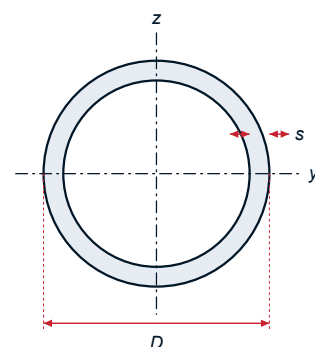


# Round Pipe Sections: Mass of 1 m, Welded and Water-Gas Pipes

The tables cover two groups of round pipes: electric-welded longitudinal pipes and water and gas pipes. Each has the mass of 1 m, and the sizes of the range also give the section area, the moment of inertia, the section modulus and the radius of gyration.

## Electric-welded pipes: mass of 1 m by diameter and wall

The mass of a welded pipe depends on two dimensions: the outside diameter  $D$  and the wall thickness  $s$ . The matrix below covers diameters from 20 to 530 mm; the mass of 1 m sits where a row (diameter) meets a column (wall). A dash means that the GOST 10704-91 range has no such combination.



Round tube section

## Electric-welded longitudinal pipes: mass of 1 m, kg · ГОСТ 10704-91

| D,<br>mm<br>/ s,<br>mm | 1.5  | 2    | 2.5   | 3     | 3.5   | 4     | 4.5   | 5     | 6     | 7     | 8     | 10    |
|------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 20                     | 0.68 | 0.89 | —     | —     | —     | —     | —     | —     | —     | —     | —     | —     |
| 25                     | 0.87 | 1.13 | 1.39  | —     | —     | —     | —     | —     | —     | —     | —     | —     |
| 32                     | 1.13 | 1.48 | 1.82  | 2.15  | —     | —     | —     | —     | —     | —     | —     | —     |
| 38                     | 1.35 | 1.78 | 2.19  | 2.59  | —     | —     | —     | —     | —     | —     | —     | —     |
| 42                     | 1.5  | 1.97 | 2.44  | 2.89  | —     | —     | —     | —     | —     | —     | —     | —     |
| 45                     | 1.61 | 2.12 | 2.62  | 3.11  | —     | —     | —     | —     | —     | —     | —     | —     |
| 48                     | 1.72 | 2.27 | 2.81  | 3.33  | —     | —     | —     | —     | —     | —     | —     | —     |
| 57                     | 2.05 | 2.71 | 3.36  | 4     | 4.62  | —     | —     | —     | —     | —     | —     | —     |
| 60                     | 2.16 | 2.86 | 3.55  | 4.22  | 4.88  | —     | —     | —     | —     | —     | —     | —     |
| 76                     | 2.76 | 3.65 | 4.53  | 5.4   | 6.26  | 7.1   | 7.93  | 8.75  | —     | —     | —     | —     |
| 89                     | —    | 4.29 | 5.33  | 6.36  | 7.38  | 8.38  | 9.38  | 10.36 | —     | —     | —     | —     |
| 102                    | —    | 4.93 | 6.13  | 7.32  | 8.5   | 9.67  | 10.82 | 11.96 | —     | —     | —     | —     |
| 108                    | —    | 5.23 | 6.5   | 7.77  | 9.02  | 10.26 | 11.49 | 12.7  | —     | —     | —     | —     |
| 114                    | —    | 5.52 | 6.87  | 8.21  | 9.54  | 10.85 | 12.15 | 13.44 | —     | —     | —     | —     |
| 133                    | —    | 6.46 | 8.05  | 9.62  | 11.18 | 12.73 | 14.26 | 15.78 | —     | —     | —     | —     |
| 159                    | —    | 7.74 | 9.65  | 11.54 | 13.42 | 15.29 | 17.15 | 18.99 | 22.64 | 26.24 | 29.79 | —     |
| 168                    | —    | 8.19 | 10.2  | 12.21 | 14.2  | 16.18 | 18.14 | 20.1  | 23.97 | 27.79 | 31.57 | —     |
| 219                    | —    | —    | 13.35 | 15.98 | 18.6  | 21.21 | 23.8  | 26.39 | 31.52 | 36.6  | 41.63 | —     |
| 273                    | —    | —    | —     | —     | 23.26 | 26.54 | 29.8  | 33.05 | 39.51 | 45.92 | 52.28 | —     |
| 325                    | —    | —    | —     | —     | —     | 31.67 | 35.57 | 39.46 | 47.2  | 54.9  | 62.54 | —     |
| 377                    | —    | —    | —     | —     | —     | 36.79 | 41.34 | 45.87 | 54.9  | 63.87 | 72.8  | 90.51 |
| 426                    | —    | —    | —     | —     | —     | 41.63 | 46.78 | 51.91 | 62.15 | 72.33 | 82.47 | 102.6 |
| 530                    | —    | —    | —     | —     | —     | —     | —     | —     | 77.54 | 90.29 | 103   | 128.2 |

$D$  is the outside diameter and  $s$  is the wall thickness, both in millimetres. The mass of 1 m in kilograms is calculated as  $\pi \cdot (D - s) \cdot s \cdot 7850$  with the dimensions in metres and a steel density of 7850 kg/m<sup>3</sup>.

## Section properties of the pipes

The section area, the moment of inertia and the section modulus are needed to check a pipe for bending or compression. The table covers the sizes of the range from 57×3 to 219×6 mm.

### Electric-welded longitudinal steel pipes · ГОСТ 10704-91

| Size    | A, cm <sup>2</sup> | Mass of 1 m, kg | Metres per tonne | J, cm <sup>4</sup> | W, cm <sup>3</sup> | i, cm |
|---------|--------------------|-----------------|------------------|--------------------|--------------------|-------|
| 57×3    | 5.09               | 4               | 250              | 18.61              | 6.53               | 1.91  |
| 57×3.5  | 5.88               | 4.62            | 216              | 21.14              | 7.42               | 1.9   |
| 57×4    | 6.66               | 5.18            | 193              | 23.52              | 8.25               | 1.88  |
| 76×3    | 6.88               | 5.4             | 185              | 45.91              | 12.08              | 2.58  |
| 76×3.5  | 7.97               | 6.26            | 160              | 52.5               | 13.82              | 2.57  |
| 76×4    | 9.05               | 7.1             | 141              | 58.81              | 15.48              | 2.55  |
| 89×3    | 8.11               | 6.36            | 157              | 75.02              | 16.86              | 3.04  |
| 89×3.5  | 9.4                | 7.38            | 136              | 86.05              | 19.34              | 3.03  |
| 89×4    | 10.68              | 8.38            | 119              | 96.68              | 21.73              | 3.01  |
| 102×3   | 9.33               | 7.32            | 137              | 114.42             | 22.43              | 3.5   |
| 102×3.5 | 10.83              | 8.5             | 118              | 131.52             | 25.79              | 3.49  |
| 102×4   | 12.32              | 9.67            | 103              | 148.09             | 29.04              | 3.47  |
| 102×5   | 15.24              | 11.96           | 83.6             | 179.68             | 35.23              | 3.43  |
| 108×3   | 9.9                | 7.77            | 129              | 136.49             | 25.28              | 3.71  |
| 108×3.5 | 11.49              | 9.02            | 111              | 157.02             | 28.08              | 3.7   |
| 108×4   | 13.07              | 10.26           | 97.5             | 176.95             | 32.77              | 3.68  |
| 133×3   | 12.25              | 9.62            | 104              | 258.97             | 38.94              | 4.6   |
| 133×3.5 | 14.24              | 11.18           | 89.4             | 298.71             | 44.92              | 4.58  |
| 133×4   | 16.21              | 12.73           | 78.6             | 337.53             | 50.76              | 4.57  |
| 133×4.5 | 18.17              | 14.26           | 70.1             | 375.42             | 56.45              | 4.55  |
| 159×3   | 14.7               | 11.54           | 86.7             | 447.42             | 56.28              | 5.52  |
| 159×3.5 | 17.1               | 13.42           | 74.5             | 517.06             | 65.04              | 5.5   |
| 159×4   | 19.48              | 15.29           | 65.4             | 585.33             | 73.63              | 5.48  |
| 159×4.5 | 21.84              | 17.15           | 58.3             | 652.27             | 82.05              | 5.47  |
| 219×5   | 33.62              | 26.39           | 37.9             | 1925.34            | 175.83             | 7.57  |
| 219×6   | 40.15              | 31.52           | 31.7             | 2278.74            | 208.1              | 7.54  |

A is the section area; J is the moment of inertia; W is the section modulus; i is the radius of gyration. For a ring section these values are the same about any axis through the centre.

## Water and gas pipes by group

Water and gas pipes to GOST 3262-75 come in three groups: light, ordinary and reinforced. The group sets the wall thickness and so the mass of a metre. For example, a DN 25 pipe with a 33.5 mm outside diameter has a 2.8 mm wall in the light version and a 4.0 mm wall in the reinforced one, weighing 2.12 and 2.91 kg/m respectively.

A pipe of this type is designated by its nominal bore DN rather than by the inside diameter. The outside diameter has its own column in the table, and it is the one you need when designing supports and fixings.

### Steel water and gas pipes · ГОСТ 3262-75

| DN, mm | Outer diameter D, mm | Light: s, mm | Light: mass of 1 m, kg | Ordinary: s, mm | Ordinary: mass of 1 m, kg | Reinforced: s, mm | Reinforced: mass of 1 m, kg |
|--------|----------------------|--------------|------------------------|-----------------|---------------------------|-------------------|-----------------------------|
| 6      | 10.2                 | 1.8          | 0.37                   | 2               | 0.4                       | 2.5               | 0.47                        |
| 8      | 13.5                 | 2            | 0.57                   | 2.2             | 0.61                      | 2.8               | 0.74                        |
| 10     | 17                   | 2            | 0.74                   | 2.8             | 0.98                      | 2.8               | 0.98                        |
| 15     | 21.3                 | 2.5          | 1.16                   | 2.8             | 1.28                      | 3.2               | 1.43                        |
| 20     | 26.8                 | 2.5          | 1.5                    | 2.8             | 1.66                      | 3.2               | 1.86                        |
| 25     | 33.5                 | 2.8          | 2.12                   | 3.2             | 2.39                      | 4                 | 2.91                        |

| DN, mm | Outer diameter D, mm | Light: s, mm | Light: mass of 1 m, kg | Ordinary: s, mm | Ordinary: mass of 1 m, kg | Reinforced: s, mm | Reinforced: mass of 1 m, kg |
|--------|----------------------|--------------|------------------------|-----------------|---------------------------|-------------------|-----------------------------|
| 32     | 42.3                 | 2.8          | 2.73                   | 3.2             | 3.09                      | 4                 | 3.78                        |
| 40     | 48                   | 3            | 3.33                   | 3.5             | 3.84                      | 4                 | 4.34                        |
| 50     | 60                   | 3            | 4.22                   | 3.5             | 4.88                      | 4.5               | 6.16                        |
| 65     | 75.5                 | 3.2          | 5.71                   | 4               | 7.05                      | 4.5               | 7.88                        |
| 80     | 88.5                 | 3.5          | 7.34                   | 4               | 8.34                      | 4.5               | 9.32                        |
| 90     | 101.3                | 3.5          | 8.44                   | 4               | 9.6                       | 4.5               | 10.74                       |
| 100    | 114                  | 4            | 10.85                  | 4.5             | 12.15                     | 5                 | 13.44                       |
| 125    | 140                  | 4            | 13.42                  | 4.5             | 15.04                     | 5.5               | 18.24                       |
| 150    | 165                  | 4            | 15.88                  | 4.5             | 17.81                     | 5.5               | 21.63                       |

DN is the nominal bore; D is the outside diameter; s is the wall thickness; the thickness and the mass of 1 m are given for each group.

## How to get the mass of a pipe from the table

A 108×4 mm pipe has a mass of 10.26 kg/m, so a six-metre length weighs about 61.6 kg, and a tonne of this pipe is 97.5 m long. For a 159×4.5 mm pipe (17.15 kg/m) a tonne is about 58.3 m.

The radius of gyration shows how well a pipe resists buckling in compression: it is the square root of the moment of inertia divided by the section area. For a 108×4 mm pipe it is  $\sqrt{(176.95 / 13.07)} \approx 3.68$  cm, which matches the table.

Metres per tonne for a DN 50 ordinary-group pipe (4.88 kg/m) are found the same way:  $1000 / 4.88 \approx 205$  m.

## Where round pipes are used

A round section behaves the same in every direction, so pipes are used for posts, columns, purlins and truss members. Water and gas pipes are meant for water and gas lines, and also for frames and supports where a thin wall is enough.

Use the rolled metal calculator to see the mass of pipes by length or by count. When the pipes are needed within a structure, send a drawing or a specification. At the POLYGONAL company they can be fabricated into steel structures from your drawings, with KM and KMD drawings prepared if needed and hot-dip galvanizing done.

## Frequently asked questions

### How much does a 108×4 pipe weigh?

A metre of 108×4 mm pipe weighs 10.26 kg. A 6 m length is about 61.6 kg.

### How is a water and gas pipe different from a welded pipe?

Welded pipes follow GOST 10704-91 and water and gas pipes follow GOST 3262-75. The latter are specified by nominal bore DN and group (light, ordinary, reinforced), the former by diameter and wall.

### How do I calculate the mass of a round pipe myself?

Multiply  $\pi$  by the difference between the outside diameter and the wall, then by the wall and by 7850. Take the dimensions in metres and the result is in kilograms per metre. For 57×3 mm it is about 4.0 kg/m.

### What does a dash in the size matrix mean?

A dash is where the range has no pipe with that combination of diameter and wall. Its mass can be estimated with the formula, but it cannot be ordered to the standard.

Reference information. Check the values against the current standard before using them in a project.