

I N T E R S T A T E S T A N D A R D S

METAL PIPES AND FITTINGS

Part 3

Welded Pipes. Profile Pipes

Official Edition
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I N T E R S T A T E S T A N D A R D**LONGITUDINAL ELECTRIC-WELDED STEEL PIPES****Technical requirements****GOST
10706-76**

OKP (All-Union Product Classification Code) 13 8100

Date of introduction 01.01.78

This Standard applies to general-purpose longitudinal electric-welded pipes of 478 to 1420 mm in diameter.

(Amended Wording, Amendment No. 4).

1. TECHNICAL REQUIREMENTS

1.1. The pipes' dimensions and its maximum deviations shall comply with GOST 10704.

1.2. Depending on quality indices the following groups of pipes are produced:

A — categorized by mechanical properties, made from carbon steel of grades Ст2, Ст3 (of all degrees of deoxidation) in accordance with GOST 380, of category 1 in accordance with GOST 14637;

Б — categorized by chemical composition, made from carbon steel of grades Ст2, Ст3 (of all degrees of deoxidation) with chemical composition in accordance with GOST 380 and GOST 14637;

В — categorized by chemical composition and by mechanical properties, made from carbon steel of grade Ст2 (of all degrees of deoxidation) in accordance with GOST 380, of category 2 in accordance with GOST 14637, of grade Ст3кп in accordance with GOST 380, of categories 2 and 3 in accordance with GOST 14637, of grades Ст3пс and Ст3сп in accordance with GOST 380, of categories 2, 3, 4 and 5 in accordance with GOST 14637, and also made from low-alloy steel whose carbon equivalent does not exceed 0.48 %;

Д — without normalization of mechanical properties and chemical composition but with normalization of hydraulic test pressure.

(Amended Wording, Amendment No. 4).

1.3. **(Removed, Amendment No. 3).**

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1.4. The mechanical properties of pipes' base metal shall comply with the norms specified in table 2.

Table 2*

Steel grade	Point of maximum load σ_b , kgf/mm ² (MN/m ²)	Yield strength σ_T , kgf/mm ² (MN/m ²)	Percent elongation δ_5 , %	Steel grade	Point of maximum load σ_b , kgf/mm ² (MN/m ²)	Yield strength σ_T , kgf/mm ² (MN/m ²)	Percent elongation δ_5 , %
	not less				not less		
Ст2кп	33 (325)	22 (215)	22	Ст3пс, Ст3сп	38 (372)	25 (245)	20
Ст2пс, Ст2сп	34 (335)	23 (225)	22	Low-alloy steel	45 (440)	27 (265)	18
Ст3кп	37 (365)	24 (235)	20				

(Amended Wording, Amendment No. 4).

1.5. Pipe groups A and B shall stand the welded joint mechanical tensile test in accordance with GOST 6996. Point of maximum load for welded joint shall be not lower that the point of maximum load for the base metal, established for pipes made from the given steel grade.

1.6. At the customer's request the pipes of group B shall stand the test for the base metal impact strength. The impact strength norms for base metal shall comply with those specified in table 3.

Table 3

Steel grade	Pipe wall thickness, mm	Impact strength KCU, kgf·m/cm ² (MJ/m ²), at a test temperature, °C		
		+20	-20	-40
		not less		
Ст3пс3, Ст3сп3	From 5 to 9 inclusive	6.0 (0.59)	—	—
	Over 9 » 25 »	5.0 (0.49)	—	—
	» 25	3.0 (0.29)	—	—
Ст3пс4, Ст3сп4	From 5 to 9 inclusive	—	2.0 (0.2)	—
	Over 9 » 25 »	—	1.5 (0.15)	—
	» 25	—	—	—
Low-alloy steel	All the walls	—	—	2.5 (0.24)

Note. By agreement between the manufacturer and the customer the impact strength of base metal of pipes made from low-alloy steel at a temperature of minus 60 °C shall be not less than 2.5 kgf·m/cm² (0.24 MJ/m²).

For trunk heat networks the pipes shall be heat-treated and made from steel of grades Ст3пс4 and Ст3сп5 with mechanical properties specified in table 3a.

Table 3a

Steel grade	Point of maximum load σ_b , kgf/mm ² (MN/m ²)	Yield strength σ_T , kgf/mm ² (MN/m ²)	Percent elongation δ_5 , %	Impact strength KCU, kgf·m/cm ² (MJ/m ²)	
				At a test temperature of minus 20 °C	After mechanical ageing
not less					
Ст3пс4	38 (372)	25 (245)	23	3 (0,3)	—
Ст3сп5	38 (372)	25 (245)	23	3 (0,3)	3 (0,3)

The impact strength norms for welded joints of heat networks pipes at a temperature of minus 20°C shall be not lower than the base metal norms specified in table 3a.

The norms of impact strength after mechanical ageing for the pipes base metal and also for welded joints at a temperature of minus 20°C are optional till 01.07.1988.

(Amended Wording, Amendments Nos. 2, 3 and 4).

* Table 1. (Removed, Amendment No. 3).

1.7. Pipes of up to 820 mm in diameter shall have not more than one longitudinal and one transverse weld. Pipes of 820 mm and more in diameter shall have two longitudinal and one transverse weld. At the customer's request a number of transverse welds increase is allowed.

Where there is a transverse weld the longitudinal welds shall be displaced relative to one another to a distance of no less than 100 mm. At the customer's request the upper bound of the longitudinal welds displacement relative to one another shall be established.

(Amended Wording, Amendment No. 1).

1.8. The height of reinforcing bead of outside longitudinal and transverse welds shall comply with the norms specified in table 4.

Table 4

mm	
Wall thickness	The height of the weld reinforcing bead
Up to 8 inclusive	From 0.5 to 3.0
Over 8 » 14 »	» 0,5 » 3.5
» 14 » 17 »	» 0.5 » 4.0
» 17	» 0.5 » 5.0

The reinforcing bead height increase by 1 mm over the norms specified in table 4 is allowed in the weld and tack repair places.

The height of reinforcing bead by the inside weld center shall be not less than 0.5 mm. The inside weld reinforcement removal to the height of 0 to 0.5 mm is allowed at the pipe ends along the length of no less than 150 mm.

(Amended Wording, Amendment No. 4).

1.9. The pipe ends shall be cut off at right angles. A right angle deviation (cut obliquity) shall not exceed that specified in table 5.

Table 5

mm			
Outside pipe diameter	478 to 720	820 to 1020	1120 to 1420
Cut obliquity maximum deviations	2.5	3.5	4.5

1.10. Pipe ends shall have a bevel at an angle of 25 to 30 ° to a pipe end face. The end-face ring (blunting) of 1.0 to 3.0 mm wide for pipes up to 1020 mm in diameter inclusive and of 1.0 to 5.0 mm wide for pipes of more than 1020 mm in diameter shall be left.

At the customer's request the bevel angle shall be of 30 to 35 °, and for pipes with the wall thickness of 17 mm and over the beveling shall be made according to figure 1.

It is allowed to make beveling according to figure 1 on pipes with the wall thickness of 15 mm.

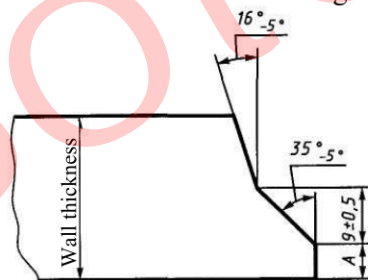


Fig. 1

Pipe diameter, mm	Dimension A, mm
Up to 1020	From 1 to 3
Over 1020	From 1 to 5

1.9 and 1.10. **(Amended Wording, Amendment No. 4).**

1.11. Cracks, slivers, voids, stratifications and backfins on the pipe surface are not allowed. Insignificant dints, rippling, dents, small hairlines, a thin scale layer, defects conditioning and patch work marks are allowed if they do not decrease the wall thickness beyond the maximum deviations. Besides, a longitudinal hairline of no more than 0.2 mm deep applied for automatic welding to direct a weld is allowed.

Pipes patch work with the subsequent conditioning of welded places and re-testing under hydraulic pressure is allowed.

1.12. The weld metal surface defects such as pores, voids, cracks, wormholes and other defects that reduce the density and strength of weld metal below the base metal level are not allowed.

The metal contraction marks lengthwise the weld longitudinal axis (shrinkages) are allowed. The contraction value shall not reduce the reinforcement height beyond the limits of the minimum allowable weld height.

The weld reinforcement junction to the base metal shall be graded (without undercuts).

Undercuts up to 0.5 mm deep are allowed without a repair. In case the undercuts on the outside and inside welds coincide, one of them shall be repaired.

It is allowed to carry out the welded pipes repairs with the subsequent testing under hydraulic pressure or the repair place inspection by physical methods.

1.13. Each pipe shall stand the hydraulic pressure test.

Pipes of group A shall be subjected to testing by hydraulic pressure calculated under the formula specified in GOST 3845 (P_1), where the allowable stress shall be accepted equal to 0.5 of the minimum point of maximum load value established for the given steel grade.

At the customer's order the allowable stress shall be equal to 0.85 of the minimum yield strength value.

Pipes of group B shall be subjected to testing by hydraulic pressure calculated under the formula specified GOST 3845 (P_1) where the allowable stress is equal to 0.9 of the minimum yield strength value established for the given steel grade.

Pipes of groups Д and Б shall stand the test by hydraulic pressure of no less than 25 kgf/cm² (2.5 MPa). Pipes of the dimensions 920·7, 1020·8, 1120·8, 1120·9, 1220·9, 1220·10, 1320·9, 1320·10, 1320·11, 1420·10 and 1420·11 mm shall be tested under the pressure of 20 kgf/cm² (2.0 MPa).

When testing on presses of various designs with axial backup the hydraulic pressure value shall be determined in accordance with the requirements of GOST 3845.

Pipes over 10 m long made by butt-seam welding, or more than two pipes that have passed the hydraulic test, shall not be subjected to hydraulic test. At the customer's request the transverse weld shall be inspected by nondestructive physical methods.

(Amended Wording, Amendments Nos. 2 and 4).

1.14. The welded joints of heat network pipes shall be inspected by nondestructive methods along the full length.

At the customer's request the welded joints of pipes of group B shall be inspected by nondestructive methods.

(Amended Wording, Amendments Nos. 2 and 3).

1.15. The welded joints of trunk heat network pipes shall be subjected to static bend test.

The minimum allowable flare angle for welded joints of pipes made from carbon steels shall be not less than 100°.

The welded joint static bend test norm is optional till 01.07.1988

(Subsequently Inserted, Amendment No. 2).

2. ACCEPTANCE PROCEDURE

2.1. Pipes shall be accepted in batches. Each batch shall consist of pipes of the same size, the same steel grade and of the same group of manufacture and shall be accompanied by one quality certificate in accordance with GOST 10692.

A number of pipes in a batch shall not exceed 100 pieces

(Amended Wording, Amendment No. 2).

2.2. Each pipe shall be subjected to inspection and measurement.

2.3. Each pipe shall be subjected to hydraulic pressure test.

2.4. For the mechanical properties and impact strength inspection the following shall be selected from a batch:

two pipes for single-weld pipes;

one pipe for double-weld pipes.

(Amended Wording, Amendment No. 4).

2.5. The steel chemical composition shall be accepted according to the billet manufacturer's quality certificate. The inspection, where necessary, of the finished pipes chemical composition shall be carried out on one pipe taken from a batch.

2.6. If unsatisfactory results are obtained for even one of the parameters, in the course of testing, a re-testing shall be performed on double the number of samples taken from the same batch or heat.

The results of the re-testing shall be assigned to the entire batch.

(Amended Wording, Amendment No. 2).**3. TEST METHODS**

3.1. The steel chemical composition shall be inspected, where necessary, in accordance with GOST 22536.0 to GOST 22536.6. The samples for determination of the steel chemical composition shall be selected in accordance with GOST 7565.

3.2. The outside pipe diameter (D_H), in millimeters, shall be inspected by the girth measurement and calculated using the formula

$$D_H = \frac{P}{3,1416} - 2\Delta p - 0,2,$$

where P is a pipe girth, in mm;

Δp is a tape-measure thickness, in mm;

0.2 is a girth measurement error due to the tape-measure misalignment when coinciding the divisions.

(Amended Wording, Amendment No. 1).

3.3. The pipe hydraulic test shall be carried out in accordance with GOST 3845 keeping a pipe under pressure for no less than 10 s.

3.4. One sample shall be cut-off from each selected pipe to carry out tensile test for the base metal and welded joint. Samples shall be selected in accordance with GOST 7564.

The base metal tensile test shall be carried out on quintuple transverse samples in accordance with GOST 10006.

It is allowed instead of tensile test to carry out the pipes inspection by nondestructive methods that provide the conformity of mechanical properties to the norms specified in this Standard.

Where disputes arise over the evaluation of mechanical properties level the test shall be carried out in accordance with GOST 10006.

It is allowed to carry out the tensile test of the base metal of pipes made from low-alloy steels pursuant to normative documents approved in accordance with the established procedure.

(Amended Wording, Amendment No. 4).

3.5. The welded joint tensile test shall be carried out in accordance with GOST 6996 on the samples of type XII with the removed reinforcement. The samples for welded joint tensile test shall be selected in perpendicular to the weld.

3.6. Three base metal samples and three welded joint samples shall be cut off from each selected pipe to carry out the impact bend test. Three samples shall be selected in addition in accordance with GOST 9454 to test the base metal for impact bending after mechanical ageing.

The pipe base metal test for impact bending shall be carried out on the samples cut off in perpendicular to the pipe axis. The test shall be carried out in accordance with GOST 9454 on the samples of type I with the wall thickness of more than 10 mm and of type 3 with the wall thickness of 10 mm and less.

The welded joint test for impact bending shall be carried out on the samples of type VII with the wall thickness of 10 mm and less and of type VI with the wall thickness of 11 mm and more in accordance with GOST 6996. The cut on the impacted samples shall be made on the latest welded joint line in perpendicular to the rolled metal surface.

The impact strength of the base metal and of the welded joint shall be determined as arithmetic mean value of three samples test results. The impact strength decrease by 4.9 J/cm² (0.5 kgf-m/cm²) is

allowed on one of the samples, except for the pipes designed for heat networks.

(Amended Wording, Amendment No. 2).

3.7. When preparing samples for mechanical test the samples straightening is allowed with the use of static load.

3.8. The welded joint quality monitoring by physical methods shall be established by the manufacturer.

The norms of the allowable defects determined by nondestructive inspection methods shall be specified in the normative documents approved in accordance with the established procedure.

3.9. Carbon equivalent (\mathcal{D}), in percentage, for an individual low-alloy steel heat shall be calculated using the formula

$$\mathcal{D} = C + \frac{Mn}{6} + \frac{V}{5},$$

where C, Mn and V is a carbon, manganese and vanadium mass fraction, %.

(Subsequently Inserted, Amendment No. 1).

3.10. Test for mechanical ageing tendency shall be carried out in accordance with GOST 7268 without 10 % preliminary deformation.

(Subsequently Inserted, Amendment No. 2).

3.11. The following shall be measured on a pipe:
girth, with a tape-measure in accordance with GOST 7502;
length, with a tape-measure in accordance with GOST 7502 or with automated measurement instrumentation in accordance with normative documents;

the wall thickness, with a micrometer in accordance with GOST 6507 or with a thickness gage in accordance with GOST 11358;

curvature, with a straightedge and a gage probe in accordance with normative document;

cut obliquity, this parameter shall be provided by a design of the equipment for pipe end faces processing;

depth of a defect in a place of conditioning, with a thickness caliper gage in accordance with GOST 162;

pipe end-face ring (blunting), with a ruler in accordance with GOST 427;

bevel angle, with a bevel square in accordance with GOST 5378.

(Amended Wording, Amendments Nos. 2 and 4).

3.12. The pipe static bend test shall be carried out in accordance with normative documents.

3.12 **(Subsequently Inserted, Amendment No. 2).**

4. MARKING, PACKING, TRANSPORTATION AND STORAGE

4.1. Marking, packing, transportation and storage of pipes shall comply with GOST 10692.

For mechanized marking the arrangement of marks at a distance of more than 500 mm from the pipe end face is allowed. A marking place shall be marked with a black paint in the form of an arrow or a straight line.

Each pipe shall be marked in addition with the following:

pipe number;

batch number;

year of manufacture;

inspection stamp;

pipe dimensions (the diameter and the wall thickness);

number of this Standard.

When marking pipes it is allowed instead of a steel grade to put its conventional designation specified in the quality certificate.

The heat-treated pipes shall be marked with a sign «T».

(Amended Wording, Amendment No. 2).

APPENDIX. (Removed, Amendment No. 3).

DETAILS

1. DEVELOPED by All-Union Research and Engineering and Design Institute of Pipe Industry (VNITI)

DEVELOPERS

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2. APPROVED AND INTRODUCED by Decree No. 892, dated 22.04.76, of the USSR State Committee for Standards

Amendment No. 4 is adopted by Interstate Council of Standardization, Metrology and Certification (protocol No. 12, dated 21.11.97)

Registered by Interstate Council Technical Secretariat No. 2893

Votes in favor:

State	National standards body
Republic of Azerbaijan	Azgosstandart
Republic of Armenia	Armgosstandart
Republic of Belarus	Gosstandart of the Republic of Belarus
Republic of Kazakhstan	Gosstandart of the Republic of Kazakhstan
Republic of Kirghizia	Kirghizstandart
Republic of Moldova	Moldovastandart
Russian Federation	Gosstandart of Russia
Republic of Tadjikistan	Tadjikgosstandart
Turkmenistan	Head State Inspectorate «Turkmenstandartlary»
Republic of Uzbekistan	Uzgosstandart
Ukraine	Gosstandart of Ukraine

3. IN PLACE OF GOST 10706-63

4. This Standard complies with CMEA Standard 489-77 and establishes more rigid requirements for the base metal impact strength, a number of transverse welds, the inside weld reinforcement and for the pipe end bevel

5. REFERENCE DOCUMENTATION

Number of reference document referred to	Number of clause	Number of reference document referred to	Number of clause
GOST 162-90	3.11	GOST 10006-80	3.4
GOST 380-94	1.2	GOST 10692-80	2.1; 4.1
GOST 427-75	3.11	GOST 10704-91	1.1
GOST 3845-75	1.13; 3.3	GOST 11358-89	3.11
GOST 5378-88	3.11	GOST 14637-89	1.2
GOST 6507-90	3.11	GOST 22536.0-87	3.1
GOST 6996-66	1.5; 3.5; 3.6	GOST 22536.1-88	3.1
GOST 7268-82	3.10	GOST 22536.2-87	3.1
GOST 7502-98	3.11	GOST 22536.3-88	3.1
GOST 7564-97	3.4	GOST 22536.4-88	3.1
GOST 7565-81	3.1	GOST 22536.5-87	3.1
GOST 9454-78	3.6	GOST 22536.6-88	3.1

7. **Restriction of validity is removed by protocol No. 5—94 of Interstate Councils on Standardization, Metrology and Certification (IUS {Standards Information Catalog} 11-12—94)**
8. **EDITION with Amendments Nos. 1, 2, 3 and 4, approved in July 1980, December 1985, November 1990, April 1999 (IUS 10-80, 4-86, 2-91 and 7-99)**

Botop Steel