Comparison of Copper and Steel Pipework Costs For Non Domestic Installations

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Davis Langdon Consultancy
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Copper in commercial applications

Research commissioned by the UK Copper Board into the total installation costs of non-domestic plumbing and heating systems with diameters up to 54mm, shows that copper is more cost-effective to install than steel. For the first time the impact of copper flame-free press fitting systems has been evaluated within a commercial application. These jointing systems are faster and easier to install and the results have shown that contractors and specifiers can expect significant cost savings when using them.

Method of research

The latest data as found in the authoritative **Spon's Mechanical and Electrical Services Price Book 2002** was used as the basis of the research. The costs for installing copper and steel were evaluated by comparing the material cost, labour hours and labour cost of the two systems. The book data for pipework and the new press fittings together with data on bends, tees and reducers in the range from 15mm to 54mm diameter were used.

Individual comparisons were made for each of these components. Finally, varying quantities of each component were aggregated and priced to represent different installations and these were compared for the different materials.

Comparing copper (EN 1057 - R250) and black steel tube (BS 1387)

Tube sizes

Steel and copper tube are produced in a slightly different range of sizes, copper is measured on the outside diameter and steel on the inside diameter. Nearest comparable sizes are shown in **bold** in **Table 3**.

Weight

Typically copper tube weighs between one third and one half of the equivalent steel pipe. Copper is therefore easier to handle and to support on fixings. Another advantage for copper is the savings in manpower, resulting from the fitting of lighter components into position; this was accounted for under labour hours.

Table 1 Dimensions and working pressures for half-hard copper tube (EN 1057 - R250) *(Formerly BS 2871, Table X)*

Tube diameter (mm)	Outside diameter maximum (mm)	Outside diameter minimum (mm)	Nominal thickness (mm)	Maximum working pressure at 65 Celsius (Bar)
15	15.04	14.96	0.7	58
22	22.05	21.95	0.9	51
28	28.05	27.95	0.9	40
35	35.06	34.94	1.2	42
42	42.06	41.94	1.2	35
54	54.06	53.94	1.2	27

Pressure

Whilst steel is generally more widely used in high pressure applications, the pressures encountered in heating installations are well within the capabilities of copper (See dimensions and working pressures of copper tube opposite **Table 1***).*

Labour hours

The time taken to install copper tube is typically about 15% less than for steel. (**Table 2** below)

Table 2 Labour Time Savings
(Labour rate = £17.60 per hour)

Copper tube diameters (mm)	Steel tube diameters (mm)	Copper/Steel (negative shows copper advantage)
15	15	-23%
22	20	-15%
28	25	-15%
35	32	-13%
42	40	-12%
54	50	-15%

Comparing copper and steel fittings

The research compared the material and labour costs when using copper press fittings with elbows, tees and reducers. When combining material and labour costs for flame-free press fittings, copper provides substantial savings over steel.

Cost savings

Although the cost of copper fittings is higher than steel fittings, the speed and ease of installing press fittings reduces overall labour costs and results in a further cost benefit for copper.

Table 3 shows the cost savings for an installed system including material and labour costs.

Costs of installations

Table 3 gives the relative cost difference for individual fittings and lengths of tube.

Table 3. Cost difference between an installed copper and steel system (negative = saving when using copper tube)

Tube sizes (mm)	Copper Steel	**15** **15**	**22** **20**	**28** **25**	**35** **32**	**42** **40**	**54** **50**
Tube		-24%	*-11%*	*-11%*	*9%*	*12%*	*12%*
Press Fittings	Elbow	-41%	*-52%*	*-43%*	*-40%*	*-31%*	*-14%*
	Equal tee	-37%	*-49%*	*-40%*	*-36%*	*-23%*	*-9%*
	Reducer	n/a	*-47%*	*-38%*	*-40%*	*-32%*	*-21%*

By taking typical proportions of fittings and tube across the range of sizes (**Table 4**) the cost of a representative installation can be achieved (**Table 5**).

For comparison purposes the relative costs of a partial installation consisting of a length of tube and number of fittings is also shown for each tube size (**Table 6**).

Table 4. A typical installation using a mixture of tube sizes and fittings

Size	Tubes (metres	Bends	Tees	Reducers
15/15	150	50	0	0
22/20	250	100	25	40
28/25	100	20	8	16
35/32	25	10	4	8
42/40	10	4	2	4
54/50	20	6	7	2

Resultant costs

Table 5. Resultant costs for a typical installation using the mixture of tube sizes and fittings shown in Table 4

	Copper press fttings system	Steel system	**Copper/ Steel factor**
Total cost	£8,866	£12,020	**0.73**

Table 6 shows the comparative costs for a range of tube sizes and fittings with tube diameters between 15 to 54mm. It clearly demonstrates the cost-effectiveness of the various copper systems.

Conclusion

Substantial cost savings can be achieved when using copper tube and copper press fittings in non-domestic installations.

The use of the new, flame-free copper press fitting systems enable contractors and specifiers to install commercial installations quicker and more effectively. Cost comparative studies of steel and copper systems with tube diameters between 15 and 54mm have shown significant labour and overall cost savings in favour of copper systems. For a typical installed system a cost saving of 27% was achieved when using copper as opposed to steel.

Table 6 Comparative costs for a range of tube sizes and fittings

Size	Tube (metres)	Bends	Tees	Reducers	Copper press fittings system	Steel system	**Copper/ Steel ratio**
15/15	20	10	0	0	£229	£327	**0.70**
22/20	20	10	4	8	£339	£585	**0.58**
28/25	20	10	4	8	£433	£669	**0.65**
35/32	20	10	4	8	£584	£781	**0.75**
42/40	20	10	4	8	£732	£907	**0.81**
54/50	20	10	4	8	£981	£1080	**0.91**

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