7/16	9/16	11/16
	1/2 x 1/8 x 1/2	0.11	7/16	7/16	9/16
	*3/4 x 1/8 x 1	0.29	5/8	3/4	13/16
	3/4 x 1/8 x 3/4	0.19	9/16	9/16	11/16
	1 x 1/8 x 1	0.32	23/32	23/32	3/4
	1 1/4 x 1/8 x 1 1/4	0.51	7/8	7/8	15/16
705 – D Vent Elbow C x C – Cast 	Nom. Size	Approx Net Wt./Lb	Dimensions Inches		
			C	D	S
	1/2	0.10	7/16	7/16	25/32
	3/4	0.20	9/16	9/16	29/32
	1	0.31	23/32	23/32	11/32

Description	Nom. Size	Approx Net Wt./Lbs	Dimensions Inches		
			C	E	S
710 – 3 Tee F x F x C – Cast 	1/2	0.20	9/16	7/8	7/8
	3/4	0.37	11/16	1	1
	3/4 x 3/4 x 1/2	0.31	11/16	31/32	31/32
	3/4 x 1/2 x 3/4	0.29	11/16	1	15/16
	3/4 x 1/2 x 1/2	0.27	11/16	31/32	7/8
710 – 3 – 4 Tee M x F x C – Cast 	Nom. Size	Approx Net Wt./Lb	Dimensions Inches		
			C	D	S
	3/4	0.34	11/16	111/32	1
	*3/4 x 3/4 x 1/2	0.34	11/16	1 7/32	31/32

*Made to order. Consult price sheet for minimum order quantities.

611
Tee
C x C x C - Wrot



Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches		
		C	F	G
3/16 OD	0.01	7/32	7/32	7/32
1/8	0.02	1/4	1/4	7/32
1/8 x 1/8 x 1/4	0.02	13/32	13/32	1/4
*1/8x 1/8 x 3/16 OD	0.01	1/4	1/4	5/16
1/8 x 3/16 OD x 1/8	0.01	1/4	11/32	7/32
5/16 OD	0.02	3/8	3/8	5/16
5/16ODx5/16ODx1/4	0.02	3/8	3/8	1/4
5/16ODx5/16ODx1/8	0.02	3/8	3/8	13/32
*5/16ODx1/8x5/16OD	0.02	3/8	13/32	5/16
*5/16ODx1/8X1/8	0.02	3/8	13/32	13/32
1/4	0.02	5/16	5/16	1/4
1/4x1/4x1/2	0.06	19/32	19/32	3/8
1/4 x 1/4 x 3/8	0.04	17/32	17/32	11/32
*1/4 x 1/4 x 5/16OD	0.02	5/16	5/16	5/16
1/4 x 1/4 x 1/8	0.02	5/16	5/16	13/32
*1/4 x 1/4 x3/16 OD	0.02	5/16	5/16	7/16
*1/4 x 5/16ODx1/4	0.02	5/16	3/8	1/4
*1/4x5/16ODx5/16OD	0.02	5/16	13/32	1/4
1/4 x 1/8 x 1/4	0.02	5/16	13/32	1/4
1/4 x 1/8 x 1/8	0.02	5/16	13/32	3/8
3/8	0.04	11/32	11/32	11/32
3/8 x 3/8 x 1/2	0.07	17/32	17/32	3/8
3/8 x 3/8 x 1/4	0.04	11/32	11/32	15/32
*3/8 x 3/8 x 5/16OD	0.04	11/32	11/32	11/32
3/8 x 3/8 x 1/8	0.04	11/32	11/32	11/32
*3/8 x 3/8 x 3/16OD	0.04	11/32	11/32	11/32
3/8 x 1/4 x 3/8	0.04	11/32	17/32	11/32
3/8 x 1/4 x 1/4	0.04	11/32	17/32	15/32
3/8 x 1/4 x 1/8	0.04	11/32	17/32	9/16
*3/8 x 1/8 x 3/8	0.04	11/32	19/32	11/32
*3/8 x 1/8 x 1/4	0.04	11/32	19/32	15/32
3/8 x 1/8 x 1/8	0.04	11/32	19/32	19/32
1/2	0.06	11/32	11/32	11/32
1/2 x 1/2 x 1	0.29	1	1	21/32
1/2 x 1/2 x 3/4	0.12	17/32	17/32	11/32
1/2 x 1/2 x 5/8	0.11	5/8	5/8	7/16
1/2 x 1/2 x 3/8	0.07	5/16	5/16	13/32
1/2 x 1/2 x 1/4	0.06	5/16	5/16	9/16
*1/2 x 3/8 x 1/2	0.07	7/16	17/32	3/8
*1/2 x 3/8 x 3/8	0.06	5/16	17/32	13/32
*1/2 x 3/8 x 1/4	0.06	5/16	17/32	17/32
1/2 x 1/4 x 3/8	0.06	5/16	5/8	9/16
5/8	0.12	7/16	7/16	7/16
5/8 x 5/8 x 3/4	0.15	23/32	23/32	1/2
*5/8 x 5/8 x 1/2	0.11	7/16	7/16	13/32
5/8 x 5/8 x 3/8	0.09	7/16	7/16	5/8
*5/8 x 5/8 x 1/4	0.09	7/16	7/16	3/4

*5/8 x 1/2 x 5/8	0.10	7/16	5/8	7/16
*5/8 x 1/2 x 1/2	0.09	7/16	19/32	13/32
*5/8 x 3/8 x 5/8	0.10	7/16	3/4	7/16
*5/8 x 3/8 x 1/2	0.09	7/16	3/4	13/32
*5/8 x 3/8 x 3/8	0.09	7/16	3/4	5/8
3/4	0.15	1/2	1/2	1/2
3/4 x 3/4 x 1	0.22	23/32	23/32	1/2
3/4 x 3/4 x 5/8	0.16	17/32	17/32	11/16
3/4 x 3/4 x 1/2	0.12	7/16	7/16	17/32
3/4 x 3/4 x 3/8	0.12	7/16	7/16	21/32
3/4 x 3/4 x 1/4	0.12	13/32	13/32	23/32
*3/4 x 3/4 x 1/8	0.12	7/16	7/16	13/16
*3/4 x 5/8 x 3/4	0.15	17/32	11/16	1/2
3/4 x 5/8 x 5/8	0.15	17/32	23/32	11/16
3/4 x 1/2 x 3/4	0.15	17/32	25/32	1/2
3/4 x 1/2 x 1/2	0.12	13/32	19/32	1/2
*3/4 x 1/2 x 3/8	0.12	7/16	21/32	21/32
*3/4 x 3/8 x 3/4	0.15	17/32	17/32	1/2
3/4 x 3/8 x 1/2	0.12	7/16	23/32	17/32
*3/4 x 3/8 x 3/8	0.12	7/16	23/32	21/32
7/8	0.31	23/32	23/32	23/32
1	0.30	11/16	11/16	21/32
1 x 1 x 1 1/2	0.60	1 11/32	1 11/32	31/32
1 x 1 x 1 1/4	0.42	1	1	29/32
1 x 1 x 3/4	0.27	9/16	9/16	21/32
1 x 1 x 5/8	0.26	9/16	9/16	7/8
1 x 1 x 1/2	0.23	15/32	15/32	23/32
*1 x 1 x 3/8	0.23	15/32	15/32	29/32
1 x 1 x 1/4	0.23	15/32	15/32	1
1 x 3/4 x 1	0.29	11/16	7/8	21/32
1 x 3/4 x 3/4	0.26	9/16	23/32	3/4
1 x 3/4 x 1/2	0.22	15/32	21/32	23/32
1 x 1/2 x 1	0.29	11/16	1	21/32
1 x 1/2 x 3/4	0.27	9/16	13/16	3/4
1 x 1/2 x 1/2	0.22	15/32	25/32	23/32
1 1/4	0.43	7/8	7/8	29/32
1 1/4 x 1 1/4 x 2	1.19	1 29/32	1 29/32	1 1/32
1 1/4 x 1 1/4 x 1 1/2	0.60	1 3/16	1 3/16	29/32
1 1/4 x 1 1/4 x 1	0.45	25/32	25/32	29/32
1 1/4 x 1 1/4 x 3/4	0.37	21/32	21/32	3/4
1 1/4 x 1 1/4 x 1/2	0.30	1/2	1/2	25/32
*1 1/4 x 1 1/4 x 3/8	0.34	23/32	23/32	29/32
1 1/4 x 1 x 1 1/4	0.43	7/8	1	29/32
1 1/4 x 1 x 1	0.47	25/32	7/8	29/32
1 1/4 x 1 x 3/4	0.35	21/32	25/32	7/8
1 1/4 x 1 x 1/2	0.30	1/2	5/8	29/32
1 1/4 x 3/4 x 1 1/4	0.42	7/8	1 5/32	29/32
1 1/4 x 3/4 x 1	0.45	25/32	1 1/32	29/32
1 1/4 x 3/4 x 3/4	0.37	21/32	15/16	7/8
*1 1/4 x 3/4 x 1/2	0.30	1/2	3/4	29/32
1 1/4 x 1/2 x 1 1/4	0.41	7/8	1 3/16	29/32
1 1/2	0.61	31/32	31/32	29/32
1 1/2 x 1 1/2 x 2	1.27	1 3/4	1 3/4	1 1/32

*Made to order. Consult price sheet for minimum order quantities.

Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches							
		C	F	G					
1 1/2 x 1 1/2 x 1 1/4	0.62	29/32	29/32	1 1/16	2 1/2 x 2 x 1	1.40	25/32	1 9/32	1 3/4
1 1/2 x 1 1/2 x 1	0.55	11/16	11/16	7/8	2 1/2 x 2 x 3/4	1.35	25/32	1 9/32	1 27/32
1 1/2 x 1 1/2 x 3/4	0.45	11/16	11/16	1 1/32	2 1/2 x 1 1/2 x 1 1/2	1.76	1 3/32	1 13/32	1 3/8
1 1/2 x 1 1/2 x 1/2	0.40	1/2	1/2	1 1/32	2 1/2 x 1 1/4 x 2 1/2	2.40	1 21/32	2 7/16	1 21/32
1 1/2 x 1 1/4 x 1 1/2	0.62	1 1/32	1 3/16	29/32	2 1/2 x 1 x 2 1/2	2.04	1 21/32	2 23/32	1 21/32
1 1/2 x 1 1/4 x 1 1/4	0.62	31/32	1 3/32	31/32	2 1/2 x 3/4 x 2 1/2	2.00	1 21/32	2 11/16	1 21/32
1 1/2 x 1 1/4 x 1	0.51	25/32	1	1 1/32	2 1/2 x 1/2 x 2 1/2	2.46	1 1/2	2 7/32	1 1/2
1 1/2 x 1 1/4 x 3/4	0.49	11/16	13/16	1 1/32	3	3.15	1 7/8	1 7/8	2 1/32
1 1/2 x 1 1/4 x 1/2	0.41	1/2	25/32	1 1/32	3 x 3 x 2 1/2	3.55	1 29/32	1 29/32	2 3/8
1 1/2 x 1 x 1 1/2	0.59	1 1/32	1 11/32	29/32	3 x 3 x 2	3.19	1 15/32	1 15/32	1 31/32
1 1/2 x 1 x 1 1/4	0.63	29/32	1 1/8	1 1/16	3 x 3 x 1 1/2	3.08	1 15/32	1 15/32	2 9/32
1 1/2 x 1 x 1	0.54	25/32	1 1/16	1 1/32	3 x 3 x 1 1/4	3.10	1 15/32	1 15/32	2 7/16
1 1/2 x 1 x 3/4	0.44	11/16	31/32	15/16	3 x 3 x 1	2.12	27/32	27/32	1 31/32
1 1/2 x 1 x 1/2	0.39	1/2	25/32	1 1/32	3 x 3 x 3/4	2.39	27/32	27/32	2 3/16
1 1/2 x 3/4 x 1 1/2	0.62	1 1/32	1 7/16	1 1/16	3 x 3 x 1/2	1.82	27/32	27/32	2 3/8
*1 1/2 x 3/4 x 1 1/4	0.58	29/32	1 11/32	1 1/16	3 x 2 1/2 x 3	3.08	1 7/8	2 3/8	1 31/32
1 1/2 x 3/4 x 1	0.54	25/32	1 1/4	1 1/32	3 x 2 1/2 x 2 1/2	3.12	1 29/32	2 11/32	2 5/32
1 1/2 x 3/4 x 3/4	0.47	11/16	1 3/32	29/32	3 x 2 1/2 x 2	2.28	1 15/32	1 27/32	1 31/32
*1 1/2 x 3/4 x 1/2	0.39	1/2	29/32	31/32	3 x 2 x 3	3.62	1 29/32	2 17/32	1 15/16
1 1/2 x 1/2 x 1 1/2	0.62	1 1/32	1 13/32	31/32	3 x 2 x 2 1/2	3.56	1 29/32	2 9/16	2 5/16
2	1.30	1 9/32	1 9/32	1 1/32	3 x 2 x 2	3.22	1 15/32	1 31/32	1 31/32
2 x 2 x 2 1/2	2.34	2	2	1 21/32	3 x 1 1/2 x 3	3.13	1 29/32	2 25/32	2 3/32
2 x 2 x 1 1/2	1.21	1 3/32	1 3/32	1 3/8	3 x 1 1/4 x 3	3.63	1 29/32	2 25/32	1 15/16
2 x 2 x 1 1/4	1.12	15/16	15/16	1 11/32	3 x 1 x 3	3.20	1 31/32	2 19/32	2 3/16
2 x 2 x 1	0.90	27/32	27/32	1 1/4	3 x 3/4 x 3	3.55	1 31/32	2 29/32	2 3/16
2 x 2 x 3/4	0.88	19/32	19/32	1 1/4	3 1/2	5.20	2 17/32	2 17/32	2 17/32
2 x 2 x 1/2	0.77	19/32	19/32	1 5/16	4	8.12	2 13/32	2 13/32	2 17/32
2 x 1 1/2 x 2	1.27	1 9/32	1 5/8	1 11/32	4 x 4 x 3	6.70	2 1/32	2 1/32	2 21/32
2 x 1 1/2 x 1 1/2	1.18	1 3/32	1 15/32	1 3/8	4 x 4 x 2 1/2	6.65	2 1/32	2 1/32	3 5/32
2 x 1 1/2 x 1 1/4	1.12	15/16	1 9/32	1 11/32	4 x 4 x 2	5.82	1 15/32	1 15/32	2 7/16
2 x 1 1/2 x 3/4	0.83	21/32	15/16	1 7/32	4 x 4 x 1 1/2	3.94	1 11/32	1 11/32	2 17/32
2 x 1 1/2 x 1/2	0.79	11/16	29/32	1 5/16	4 x 4 x 1 1/4	4.04	1 11/32	1 11/32	2 29/32
2 x 1 1/4 x 2	1.33	1 9/32	1 7/8	1 9/32	4 x 4 x 1	3.72	1	1	2 9/16
2 x 1 1/4 x 1 1/2	1.14	1 3/32	1 7/16	1 11/32	4 x 4 x 3/4	3.70	1	1	2 11/16
2 x 1 1/4 x 1 1/4	1.19	15/16	1 11/32	1 11/32	4 x 4 x 1/2	3.58	1	1	3
2 x 1 1/4 x 1	0.90	27/32	1 9/32	1 11/32	4 x 3 x 4	7.05	2 25/32	3 7/32	2 17/32
*2 x 1 1/4 x 3/4	0.85	21/32	1	1 5/16	4 x 3 x 3	5.03	2 1/32	2 15/32	2 15/32
2 x 1 x 2	1.32	1 1/8	1 25/32	1 11/32	4 x 3 x 2 1/2	5.04	2 1/32	2 15/32	2 29/32
2 x 1 x 1	0.89	27/32	1 9/32	1 11/32	4 x 3 x 2	5.87	1 15/32	1 31/32	2 7/16
2 x 3/4 x 2	1.31	1 9/32	2 3/16	1 9/32	4 x 2 1/2 x 4	7.19	2 25/32	3 15/32	2 27/32
2 x 1/2 x 2	1.35	1 9/32	2 3/8	1 1/32	4 x 2 x 4	7.08	2 25/32	3 19/32	2 27/32
2 1/2	2.40	1 5/8	1 5/8	1 5/8	5	8.29	2 27/32	2 27/32	3 13/32
2 1/2 x 2 1/2 x 2	1.97	1 5/16	1 5/16	1 21/32	5 x 5 x 4	7.09	2 7/32	2 9/32	3 3/16
2 1/2 x 2 1/2 x 1 1/2	1.53	1 3/32	1 3/32	1 21/32	5 x 5 x 3	5.91	1 25/32	1 25/32	3 3/16
2 1/2 x 2 1/2 x 1 1/4	1.72	1 3/32	1 3/32	1 27/32	5 x 5 x 2 1/2	5.90	1 5/16	1 5/16	3 3/16
2 1/2 x 2 1/2 x 1	1.34	25/32	25/32	1 11/16	5 x 5 x 2	5.29	1 1/16	1 1/16	3 3/16
2 1/2 x 2 1/2 x 3/4	1.34	25/32	25/32	1 13/16	5 x 5 x 1 1/2	4.87	1 1/32	1 1/32	3 3/16
2 1/2 x 2 1/2 x 1/2	1.34	25/32	25/32	2 1/8	5 x 5 x 1 1/4	4.50	11/16	11/16	3 3/16
2 1/2 x 2 x 2 1/2	1.99	1 21/32	2 3/32	1 21/32	5 x 5 x 1	4.20	9/16	9/16	3 3/16
2 1/2 x 2 x 2	1.95	1 11/32	1 5/8	1 23/32	5 x 4 x 5	8.53	2 27/32	4 29/32	3 13/32
2 1/2 x 2 x 1 1/2	1.57	1 3/32	2 13/32	1 21/32	5 x 4 x 4	8.17	2 1/4	4 17/32	3 3/8
2 1/2 x 2 x 1 1/4	1.57	1 3/32	1 19/32	1 27/32	5 x 2 x 5	9.47	2 3/4	5 1/16	3 1/2
					6	13.50	3 9/32	3 9/32	4 1/32

*Made to order. Consult price sheet for minimum order quantities.

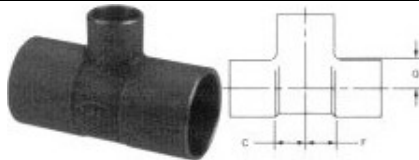


Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches		
		C	F	G
6 x 6 x 5	11.67	2 25/32	2 25/32	4 1/32
6 x 6 x 4	10.17	2 9/32	2 9/32	3 11/16
6 x 6 x 3	8.92	1 25/32	1 25/32	3 11/16
6 x 6 x 2 1/2	8.11	1 17/32	1 17/32	3 3/4
6 x 6 x 2	7.78	1 9/32	1 9/32	3 11/16
6 x 6 x 1 1/2	6.86	1	1	3 11/16
6 x 6 x 1 1/4	6.66	29/32	29/32	3 11/16
6 x 6 x 1	7.19	9/16	9/16	3 11/16
6 x 6 x 3/4	7.18	9/16	9/16	4 9/16
6 x 6 x 1/2	7.17	9/16	9/16	4 11/16
6 x 4 x 6	16.60	3 3/16	5 1/8	4 1/8
6 x 4 x 1 1/2	9.62	15/16	2 15/16	3 3/4
8	36.81	4 1/16	4 1/16	5 1/32
8 x 8 x 6	27.86	3 1/16	3 1/16	5 1/8
8 x 8 x 5	24.90	2 25/32	2 25/32	4 15/16
8 x 8 x 4	22.26	2 1/16	2 1/16	4 3/4
8 x 8 x 3	20.01	1 9/16	1 9/16	4 3/4
8 x 8 x 2 1/2	19.02	1 5/16	1 5/16	4 3/4
8 x 8 x 2	18.01	1 1/16	1 1/16	4 3/4

Note: Tee sizes are read Run x Run x Outlet

611 – HE Heat Exchanger Tee C x C x C – Wrot	*Tube slips entirely trough fitting on small end of return. Sizes same as listed under 611 where tee has one or more reductions on one end of run.
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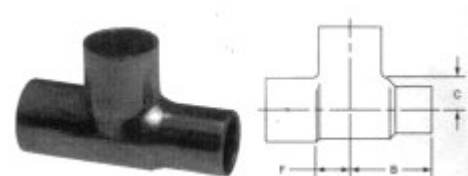
711
Tee C x C x C – Cast



Description	Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches	
			C	J
711 – A Supply and Return Tee C x C x C – Cast	*1/2	0.17	13/16	1
	*3/4	0.34	1 3/32	1 5/16

Description	Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches	
			A	C
711 – 5 Drop Tee C x C x C – Cast	1/2	0.16	3/8	7/16

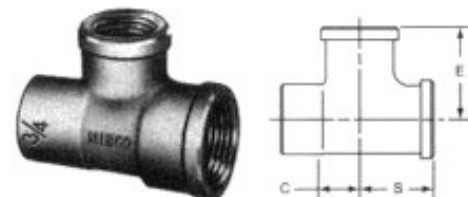
611 – 2
Fitting Tee C x Ftg x C – Wrot



Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches		
		C	F	G
1 1/4 x 1/2 x 1	0.48	3/4	3/4	7/8
1 1/4 x 1/2 x 1/2	0.50	9/16	5/8	1
*1 1/2 x 1/2 x 1 1/4	0.70	7/8	31/32	1
2 x 2 x 3	3.11	1 21/32	1 21/32	1 5/16
2 x 1 x 1 1/2	1.23	1	1 1/4	1 1/4
*2 x 3/4 x 1 1/2	1.08	1	1 3/32	1 1/4
*2 x 3/4 x 3/4	0.84	21/32	7/8	1 1/4
2 1/2 x 2 1/2 x 3	2.98	1 3/4	1 3/4	1 17/32
2 1/2 x 1 1/2 x 2	2.02	1 1/4	1 15/32	1 1/2
*2 1/2 x 1 1/2 x 1 1/2	1.76	1 3/32	1 13/32	1 3/8
2 1/2 x 1/2 x 2 1/2	2.46	1 1/2	2 7/32	1 1/2
*3 x 3 x 4	6.96	2 11/32	2 11/32	1 23/32
*3 x 2 1/2 x 1 1/2	2.53	1	1 3/32	1 3/4
*3 x 2 1/2 x 1	2.17	3/4	13/16	1 3/4
*3 x 2 x 1 1/2	2.62	1	1 1/4	1 3/4
*4 x 4 x 6	16.47	3 7/32	3 7/32	2 9/32
*4 x 2 x 2	4.64	1 3/4	1 3/4	2 1/4

Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches		
		B	C	F
1/2	0.07	1 1/32	3/8	7/16
3/4	0.15	1 15/32	1/2	17/32

712 – 3
Tee C x F x F – Cast

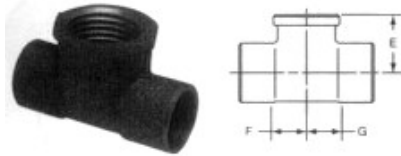


Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches		
		C	E	S
*1/2	0.23	7/16	1 3/32	7/8

*Made to order. Consult price sheet for minimum order quantities.

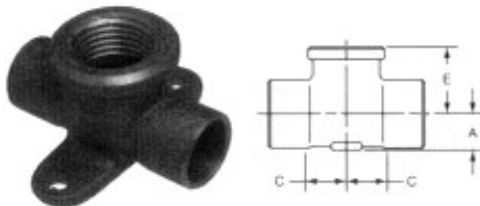


**712
Tee
C x C x F – Cast**



Nom. Size	Approx. Net Wt./Lbs.	Dimesions Inches		
		E	F	G
3/8	0.11	11/16	7/16	7/16
1/2	0.14	13/16	7/16	7/16
3/4	0.33	1	21/32	21/32
1	0.54	1 1/4	7/8	7/8
1 1/2	1.08	1 5/8	1 1/8	1 1/8
2	1.74	1 7/8	1 3/8	1 3/8
1/2 x 1/2 x 1/4	0.16	13/16	1/2	1/2
1/2 x 1/2 x 3/8	0.15	13/16	1/2	1/2
1/2 x 1/2 x 3/4	0.23	15/16	11/16	11/16
3/4 x 3/4 x 3/8	0.23	7/8	1/2	1/2
3/4 x 3/4 x 1/2	0.24	57/64	17/32	17/32
1 1/4x1 1/4 x 1/2	0.49	1 1/4	9/16	9/16
1 1/4x1 1/4 x 3/4	0.55	1 5/16	11/16	11/16
1 1/4 x 1 1/4 x 1	0.66	1 7/16	7/8	7/8
1 x 1 x 1/2	0.34	1 1/8	9/16	9/16
1 x 1 x 3/4	0.42	1 3/16	11/16	11/16
1 1/2x1 1/2 x 1/2	0.62	1 3/8	9/16	9/16
1 1/2x1 1/2 x 3/4	0.70	1 7/16	11/16	11/16
1 1/2 x 1 1/2 x 1	0.79	1 1/2	13/16	13/16
2 x 2 x 1/2	0.97	1 5/8	17/32	17/32
2 x 2 x 3/4	1.10	1 11/16	11/16	11/16
2 x 2 x 1	1.23	1 3/4	13/16	13/16
*1/4	0.08	13/16	9/32	9/32
*1 1/4	0.76	1 7/16	1	1
*3/8 x 3/8 x 1/4	0.12	11/16	7/16	7/16
*3/8 x 3/8 x 1/2	0.15	13/16	9/16	9/16
*1/2 x 1/2 x 1/8	0.10	3/4	1/4	1/4
*3/4 x 1/2 x 3/4	0.28	1	21/32	11/16
*3/4 x 3/4 x 1	0.40	1 1/8	7/8	7/8
*1 x 1 x 3/8	0.34	1 1/16	1/2	1/2

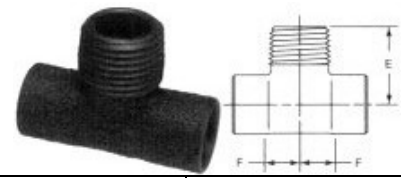
**712 – 5
Drop Tee
C x C x F – Cast**



Nom. Size	Approx. Net Wt./Lbs.	Dimesions Inches		
		A	C	E
1/2	0.25	3/8	9/16	7/8
3/4	0.38	1/2	21/32	1

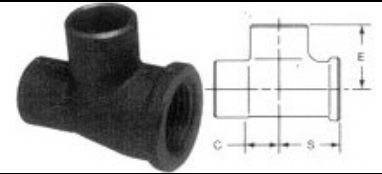
*Made to order. Consult price sheet for minimum order quantities.

**713
Tee
C x C x M - Cast**



Nom. Size	Approx. Net Wt./Lbs.	Dimesions Inches	
		E	F
*1/2	0.15	1 3/32	7/16
*3/4	0.29	1 9/32	9/16

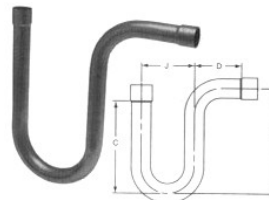
**714
Tee
C x F x C – Cast**



Nom. Size	Approx. Net Wt./Lbs.	Dimesions Inches		
		C	E	S
1/2	0.18	7/16	9/16	7/8
1/2 x 3/4 x 1/2	0.27	7/16	9/16	1 3/16
3/4	0.31	9/16	11/16	1
3/4 x 3/4 x 1/2	0.25	7/16	21/32	29/32
3/4 x 1/2 x 3/4	0.26	9/16	9/16	15/16
1	0.52	23/32	13/16	1 1/4
1 x 3/4 x 1	0.43	23/32	23/32	1 3/16
1 x 1/2 x 1	0.42	3/4	3/4	1 1/8
1 1/4	0.70	7/8	1	1 13/32
1 1/4 x 3/4 x 1 1/4	0.62	7/8	7/8	1 7/32
1 1/4 x 1/2 x 1 1/4	0.56	7/8	7/8	1 3/16
*1 1/2	1.00	1	1 1/8	1 9/16
1 1/2 x 3/4 x 1 1/2	0.88	1	1	1 13/16
*2	1.72	1 1/4	1 3/8	1 7/8
2 x 3/4 x 2	1.57	1 1/4	1 1/4	2
2 x 1/2 x 2	1.58	1 1/4	1 1/4	2

TRAPS

**698
Suction Line P – Trap
C x C – Wrot**








A major application of this fitting is on the suction line of a refrigeration compressor. The line is looped, by use of the Suction Line P – Trap, to the floor prior to being run vertically upwards to prevent the drainage of oil back to the compressor during shut down periods.

Additional P – Traps are used for each 20' or riser pipe. This prevents high velocity build-up as the oil or liquid begins to return to the compressor during this shut down period.


Nom. Size	Approx Net Wt./Lbs	Dimesions Inches			
		C	D	J	K
1/2	0.40	5 3/8	3	3	6
5/8	0.47	5 3/8	2 7/8	3	6
3/4	0.56	5 3/8	2 3/4	3	6
1	0.92	5 1/4	221/32	3	6
1 1/4	1.23	5 3/8	2 7/8	3 3/4	6 1/8
1 1/2	1.65	7 5/8	3 5/8	5	9
2	3.71	8	3 5/8	6	97/16

UNIONS

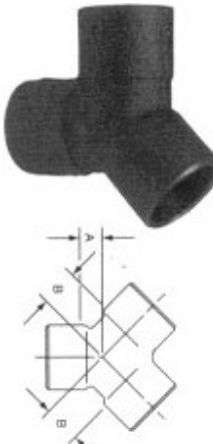
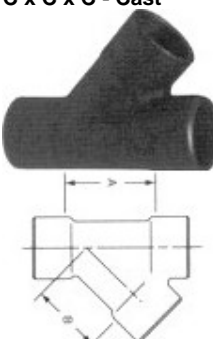
Description	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
633 - W Union C x C - Wrot 	1/8	0.10	5/8
	1/4	0.15	11/16
	3/8	0.22	7/16
	1/2	0.31	13/32
	3/4	0.33	3/8
	1	0.54	1/2
733 Union C x C - Cast 	1/4	0.10	11/16
	3/8	0.15	7/16
	1/2	0.22	13/32
	5/8	0.31	21/32
	3/4	0.31	3/8
	1	0.54	1/2
	1 1/4	0.76	1/2
	1 1/2	1.04	23/32
	2	1.77	1/2
	2 1/2	3.25	1
3	4.75	1 5/32	
733 - 2 Fitting Union Ftg. x F - Cast 	Nom. Size	Approx. Net Wt./Lbs.	Dim. B Inches
	1/2	0.23	1 9/32
	3/4	0.35	1 5/8
	1	0.55	1 27/32
733 - 3 Fitting Union C x F - Cast 	Nom. Size	Approx. Net Wt./Lbs.	Dim. A Inches
	*1/4	0.14	1 5/32
	*3/8	0.19	1 3/32
	1/2	0.26	1 1/8
	3/4	0.37	1 5/16
	1	0.61	1 7/16
	1 1/4	0.98	1 19/32
	1 1/2	1.21	1 13/16
	2	1.90	2 5/32
*3	5.19	3	
733 - 4 Fitting Union C x M - Cast 	*1/4	0.13	1 1/2
	3/8	0.20	1 5/8
	1/2	0.28	1 11/16
	*1/2 x 3/4	0.35	2 1/16
	3/4	0.43	1 29/32
	1	0.68	2 1/8
	1 1/4	0.95	2 5/32
	1 1/2	1.35	2 13/32
2	2.17	2 25/32	
2 1/2	4.13	3 13/32	

VENTURI

As air chamber, just solder one joint. When used as Stub-Out, simply pressure test system then cut off stub-out (save piece for future use) and install valve or fixture.

Description	Nom. Size	Approx. Net Wt./Lbs.
621 Venturi Insert - Wrot 	*1/2	0.01
	*3/4	0.02
	*1	0.03
	*1 1/4	0.04

Y's

Description	Nom. Size	Approx. Net Wt./Lbs.	Dimensions Inches	
			A	B
748 90° Y C x C x C - Cast 	*1/2	0.11	7/32	7/16
	*3/4	0.25	7/16	5/8
	*1	0.61	1/2	13/16
	*1 x 3/4 x 3/4	0.54	9/16	3/4
749 45° Y C x C x C - Cast 	1/2	0.15	1 3/32	7/8
	3/4	0.30	1 17/32	1 7/32
	1	0.55	1 13/16	1 15/32
	1 1/4	0.81	2 1/4	1 7/8
	*1 1/2	1.14	2 5/8	2 1/8
	*2	2.17	3 5/16	2 3/4

*Made to order. Consult price sheet for minimum order quantities.

COPPER TUBE FITTINGS

TYPES OF JOINTS

FLARED JOINT – The principle of the flared type joint was first developed for copper tube plumbing in 1928 by NIBCO. The flared type joint is wholly a mechanical means of joining copper tubes. The tube nut is placed over the end of the copper tube to be joined; the tube end then is flared out at an approximate 45-degree angle by a flaring tool. The flared end is then drawn up by the tube nut so the inside surface is tightly secured against the ball seat of the fitting. This joint can be readily dismantled at any time and is, in effect, a type of union connection. Its use is generally restricted to soft (annealed) copper tubes since hard drawn tubes would be subject to splitting when flared (if the ends were not previously annealed). The flared ends of NIBCO Flared Fittings are produced to the requirements of ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tube."

SOLDER JOINT – NIBCO pioneered the development of the solder type joint and its application to the field of copper tube piping. Today the solder type joint is widely adopted, as evidenced by the majority of cities and states that have written codes to include copper tube and solder joints as desirable for general plumbing, water lines, vent, stack, waste and drain lines, as well as other uses in industry. Testing has shown that often the solder joint has greater strength than the tubes being joined, depending upon the soldering alloy selected. While the method of preparing a solder joint is an exacting art to insure a full strength joint, can be readily mastered by skilled tradesmen. It is for this reason – to insure the public of the protection afforded by properly prepared joints – that NIBCO products are marketed through the reputable sources of supply to the piping trades. Important procedures for preparing a solder joint are [graphically illustrated in this catalog on page 28](#).

BRAZED JOINT – This type of joint has long been used wherever and whenever critical situations have been encountered in copper piping. The joint itself is completed much in the same manner as the solder joint; however, considerably more heat and several refinements of technique require separate procedures that are [described further in this catalog on pages 29 – 30](#).

THREADED ENDS – To adapt copper tube to equipment having National Standard Pipe Taper (NPT) threads or to add copper tube to existing iron

pipe installations or other threaded connections, NIBCO provides fittings having both external and internal NPT threads. These threaded ends are produced to the requirements of ASME B1.20.1, "Pipe Threads, General Purpose (Inch)."

FLANGES – To adapt copper tube to equipment having flanged connections, or to add copper tube to flanged pipe installations or other purposes, NIBCO provides flanges. The flanges are produced in two standard types widely used in this field where copper tube can serve – Class 150, comply with ASME B16.24, "Cast Copper Alloy Pipe Flanges and Flanged Fittings Class 150, 300, 400, 600, 900, 1500 and 2500"; and Class 125, which conform to MSS SP 106, "Cast Copper Alloy Flanges and Flanged Fittings Class 125, 150 and 300."

BARBED INSERT FITTINGS FOR POLYBUTYLENE (PB) – NIBCO offers a complete line of copper barbed insert fittings for joining PB tube. The insert fittings are produced to the requirements of ASTM F 1380. Along with the insert fittings are copper crimp rings, which, when properly installed, provide a leak – tight mechanical joint. Transition fittings are available for adapting to new or existing threaded or solder joint ends.

BARBED INSERT FITTINGS FOR PEX – NIBCO offers a complete line of copper barbed insert fittings for joining PEX tube. The insert fittings are produced to the requirements of ASTM F 1380. Along with the insert fittings are copper crimp rings, which, when properly installed, provide a leak – tight mechanical joint. Transition fitting are available for adapting to new or existing threaded or solder joint ends.

FITTINGS TERMS AND ABBREVIATIONS

C	Female solder cup
Ftg	Male solder end
F	Female NPT thread
M	Male NPT thread
Hose	Standard hose thread
Hub	Female end for soil pipe
Spigot	Male end for soil pipe
No Hub	Used with mechanical coupling
O.D. Tube	Actual tube outside diameter
S	Straight thread
SJ	Slip joint



WHAT MAKES A PLUMBING SYSTEM FAIL?

Failure in a copper plumbing system is rare, but may occur due to a variety of reasons. The most common causes of failure are:

1. Excessive fluid **velocity** causes erosion – corrosion or impingement (to strike or hit against) attack in the tube and/or fitting. For this reason, the copper plumbing industry has establish design velocity limits for copper plumbing systems to the following:

Hot Water > 140° F (60° C)	2 to 3 feet per second (0.6 to 0.9 meters per second)
Hot Water ≤ 140° F (60° C)	4 to 5 feet per second (1.2 to 1.5 meters per second)
Cold Water	5 to 8 feet per second (1.5 to 2.4 meters per second)

2. **Workmanship**

System life by creating localized high velocities and/or turbulence. The presence of a dent, tube ends, which are not reamed or deburred before soldering, and sudden changes in direction can all cause, localized high velocity conditions.

3. **Flux Corrosion**

Is typified by pinhole leaks, generally in the bottom of a horizontal line. Fluxes are mildly corrosive liquid or petroleum – based pastes containing chlorides of zinc and ammonia. Unless the flux is flushed from the system, it will lay in the bottom of the tube and remain active. ASTM B813, "Liquid and Paste Fluxes for Soldering Applications of Copper and Copper – Alloy Tube," limits the corrosivity of soldering fluxes and ensures that these fluxes are flushable in cold water, which facilitates easy removal of flux residue following installation.

4. **Galvanic Corrosion**

May be defined as the destruction of a material by electrochemical interaction between the environment and the material. Generally, it is slow but persistent in character and requires the presence of dissimilar metals. Galvanic corrosion requires the flow of and electric current between certain areas of dissimilar metal surfaces. To complete the electric circuit, there must be two electrodes, an anode and a cathode, and they must be connected by an electrolyte media (water) through which the current can pass. The amount of metal which dissolves at the anode is proportional to the number of electrons flowing, which in turn is dependent upon the potential and resistance of the two metals. The use of dissimilar metals in a plumbing system may or my not create a problem. For instance, copper and steel are perhaps the most common dissimilar metals found together in a plumbing system. In closed systems, such as chilled or heating water piping, the use of dissimilar metals may not create a serious problem; this is because there is virtually no oxygen in the water and corrosion relations tend to be stifled. Where dissimilar metals must be used, some codes require that they should be separated by dielectric union or a similar type of fitting. The effectiveness depends upon; distance between the metals on the electromotive force series (EMF) chart, ratio of cathode to anode area, degree of aeration, amount of agitation, temperature, presence of dissolved salts, and other factors.

ABBREVIATED EMF SERIES

(Electromotive – Force Series; Common Piping Materials in Sea Water)

CATHODE (+) Passive

GOLD – Fixtures, Faucets, Plating
PLATINUM
SILVER – Brazing alloys, Silver – bearing solders
TITANIUM – Condenser tubes
MONEL (67% Ni – 33% Cu) – Specialty piping & equipment
CUPRO – NICKEL – Condensers, Marine, Nuclear
COPPER – Pressure, DWV, Gases, Air, Refrigeration, etc.
BRASS (85/15 – Red) – Cast fittings, Valves
BRASS (70/30 – Yellow) – Gas-cocks, fittings, Connectors
LEAD – Solder, pipe, Sheet, Coating, Lining
TIN – Solders, Coating, Lining
CAST IRON – Pressure
MILD STEEL – Fire Protection
ALUMINIUM – Refrigeration, Irrigation, some Solar
GALVANIZED STEEL – Pressure, DWV
ZINC – Coatings, linings, some Fittings
MAGNESIUM. Water Heater Anodes, Cathodic protection for pipelines

ANODE (-) Active; Sacrificial Material

Galvanic corrosion may be defined as “the destruction of a material by electrochemical interaction between the environment and the material. “ Generally it is slow but persistent in character. The basic cause of corrosion is the instability of metals in their refined forms. The metals tend to revert back to their refined forms. The metals tend to revert back to their natural states through the processes of corrosion through transformation from the metallic to the ionic state.

5. Dezincification

Is a type of corrosion in which brass dissolves as an alloy and the copper constituent redeposits from solution onto the surface of the brass as a metal, but in the porous form. The zinc constituent may be carried away from the brass as a soluble salt, or may be deposited in place as an insoluble compound. Dezincification is normally associated with brass valves where the zinc content exceeds 15%. Generally, areas of high stress, such as valve stems and gate valve bodies, are primary targets of attack.

6. On rare occasion problems of corrosion by aggressive water, possibly aggravated by poor design or workmanship, do exist, **Aggressive, hard well waters** that cause pitting can be identified by chemical analysis and treated to bring their composition within acceptable limits. Typically these hard waters are found to have high total dissolved solids (t.d.s.) including sulfates and chlorides, a pH in the range of 7.2 to 7.8, a high content of carbon dioxide (co2) gas (over 10 parts per million, ppm), and the presence of dissolved oxygen (D.O) gas. Soft acidic waters can cause the annoying problem of green staining of fixtures or “green water”. Raising the pH of such waters to a value of about 7.2 or more usually solves the problem, but a qualified water treatment specialist should be consulted.

7. Aggressive soil conditions

Can be a cause for external corrosion of copper piping systems. Non – uniform soil characteristics, such as different soil aeration, resistivity, or moisture properties, between adjacent sections of tube can create galvanic corrosion cells. Soils contaminated with high concentrations of road salts of fertilizers containing ammonia, chlorides, and nitrogen are known to combine with water to form acids. Any metal pipe laid in ash or cinders is subject to attack by the acid generated when sulfur compounds combine with water to form sulfuric acid.

SOLDER JOINT SPECIFICATION

- Soldering clearance** (between the outside of the tube and the inside diameter of the solder cup) and the Depth of the Solder Cup (into which the tube is inserted).

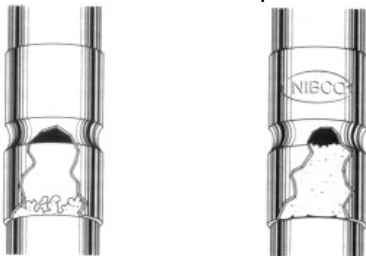
Chart 1 – Soldering Clearance and Solder Cup Depth

Nominal Size of Fitting	Maximum I.D. of fitting		Minimum O.D. of tube		Maximum Clearance for Soldering		Depth of Solder Cup		
	(Inches)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)
1/4		0.381	9.66	0.374	9.50	0.007	0.18	0.31	7.9
3/8		0.506	12.85	0.499	12.67	0.007	0.18	0.38	9.7
1/2		0.631	16.03	0.624	15.85	0.007	0.18	0.50	12.7
5/8		0.756	19.20	0.749	19.02	0.007	0.18	0.62	15.7
3/4		0.881	22.38	0.874	22.20	0.007	0.18	0.75	19.1
1		1.132	28.75	1.123	28.54	0.008	0.216	0.91	23.1
1 1/4		1.382	35.10	1.373	34.88	0.008	0.216	0.97	24.6
1 1/2		1.633	41.48	1.623	41.22	0.010	0.25	1.09	27.7
2		2.133	54.18	2.123	53.92	0.010	0.25	1.34	34.0
2 1/2		2.633	66.88	2.623	66.62	0.010	0.25	1.47	37.3
3		3.133	79.58	3.123	79.32	0.010	0.25	1.66	42.2
3 1/2		3.633	92.28	3.623	92.02	0.010	0.25	1.91	48.5
4		4.133	104.98	4.123	104.72	0.010	0.25	2.16	54.9
5		5.133	130.38	5.123	130.12	0.010	0.25	2.66	67.6
6		6.133	155.78	6.123	155.52	0.010	0.25	3.09	78.5

The National Bureau of Standards Report BMS58, "Strength of Soft – Soldered Joints in Copper Tubing," reporting on test conducted with 3/4 - inch tubing and fitting, says "When the clearance is greater than 0.010 inch (0.25 mm), there is difficulty in filing the joint properly."

- Depth of Solder Penetration** drastically affects the breaking load of the joint. When there is too great a soldering clearance, there is no capillary flow to assure complete solder penetration. As shown in the chart below, the holding power of the 3/4 - inch joint is directly proportional to the depth of solder penetration.

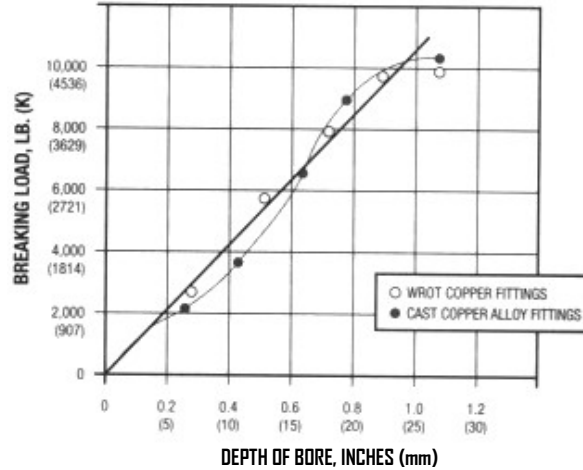
For example: if you get only one-third penetration, you get approximately one – third the strength needed to assure complete satisfaction.



Solder penetration of one -third the cup depth – breaking load, approximately 2,100 lb. (955 Kg)

Solder penetration of the entire cup depth – breaking load approximately 7,000 lb. (3175 Kg)

Chart 2 – Type K 3/4” Tubing



HOW TO BE SURE OF PROPER TOLERANCES

It is apparent that all of the scientific apparatus used to test tube and fittings, according to the dimensions indicated in Chart 1, would be impractical to use on the job. It is therefore essential that you install tube and fittings manufactured by companies know to be dedicated to the highest quality control standards. Should you encounter a condition where there is difficulty in filing the joint properly, NIBCO will analyze the trouble without charge. Just send six inches of the tube, along with the fitting and our technicians will provide you with an authoritative report.

U.S. customary units in this document are the standard; the metric units are provided for reference only. The values stated in each system are not exact equivalents.

BRAZING INFORMATION

Cooper Water Tube Size	Brazing* Filler Required		Torch Tip Drill Size No.	Acetylene Consumption		For Estimating Purposes Oxygen Pressure (Approx)		Acetylene Pressure (Approx)	
	Inches	Mm		C.F.H.	C.M.H.	PSI	Kpa	PSI	Kpa
1/4	0.25 ^B	6.4	54	15.9	0.5	4	27	4	27
3/8	0.38 ^B	9.7	54	15.9	0.5	4	27	4	27
1/2	0.50	12.7	51	24.8	0.7	5	34	5	34
5/8	0.62	15.7	51	24.8	0.7	5	34	5	34
3/4	1.00	25.0	51	24.8	0.7	5	34	5	34
1	1.60	41.0	48	31.6	0.9	6	41	6	41
1 1/4	2.00	51.0	48	31.6	0.9	6	41	6	41
1 1/2	2.60	66.0	44	38.7	1.1	7	48	7	48
2	4.40	112.0	40	60.0	1.7	7	48	7	48
2 1/2	5.90	150.0	40	60.0	1.7	7	48	7	48
3	7.90	200.0	35	70.0	2.0	7 1/2	52	7 1/2	52
3 1/2	10.50	207.0	35	70.0	2.0	7 1/2	52	7 1/2	52
4	13.50	343.0	30	88.5	2.5	9	62	9	62
5	20.50	521.0	30	88.5	2.5	9	62	9	62
6	28.50	724.0	30	88.5	2.5	9	62	9	62

* Approximate consumption when brazing one cup of the fittings. Actual consumption depends on workmanship.

For filler sizes shown, one pound of filler alloy provides 1.068 inches (27.13 mm) of 1/16 -inch wire or 475 inches (12.065 mm) of 3/32 -inch wire.

^A 1/16 -inch (1.59 mm) diameter wire; all other is 3/32 -inch (2.38 mm) diameter.

SOLDER AND FLUX REQUIREMENTS

Nom. Size Joint	Solder Required, LBG (kg)	
	General Use	Drainage Use
1/4	0.097	-
3/8	0.159	-
1/2	0.261	-
5/8	0.389	-
3/4	0.548	-
1	0.856	-
1 1/4	1.115	1.2 0.5
1 1/2	1.480	1.4 0.6
2	2.380	1.5 0.7
2 1/2	3.225	-
3	4.335	2.8 1.3
3 1/2	5.786	-
4	7.446	4.2 1.9
5	11.392	-
6	15.815	-
8	26.955	-

Solder requirements in this table are based on estimate of weight of solder used to prepare 100 solder joints of sizes shown.

Two (2) ounces (0.06 Kg) of solder flux will be required for each pound (0.45 Kg) of solder.

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Página 26

DISTRIBUIDOR MAYORISTA DE MATERIALES PARA LA CONSTRUCCIÓN

Este documento lo encuentra en Internet: www.coval.com.co - E-mail: info@coval.com.co



**RATED INTERNAL WORKING PRESSURES OF JOINTS
MADE WITH COPPER WATER TUBE AND SOLDER TYPE FITTINGS, PSI (BAR)**

Solder or Brazing Alloy Used in joints	Service Temperature		Copper Water Tube K, L and M Nominal Sizes, In Inches (mm)							Saturated Steam LB (kg) All Sizes	
			Water ^A								
	°F	°C	¼" to 1"	1 ¼" to 2"	2 ½" to 4"	5" to 8"	10" to 12"				
50-50 Tin- Lead ^{B,G}	100	38	200 14	175 12	150 10	135 9	100 7	15 ^D 6.8 ^D			
	150	66	150 19	125 8	100 7	90 6	70 4				
	200	93	100 9	90 6	75 5	70 4	50 3				
	250	121	85 6	75 5	50 3	45 3	40 2				
95 – 5 Tin – Antimony ^C	100	38	635 43	560 39	375 26	340 23	150 10	15 ^D 6.8 ^D			
	150	66	635 43	560 39	375 26	340 23	150 10				
	200	93	630 43	480 33	375 26	340 23	140 10				
	250	121	435 30	330 23	265 18	245 16	110 7				
Brazing Alloys, Melting at or above 1000°F (538° C)	100-150-200	32-66-93	H	H	H	H	H	120 ^E 54.4 ^E			
	250 ^F	121 ^F	H	H	H	H	H				
	350	177	H	H	H	H	H				

The values in the above table are based on data in the National Bureau of Standards publications, "Building Materials and Structures Reports" BMS 58 and BMS 83.

^A Including other non – corrosive liquids and gases.

^B ASTM B32, alloy Grade Sn50.

^C ASTM B32, Alloy Grade Sb5.

^D This pressure is determined by the temperature of saturated steam at 15 lb. (6.8 Kg) pressure at 250° F (121° C).

^E This pressure is determined by the temperature of saturated steam at 120 lb. (54.4 Kg) pressure at 350° F (177° C).

^F For service temperatures lower than 250° F (121° C), the solders as above may be used.

^G The safe Drinking Water Act Amendment of 1986 prohibits the use in potable water systems of any solder having a lead content in excess of 0.2%.

^H Rated internal pressure is that of the tube being joined. While solders can be used, brazing alloys are recommended.

**RATED INTERNAL WORKING PRESSURES OF
JOINTS MADE WITH FLARED FITTINGS AND
COPPER WATER TUBE**

Nominal Size Joint (Inches)	Temperature, °F (°C) ^A	Pressure, PSI (BAR) ^A
3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2	100 (38)	175 (12)

^A ASME B16, 26

**RATED INTERNAL WORKING PRESSURES OF
POLYBUTYLENE TUBE AND COPPER BARBED
INSERT FITTINGS**

Nominal Size Joint (Inches)	Temperature, °F (°C)	Pressure, PSI (BAR)
3/8, 1/2, 3/4, 1	73 (23)	200 (14)
	140 (60)	160 (11)
	180 (82)	100 (7)
	200 (93)	80 (5)

U.S. customary units in this document are the standard; the metric units are provided for reference only. The values stated in each system are not exact equivalents.



RATED INTERNAL WORKING PRESSURE¹ FOR COPPER FITTINGS, PSI (BAR)

Nominal Water Tube Size Inches	Water Temperature Range													
	-20° to 100°F		150°F		200°F		250°F		300°F		350°F		400°F	
	(-29° to 38°C)		66°C		95°C		120°C		177°C		177°C		204°C	
1/4	912	62	775	53	729	50	729	50	714	49	608	42	456	31
3/8	779	54	662	46	623	43	623	43	610	42	519	36	389	27
1/2	722	50	613	42	577	40	577	40	565	39	481	33	361	25
5/8	631	43	537	37	505	35	505	35	495	34	421	29	316	21
3/4	582	40	495	34	466	32	466	32	456	31	388	27	291	20
1	494	34	420	29	395	27	395	27	387	26	330	23	247	17
1 1/4	439	30	373	26	351	24	351	24	344	23	293	20	219	15
1 1/2	408	28	347	24	327	23	327	23	320	22	272	19	204	14
2	364	25	309	21	291	20	291	20	285	20	242	17	182	13
2 1/2	336	23	285	20	269	19	269	19	263	18	224	15	168	12
3	317	22	270	19	254	17	254	17	248	17	211	15	159	11
3 1/2	304	21	258	18	243	17	243	17	238	16	202	14	152	10
4	293	20	249	17	235	16	235	16	230	16	196	13	147	10
5	269	19	229	16	215	15	215	15	211	15	179	12	135	9
6	251	17	213	15	201	14	201	14	196	14	167	12	125	8
8	270	19	230	16	216	15	216	15	212	15	180	12	135	9

The fitting pressure rating applies to the largest opening of the fitting.

RATED INTERNAL WORKING PRESSURES OF CAST COPPER ALLOY FLANGES AND FLANGED FITTINGS

Nominal Size Joint Inches	Temperature		Pressure (PSI)					
	°F (°C) ^A		Class 125 _{A, B}		Class 150 _{A, C}			
1/2, 3/4, 1,	0- 150	0 - 66	105	7	210	14	225	15
1 1/4,	175	79	100	7	205	14	220	15
1 1/2, 2,	200	93	95	7	195	13	210	15
2 1/2, 3, 4,	225	107	90	6	190	13	205	14
5, 6, 8	250	121	90	6	180	12	195	13
(also 10"	275	135	85	6	175	12	190	13
for Class	300	149	85	6	170	12	180	12
125)	350	177	75	5	150	10	165	11
	406	208	70	5	140	9	150	10

^A MSS SP - 106

^B ASTM B584, UNS C83800 and UNS C84400

^C ASTM B62, UNS C83600 and ASTM B584, UNS C83600

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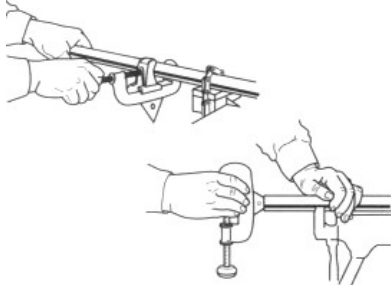
THE FINE ART OF SOLDERING

Installation Instructions

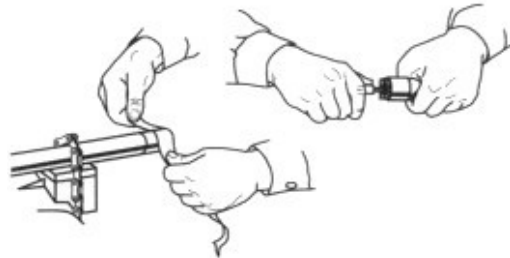
When adjoining of copper and copper alloys meet under proper conditions of cleanliness and temperature, solder will make a perfect adhesion. The strength of joint is equal to or even greater than the strength of tube alone. Surface tension seals the joint. Capillary attraction draws solder into, around, and all about the joint. It's easy to learn to make a perfect solder joint when you use NIBCO Fittings.

WITH 95-5 SOLDER AND INTERMEDIATELY CORROSIVE FLUX

1. Cut tube end square, ream, burr and size.



2. Use sand cloth or steel wire brush to clean tube and cup to a bright metal finish.



3. Apply solder flux to outside of tube and inside of cup of fitting carefully so that surfaces to be joined are completely covered. **Use flux sparingly.**



4. Apply flame to the fitting to heat tube and solder cup of fitting until solder melts when placed at joint of tube and fitting.



5. Remove flame and feed solder into the joint at one or two points until a ring of solder appears at the end of the fitting. The correct amount of solder is approximately equal to $1 \frac{1}{2}$ the diameter of the fitting... $\frac{3}{4}$ " (20 mm) solder for $\frac{1}{2}$ " fitting, etc.



6. Remove excess solder with a small brush or wiping cloth while the solder is plastic.



THE FINE ART OF BRAZING

Best results will be obtained by a skilled operator employing the step – by – step brazing technique that follows:

1. The tube should be cut to desired length with a square cut, preferably in a square – end sawing vise. The cutting wheel of the type specifically designed for cutting copper tube will also do a satisfactory job. The tube should be the exact length needed, so that the tube will enter the cup of the fitting all the way to the shoulder of the cup. Remove all slivers and burrs left from cutting the tube, by reaming and filing, both inside and outside.

2. To make a proper brazing joint, the clearance between the solder cup and the tube should be approximately 0.001" to 0.010" (0.0254mm to 0.254 mm). Maintaining a good fit on parts to be brazed insures:

Ease of Application – Excessively wide tolerances tend to break capillary force; and, as a result the alloy will either fail to flow throughout the joint or may flush out of the joint.

Corrosion Resistance – There is also a direct relation between the corrosion resistance of a joint and the clearance between members.

Economy – If brazing alloys are to be used economically, they, of necessity, must be applied in the joint proper and in minimum quantities, using merely enough alloy to fill the area between the members.

3. The surfaces to be joined must be clean and free from oil, grease and heavy oxides. The end of the tube need be cleaned only for a distance slightly more than it is to enter the cup. Special wire brushes designed to clean tube ends may be used, but they should be carefully used so that an excessive amount of metal will not be removed from the tube. Fine sand cloth or emery cloth may also be used with the same precautions. The cleaning should not be done with the same precautions. The cleaning should not be done with steel wool, because of the likelihood of leaving small slivers of the steel or oil in the joint.



4. The cup of the fitting should be cleaned by methods be cleaned by methods similar to those used for the tube end, and care should be observed in removing residues of the cleaning

medium. Attempting to braze a contaminated or an improperly cleaned surface will result in an unsatisfactory joint.

Brazing alloys will not flow over or bond to oxides; and oily or greasy surfaces tend to repel fluxes, leaving bare spots which will oxidize, resulting in voids and inclusions.

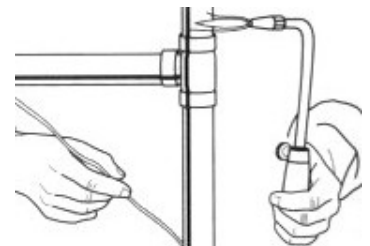


5. Flux should be applied to the tube and solder cup sparingly and in a fairly thin consistency. Avoid flux on areas not cleaned. Particularly avoid getting excess flux into the inside of the tube itself. Flux has three principal functions to perform:



- A. It prevents the oxidation of the metal surfaces during the heating operation by excluding oxygen.
- B. It absorbs and dissolves residual oxides that are on the surface and those oxides which may form during the heating operation.
- C. It assists in the flow of the alloy by presenting a clean nascent surface for the melted alloy to flow over. In addition, it is an excellent temperature indicator, especially if an indicating flux is used.

6. Immediately after fluxing, the parts to be brazed should be assembled. If fluxed parts are allowed to stand, the water in the flux will evaporate, and dried flux is liable to flake off, exposing the metal surfaces to oxidation from the heat. Assemble the joint by inserting the tube into the cup, hard against the stop. The assembly should be firmly supported so that it will remain in alignment during the brazing operation.

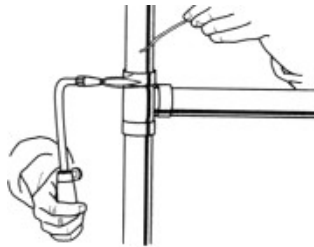


7. Brazing is started by applying heat to the parts to be joined. The preferred method is by the oxyacetylene flame. Propane and other gases are sometimes used on smaller sizes. A slightly reducing flame should be used, with a slight feather on the inner blue cone; the outer portion of the flame, pale green. Heat the tube first,

beginning at about one inch from the edge of the fitting. Sweep the flames around the tube in short strokes up and down at right angles to the run of the tube. It is very important that the flame be in continuous motion and should not be allowed to remain on any one point to avoid burning through the tube. Generally, the flux may be used as a guide as to how long to heat the tube, continuing heating after the flux starts to bubble or work, and until the flux becomes quiet and transparent, like clear water. The flux will pass through four stages:

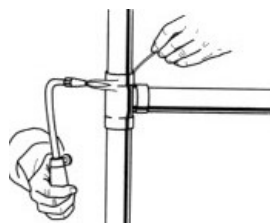
- A. At 212° F (100° C) the water boils off.
- B. At 600° F (315.6° C) the flux becomes white and slightly puffy and starts to work.
- C. At 800° F (426.7° C) It lays against the surface and has a milky appearance.
- D. At 1100° F (593.3° C) it is completely clear and active and has the appearance of water.

8. Now switch the flame to the fitting at the base of the cup. Heat uniformly, sweeping the flame from the fitting to the tube until the flux on the fitting becomes quiet. Avoid excessive heating of cast fittings.



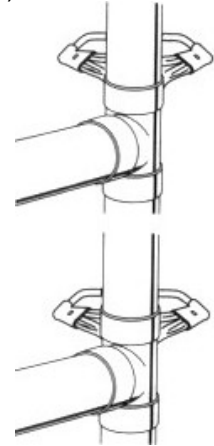
9. When the flux appears liquid and transparent on both the tube and the fitting, start sweeping the flame back and forth along the axis of the joint to maintain heat on the parts to be joined, especially toward the base of the cup of the fitting. The flame must be kept moving to avoid burning the tube or the fitting.

10. Apply the brazing wire or rod at a point where the tube enters the socket of the fitting. The temperature of the joint should be hot enough to melt the brazing alloy. Keep the flame away from the rod or wire as it is fed into the joint. Keep both the fitting and the tube heated by moving the flame back and forth from one to the other as the alloy is drawn into the joint. When the proper temperature is reached, the alloy will flow readily into the space between the tube outer wall and the fitting socket, drawn in by the natural force of capillary attraction. When the joint is filled, a continuous fillet of brazing alloy will be visible completely around the joint. Stop feeding as soon as the joint is filled,



using table as a guide for the alloy consumption. (SOLDER JOINT SPECIFICATION)

NOTE: For tubing one inch and larger, it is difficult to bring the whole joint up to heat at one time. It frequently will be found desirable to use a double – tip torch to maintain the proper temperature over the larger area. A mild pre – heating of the whole fitting is recommended. The heating then can proceed as in steps 7, 8, 9, and 10. If difficulty is encountered in getting the whole joint up to heat at one time, then when the joint is nearly up to the desired temperature the alloy is concentrated in a limited area. At the brazing temperature the alloy is fed into the joint and the torch is then moved to an adjacent area and the operation carried on progressively all around the joint.



Horizontal joints

When making horizontal joints, it is preferable to start applying the brazing alloy at the 5 o' clock position, then move around to the 7 o'clock position and then move up the sides to the top of the joint, making sure that the joint, making sure that the operations overlap.



Vertical joints

On vertical joints, it is immaterial where the start is made. If the opening of the cup is pointed down, care should be taken to avoid overheating the tube, as this may cause the alloy to run down the tube. If this condition is encountered, take the heat away and allow the alloy to set. Then reheat the solder cup of the fitting to draw up the alloy.



After the brazing alloy has set, remove residual flux from the joint area as it is corrosive and presents an unclean appearance and condition. Hot water or steam and a soft cloth should be used. Wrot fittings may be chilled; however it is advisable to allow cast fittings to cool naturally to some extent before applying a swab. All flux must be removed before inspection and pressure testing.

TROUBLE SPOTS

If the alloy fails to flow or has a tendency to ball up, it indicates oxidation on the metal surfaces, or insufficient heat on the parts to be joined. If work starts to oxidize during heating, it indicates too little flux, or a flux of too thin consistency. If the brazing alloy refuses to enter the joint and tends to flow over the outside of either member of the joint, it indicates this member is overheated, or the other is under heated, or both. In both cases, operations should be stopped and the joints disassembled, re-cleaned and fluxed.

FREQUENTLY ASKED QUESTIONS

Q: What is the pressure rating of a given fitting?

A: Fittings are rated per Table 1 of ASME B16.22. The system rated pressure shall be the lowest of the fitting, tube or joint.

Q: When copper fails in a system, what is the problem?

A: MOST COMMON:

1. **Velocity** – fluid is moving too fast. Recommendation: 2-3 fps (0.0508 – 0.0762 m/s) hot water < 140°F, 5-8 fps (0.127 – 0.2032 m/s) cold water.
2. **Turbulence** – burrs left on the cut tubing causes a tumbling effect causing localized erosion and eventual failure.
3. **Aggressive Waters** – tend to cause pitting or green staining of fixtures. Aggressive, hard well waters that cause pitting typically are found to have total dissolved solids including sulfates and chlorides, a pH in the range of 7.2 to 7.8, a high content of carbon dioxide gas and the presence of dissolved oxygen gas. Soft acidic waters that cause green staining typically tend to be more corrosive. Low alkalinity, low mineralization, pH levels of 7 or lower should be avoided.

LESS COMMON

1. **Flux corrosion** – using too much flux when making joints can potentially leave residue and cause isolated corrosion. Flux should be used sparingly and system adequately flushed.
2. **Electrolysis** – stray (D.C.) current; inadequate grounding for the piping.
3. **Sand or other solid particulates** – erosion/corrosion problems can occur. Lower velocities must be maintained if solids are present in flow media.
4. **Galvanic corrosion** – destruction of a material by electrochemical interaction between the environment and the material.

Q: Copper tubing wall thickness is designated “K,” “L” or “M.” What are the copper fittings applicable to?

A: Copper fittings’ wall thickness is determined by standards (ASME B – 16:22 and MSS – SP – 104). These standards address minimum wall thickness (per size) for the full range of copper fittings and are not intended to match tubing wall thicknesses.

Q: Can dissimilar metals (i.e., copper and iron) be joined together without use of dielectric insulators to prevent corrosion?

A: In most situations dissimilar metals (copper/iron/steel) can be joined successfully without using dielectric insulators. Factors to consider:

1. The composition of the two metals.
2. The rate of liquid flow past the two metals.
3. Chemicals in the water which could enhance or destroy protective films.
4. The relative areas of the two metals – unless the surface area of the less noble (steel) material is less than 5% of the more noble (copper) material, the need for dielectric separator is not needed. (Failures due to galvanic corrosion are very unusual and only occur under very strict conditions.)
5. Local code requirements.

Q: What should the installer of copper unions know and do in order to assure a proper leak – free installation?

A: The following should be done:

1. Make sure the ground – joint (mating area of unions tail and thread pieces) are free of nicks and scratches.
2. Spray the ground – joint area with a food grade silicone spray or apply bees wax to enhance seating.
3. Make sure alignment of line does not put lateral stress on the ground – joint seal.
4. Make sure that excess solder (droplets) do not reach the ground – joint area.

RESIDENTIAL COPPER PLUMBING PRODUCTS LIMITED WARRANTY

What the warranty terms mean

In this warranty "Manufacturer" refers to the company listed below which manufactured the product and any person or company that assumes its obligations under this warranty. "Homeowner" means you as the owner of the residential building in the United States in which the product has been installed and also means any succeeding owner during the original warranty term. "Product" means the copper water tube and/or copper or brass fittings manufactured by the manufacturer for the residential building market in the United States. Each Manufacturer listed below separately and individually warrants only products it has manufactured and does not warrant Products of any other company, whether or not listed below.

Date the warranty begins

The warranty begins on the date of the new home purchase, or in the case of home additions or renovations, on the date the installation is completed. The warranty is transferable to succeeding Homeowners for the remainder of the original warranty term, in which case the date the warranty begins shall continue without change.

What is covered

The Manufacturer warrants to the Homeowner for a period of 50 Years from the date the warranty begins that its properly installed Product will be free of failure as a result of defects in material or workmanship in manufacturing the Product.

What the manufacturer will do for you

As long as (1) such a failure occurs within 50 years from the date the warranty begins and (2) the Homeowner promptly notifies the Manufacturer will correct that failure by repairing or replacing the product within a reasonable time, without charge. This warranty is limited to the cost of repairing or replacing the Product, including installation.



What is not covered: Disclaimer of liability for consequential and other damages

The manufacturer does NOT warrant against failure:

1. Of any product, parts, or systems that is has not manufactured;
2. If the product is used for purposes other than residential plumbing applications;
3. Caused by, contributed in whole or in part by, or resulting from, any of the following:

- A. Improper installation;
- B. Abuse, such as, without limitation, vandalism;
- C. Natural disasters, such as, without limitation, flooding, windstorm and lightning;
- D. Attachments or modifications to the product that the manufacturer did not authorize;
- E. External causes, where external, physical or chemical qualities produce damage to the product, such as, without limitation, aggressive water or an unsuitable or hostile environment; or
- F. Any other cause beyond the Manufacturer's control.

The Manufacturer shall NOT be liable under any circumstances for any other direct or any indirect, incidental or consequential damages of any kind.

This is the only warranty

This warranty is the only warranty for the Product provided by the manufacturer, and is and shall be in lieu of any and all other warranties, express or implied, including but not limited to an implied warranty of merchantability, and of all other obligations or liabilities on the part of the manufacturer. None of the Manufacturer's employees, and no other person or business, is authorized to make any other warranty on the Manufacturer's behalf covering the product.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.