

## GOST 8731-74 SEAMLESS HOT-FINISHED STEEL TUBES TECHNICAL REQUIREMENTS

This standard specifies steel grades, mechanical properties and testing procedures for tubes.

Steel grades.

Tubes to this standard are made of steel grades St2sp, St4sp, St5sp, St6sp according to GOST 380-88; steel grades 10, 20, 35 and 45 according to GOST 1050-88; 10G2; 20H; 40H; 30HGSA; 15HM; 30HMA and 12HN2 according to GOST 4543-71.

According to quality level required tubes can be delivered with indications given below:

A - steel grades St2sp, St4sp, St5sp, St6sp with specified mechanical properties;

B - steel grades to GOST 380-71 (killed) with standard manganese content to GOST 1050-88 and steel grades to GOST 4543-71 and GOST 19282-73;

V - steel grades with specified mechanical properties (see Table) and chemical composition to GOST 1050-88, GOST 4543-71 and GOST 380-71;

G - steel grades with specified 1050-88, GOST 4543-71 and GOST 19282-79 and mechanical properties of heat-treated specimens, whose mechanical properties shall conform to those given for the steel grades;

D - steel grades without mechanical properties specified but the hydraulic testing pressure being clearly indicated.

Mechanical properties of tube metal with A and V indications shall be in accordance with those given in Table 1. Mechanical properties of tubes with wall thickness over 45 mm are subject to agreement.

Table 1 Mechanical properties of seamless hot-finished tubes of carbon and low alloy steel grades

| Марка стали | Временное сопротивление разрыву, МПа | Предел прочности, МПа | Относительное удлинение, % | Твёрдость по Бринеллю при толщине стенки S > 10 мм    |                |
|-------------|--------------------------------------|-----------------------|----------------------------|---|----------------|
|             | не менее                             |                       |                            | Диаметр отпечатка, мм<br>не менее                     | HB<br>не более |
| Steel grade | Tensile strength, MPa;               | Yield strength, MPa;  | Elongation, percent        | Brinell hardness number for wall thickness over 10 mm |                |
|             | not lower                            |                       |                            | Diameter of indentation, mm<br>not lower              | HB<br>not over |
| 10          | 353                                  | 216                   | 24                         | 5.1   | 137            |
| 20          | 412                                  | 245                   | 21                         | 4.8   | 156            |
| 35          | 510                                  | 294                   | 17                         | 4.4   | 187            |
| 45          | 589                                  | 324                   | 14                         | 4.2   | 207            |
| 10Г2        | 471                                  | 265                   | 21                         | 4.3   | 197            |
| 20X         | 432                                  | -                     | 16                         | -   | -              |
| 40X         | 657                                  | -                     | 9                          | 3.7   | 269            |
| 30ХГСА      | 687                                  | -                     | 11                         | -   | -              |
| 15ХМ        | 432                                  | 226                   | 21                         | -   | -              |
| 30ХМА       | 589                                  | 392                   | 13                         | -   | -              |
| 12ХН2       | 638                                  | 392                   | 14                         | -   | -              |
| Ст2сп       | 343                                  | 216                   | 24                         | -   | -              |
| Ст4сп       | 412                                  | 245                   | 20                         | -   | -              |
| Ст5сп       | 392                                  | 275                   | 17                         | -   | -              |
| Ст6сп       | 589                                  | 304                   | 14                         | -   | -              |

If required, all the mechanical properties of other steel grades to GOST 380-88, GOST 1050-88, GOST 4543-71 and GOST 19282-79 can be given in other specifications.

Hydraulic testing. All types of tubes intended for high pressure service shall undergo hydraulic tests. This requirement is indicated in the order.

Hydraulic test pressure is calculated from the formulas given in GOST 3845-75 depending on tube size and permissible stress R in tube metal, equal to 40 percent of the tensile strength value for a given steel grade.

Bending test (if required by the customer) is carried out for tubes with diameters below 159 mm and wall thickness below 8 mm using a conical (1:10) drift mandrel.

Specified diameter increase (percent of initial value)

| for wall thickness in mm       | Steel grade 10; St2sp | Steel grade 20; St4sp; 15HM |
|--------------------------------|-----------------------|-----------------------------|
| не более 4<br>equal or under 4 | 10                    | 8                           |
| больше 4<br>over 4             | 6                     | 5                           |

When required by the customer, flattening test is carried out for tubes with wall thickness below 10 mm; during the test distance H between the plates is calculated from the formula:

$$H = \frac{(1 + c)t}{c + t/D_s}$$

where c is a coefficient equal to 0.09 for steel grade 10; 0.08 for steel grades St2sp, 20, St4sp, 15HM;

t - is specified wall thickness;

D<sub>s</sub> - is specified diameter (mm).

Flanging test (is required by the customer) is carried out for tubes with the specified diameter 30 to 160 mm and wall thickness not greater than the values given below:

|                               |                    |                     |                     |                     |
|-------------------------------|--------------------|---------------------|---------------------|---------------------|
| D <sub>n</sub> , мм . . . . . | <60                | 60-108              | 108-140             | 140-160             |
| S, мм, не более . . .         | 0.1D <sub>n</sub>  | 0.08D <sub>n</sub>  | 0.06D <sub>n</sub>  | 0.05D <sub>n</sub>  |
| OD, мм                        | below 60           | 60-108              | 108-140             | 140-160             |
| t, мм, not greater            | 0.1 D <sub>s</sub> | 0.08 D <sub>s</sub> | 0.06 D <sub>s</sub> | 0.05 D <sub>s</sub> |

Flanging test for tubes of steel grades 10 and St2sp is carried out till the angle of 90 degrees is reached; for steel grades 20, St4sp, 15HM this angle is equal to 60 degrees. The width of the flanged portion of the tube shall be not less than 12 % of D<sub>s</sub> and not less than 1.5 t.

Supplementary requirements.

Tube surface quality. Surface defects such as cracks, laps, fractures are regarded as permissible.

Macrostrutural examination of tube metal is carried out for wall thickness over 12 mm on the buyer's request; this test is not required for tubes manufactured on pilger mills from billets.

Hydraulic testing of tubes can be substituted by some flaw-detection procedures which are mutually agreed on.