



U S S R   S T A T E   S T A N D A R D

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**SIZED BARS MADE OF HIGH-QUALITY  
STRUCTURAL CARBON STEEL  
WITH A SPECIAL SURFACE FINISH**

GENERAL TECHNICAL SPECIFICATIONS

**GOST 1050-88**

Official Edition

USSR STATE COMMITTEE FOR PRODUCT QUALITY MANAGEMENT  
AND STANDARDS

M o s c o w

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**SIZED BARS MADE OF HIGH-QUALITY  
STRUCTURAL CARBON STEEL  
WITH A SPECIAL SURFACE FINISH****GOST  
1050-88****General technical specifications**OKP (All-Union Product Classification Code) 09 5 000. 11 4 100. 11 5 000

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Period of validity from 01.01.91  
to 01.01.96**Failure to comply with this Standard will result in legal proceedings**

This Standard establishes the general technical specifications for hot-rolled and forged bars made of high-quality structural carbon steel of grades 08, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 58 (55mm), and 60 with diameter or thickness up to 250 mm, and also for sized rolled products with a special surface finish of all grades.

Regarding the standards for chemistry, this Standard applies to the other types of rolled products, ingots, forging and pressings made both of steels of grades listed above, and also of steels of grades 05кп, 08кп, 08пс, 10кп, 10пс, 11кп, 15кп, 15пс, 18кп, 20кп and 20пс.

**1. KEY PARAMETERS AND DIMENSIONS**

1.1. Grades and chemistry of steel determined from a ladle sample shall correspond to the values specified in table 1.

Table 1

Grade of steel	Fraction of total mass of elements, %			
	Carbon	Silicon	Manganese	Chromium, no more than
05кп	No more than 0.06	No more than 0.03	No more than 0.40	0.10
08кп	0.05–0.12	No more than 0.03	0.25–0.50	0.10
08пс	0.05–0.11	0.05–0.17	0.35–0.65	0.10
08	0.05–0.12	0.17–0.37	0.35–0.65	0.10
10кп	0.07–0.14	No more than 0.07	0.25–0.50	0.15
10пс	0.07–0.14	0.05–0.17	0.35–0.65	0.15
10	0.07–0.14	0.17–0.37	0.35–0.65	0.15
11кп	0.05–0.12	No more than 0.06	0.30–0.50	0.15
15кп	0.12–0.19	No more than 0.07	0.25–0.50	0.25
15пс	0.12–0.19	0.05–0.17	0.35–0.65	0.25
15	0.12–0.19	0.17–0.37	0.35–0.65	0.25
18кп	0.12–0.20	No more than 0.06	0.30–0.50	0.15
20кп	0.17–0.24	No more than 0.07	0.25–0.50	0.25
20пс	0.17–0.24	0.05–0.17	0.35–0.65	0.25
20	0.17–0.24	0.17–0.37	0.35–0.65	0.25
25	0.22–0.30	0.17–0.37	0.50–0.80	0.25
30	0.27–0.35	0.17–0.37	0.50–0.80	0.25
35	0.32–0.40	0.17–0.37	0.50–0.80	0.25
40	0.37–0.45	0.17–0.37	0.50–0.80	0.25
45	0.42–0.50	0.17–0.37	0.50–0.80	0.25
50	0.47–0.55	0.17–0.37	0.50–0.80	0.25
55	0.52–0.60	0.17–0.37	0.50–0.80	0.25
58 (55пп)	0.55–0.63	0.10–0.30	No more than 0.20	0.15
60	0.57–0.65	0.17–0.37	0.50–0.80	0.25

## Notes:

1. The following identification numbers for steels (depending on degree of deoxidation) shall be used: кп is for rimmed steel; пс is for semi-killed steel; and identification numbers without letters are for killed steels.

2. The use of grade 05кп steel is not allowed in newly developed or modified machines.

1.1.1. The sulfur fraction of total mass in steel shall be no more than 0.040 %; the phosphorus fraction of total mass shall be no more than 0.035 %.

For grades 11кп and 18кп steels applied for cladding, the sulfur fraction of total mass shall be no more than 0.035 %; the phosphorus fraction of total mass shall be no more than 0.030 %.

1.1.2. The nickel residual fraction of total mass in steel of all grades shall not exceed 0.30 %; the copper fraction of total mass shall not exceed 0.20 % in steel of grades 11кп and 18кп and shall not exceed 0.30 % in steel of other grades.

1.1.3. In steels of grades 35, 40, 45, 50, 55 and 60, intended for manufacturing patented wire, the manganese fraction of total mass shall be from 0.30 to 0.60 %; the nickel fraction of total mass shall be no more than 0.15 %; the chromium fraction of total mass shall be no more than 0.15 %; the copper fraction of total mass shall be no more than 0.20 %. The sulfur and phosphorus fractions of total mass shall meet the requirements of the standards for wire, but shall not exceed the standards specified in clause 1.1.1.

1.1.4. In grades 08пс, 10пс, 15пс and 20пс steels intended for manufacturing rolled sheet for cold pressing, the lower limit of the manganese fraction of total mass shall be 0.25 %.

1.1.5. In grades 08пс, 10пс, 10пс and 20пс steels, the silicon fraction of total mass may be less than 0.05 % provided that the others deoxidizers (except for silicon) are applied in the necessary amount.

1.1.6. The arsenic fraction of total mass shall be no more than 0.08 % in steel.

1.1.7. The nitrogen fraction of total mass in basic oxygen steel shall not exceed 0.006 % for light-gage rolled products and strips and 0.008 % for other types of rolled products.

1.2. In rolled products, billets, forging and products intended for further processing, chemistry deviations from the standards specified in table 1 are allowed in accordance with table 2.

Table 2

Description of element	Permissible deviations, %
Carbon	±0.01
Silicon for killed steel	±0.02
Manganese	±0.03
Phosphorus	+0.005

1.3. The rolled product range shall meet the following requirements:

GOST 2590 for hot-rolled round products;

GOST 2591 or other specifications and technical documentation for hot-rolled square products;

GOST 1133 for forged round and square products;

GOST 2879 for hot-rolled hexagonal products;

GOST 103 for hot-rolled strips;

GOST 4405 for forged strips;

GOST 7417 for sized round rolled products;

GOST 8559 for sized square rolled products;

GOST 8560 for sized hexagonal rolled products;

specifications and technical documentation for sized strips;

GOST 14955 for rolled products with special surface finish.

Examples of identification number are presented in Appendix 1.

## 2. TECHNICAL REQUIREMENTS

2.1. Characteristics of the standard version:

2.1.1. Bars of non-standard length with maximum deviations for usual accuracy of dimensions, curvature, ovality, and other requirements for profile, camber, and nonflatness of class 2 in accordance with GOST 103 (for strips).

2.1.2. Sized rolled products of non-standard length, with maximum deviations for finish equal to h11, with ovality of no more than the maximum deviations of the diameter.

2.1.3. Rolled products with a special surface finish, of non-standard length, with maximum deviations for finish equal to h11, with ovality no greater than half the maximum deviations of the diameter.

2.1.4. Bars without heat treatment, sized, and with a special surface finish, hard-worked (denoted by H) or bars with heat treatments (annealed, high-temperature tempered, normalized, normalized with tempering, hardened with tempering) (denoted by T).

2.1.5. Bars of two groups of surface quality: a and б. The group of surface quality bars a are intended mainly for hot working by pressure; the group б bars are intended mainly for cold working.

2.1.6. On the surface of rolled products of group of surface quality a, rolled blisters, rolling skins, laps, cracks, dirt and stress cracks are not allowed.

2.1.6.1. The defects of surface shall be removed by flat-grade cutting down or cleaning with a width of no less than five times the depth.

The depth of cleaning of defects, counting from the actual dimensions, shall not exceed:  
half of the dimensional tolerance for rolled products with dimensions less than 80 mm;  
dimensional tolerance for rolled products with dimensions from 80 to 140 mm;  
5 % diameter or thickness for rolled products with dimensions from 140 to 200 mm;  
6 % of diameter or thickness for rolled products with dimensions greater than 200 mm.

In one section of rolled products with dimensions (diameter or thickness) greater than 140 mm, no more than two cleanings of the maximum depth are allowed.

2.1.6.2. On surface of rolled products, tool marks, dimples, and pitted surface with depth of no greater than half of dimensional tolerance, and also rolled blisters and dirt (hair seams) with depth of no greater than  $\frac{1}{4}$  of the dimensional tolerance, but no greater than 0.20 mm counting from the actual dimensions, are allowed without cleaning.

2.1.7. On the surface of rolled products with group б surface quality, local defects with a depth not exceeding the maximum negative deviation for the dimensions are allowed for rolled products with dimensions less than 100 mm and the local defects with depth not exceeding the dimensional tolerance are allowed for rolled products with dimensions of 100 mm or greater.

The depth of location of defects shall be counted from the nominal dimensions.

2.1.8. The bars shall be trimmed.

Crumpled ends and burrs are allowed.

The obliquity of cut of bars with dimensions up to 30 mm is not regulated; that with dimensions greater than 30 mm shall not exceed 0.1 of the diameter or thickness. The bars with dimensions up to 40 mm and with non-standard length may be produced with non-trimmed ends.

2.1.9. Quality of surface and requirement for trimming the ends of the sized rolled products shall correspond to GOST 1051 (groups Б and u) and to GOST 14955 (groups u, Г and Д) for rolled products with special surface finish.

In rolled products with special surface finish, decarbonization is not allowed.

2.1.10. The hardness of bars shall not exceed 255 HB; the hardness of sized bars with special surface finish shall not exceed 269 HB.

2.1.11. The mechanical properties of rolled products shall correspond to the standards specified in table 3.

Table 3

Grade of steel	Mechanical properties, no less than			
	Yield point $\sigma_y$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Ultimate rupture strength, $\sigma_u$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Elongation $\delta_5$	Reduction of area $\psi$
			%	
08	196 (20)	320 (33)	33	60
10	205 (21)	330 (34)	31	55
15	225 (23)	370 (38)	27	55
20	245 (25)	410 (42)	25	55
25	275 (28)	450 (46)	23	50
30	295 (30)	490 (50)	21	50
35	315 (32)	530 (54)	20	45
40	335 (34)	570 (58)	19	45
45	355 (36)	600 (61)	16	40
50	375 (38)	630 (64)	14	40
55	380 (39)	650 (66)	13	35
58 (55mm)	315 (32)	600 (61)	12	28
60	400 (41)	680 (69)	12	35

Notes:

1. The standards for mechanical properties specified in table 3 are concerned with the rolled products of diameter or thickness up to 80 mm. For rolled products with diameter or thickness more than 80 mm, a decrease of elongation by 2 % (absolute value) and a reduction of the area by 5 % (absolute value) are allowed.

The standards for mechanical properties of billets reformed from rods with a diameter or thickness from 120 to 250 mm into rolled products with a diameter or thickness from 90 to 100 mm shall correspond to the values specified in table 3.

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2. By agreement between the manufacturer and customer, a decrease of ultimate rupture strength by 20 N/mm<sup>2</sup> (2 kgf/mm<sup>2</sup>) for steels of grades from 25 to 60 in comparison with the standards specified in table 3 is allowed if the standards for elongation are simultaneously increased by 2 % (absolute value).

2.1.12. Macroscopic structure of rolled products shall not have pipes, looseness, blisters, stratification, internal cracks, slag inclusions or flakes.

2.2. Characteristics established by customer

2.2.1. Rolled products from steel of grades 20, 25, 30, 35, 40, 45 and 50 with a boron fraction of total mass from 0.002 to 0.006 %.

In this case, the symbol P shall be put at the end of the identification number

2.2.2. Rolled products made of killed steel with silicon fraction of total mass from 0.17 to 0.27 %.

2.2.3. Rolled products of standard length.

2.2.4. Rolled products with lengths multiple to the standard one.

2.2.5. Sized rolled products with a length restricted within the limits of a non-standard one.

2.2.6. Bars after heat treatment.

2.2.7. Rolled products with group r surface quality, without rolled blisters or dirt (hair seams).

These rolled products are mainly intended for hot upsetting, heading and pressing.

2.2.8. Rolled products made of steel of grades 25, 30, 35, 40, 45 and 50 with the monitoring of the impact toughness of the heat treated (hardening + temper) samples.

The standards for impact toughness shall correspond to the values specified in table 4.

T a b l e 4

Grade of steel	Impact toughness KCU, J/cm <sup>2</sup> (kgf·m/cm <sup>2</sup> ), no less than
25	88 (9)
30	78 (8)
35	69 (7)
40	59 (6)
45	49 (5)
50	38 (4)

2.2.9. Hard-worked or heat treated sized rolled products with standard mechanical properties according to the requirements specified in table 5.

2.2.10. Rolled products with macroscopic structures standardized in numbers and in accordance with the requirements specified in table 6.

2.2.11. Rolled products with standardized hardness according to the requirements specified in table 7,

Table 5

Grade of steel	Mechanical properties of rolled products, no less than					
	Hard-worked rolled products			Annealed or high-temperature tempered rolled products		
	Ultimate rupture strength $\sigma_u$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Elongation $\delta_5$ , %	Reduction of area $\psi$ , %	Ultimate rupture strength $\sigma_u$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Elongation $\delta_5$ , %	Reduction of area $\psi$ , %
10	410 (42)	8	50	290 (30)	26	55
15	440 (45)	8	45	340 (35)	23	55
20	490 (50)	7	40	390 (40)	21	50
25	540 (55)	7	40	410 (42)	19	50
30	560 (57)	7	35	440 (45)	17	45
35	590 (60)	6	35	470 (48)	15	45
40	610 (62)	6	35	510 (52)	14	40
45	640 (65)	6	30	540 (55)	13	40
50	660 (67)	6	30	560 (57)	12	40

Table 6

Macroscopic structure of steel measured in numbers, no more than								
Center porosity	Point inhomogeneity	Liquation square	General liquation ghost	Zonal spotty liquation	Shrinkage liquation for rolled products with dimensions		Subcutaneous blowholes	Intergranular cracks
					up to 70 mm	over 70 mm		
3	3	3	2	1	1	2	They are not allowed	

Note. For rolled products with dimensions of 70 mm or greater and with group 6 surface quality, subcutaneous blowholes of number 2 at a depth of no more than  $1/2$  the dimensional or thickness tolerance.

Table 7

Grade of steel	Number of hardness HB, no more than			
	For hot-rolled and forged products		For sized rolled products and with a special surface finish	
	Without heat treatment	Annealed or high-temperature tempered	Hard-worked	Annealed or high-temperature tempered
08	131	—	179	131
10	143	—	187	143
15	149	—	197	149
20	163	—	207	163
25	170	—	217	170
30	179	—	229	179
35	207	—	229	187
40	217	187	241	197

Table 7 (cont.)

Grade of steel	Number of hardness HB, no more than			
	For hot-rolled and forged products		For sized rolled products and with a special surface finish	
	Without heat treatment	Annealed or high-temperature tempered	Hard-worked	Annealed or high-temperature tempered
45	229	197	241	207
50	241	207	255	217
55	255	217	269	229
58 (55mm)	255	217	—	—
60	255	229	269	229

2.2.12. Rolled products manufactured with the ultrasonic monitoring of internal defects in accordance with GOST 21120.

2.2.13. Rolled products with ensured weldability.

2.2.14. Rolled products made of steels of grades 35, 40, 45, 50, 55, 58 (55mm) and 60 intended for surface induction hardening, with decarbonization (ferrite + transition zone), no greater than 1.5 % of the diameter or thickness on the side.

2.2.15. Rolled products with group r surface quality and tested for hot upsetting.

The manufacturer is allowed not to carry out the test of rolled products with dimensions over 80 mm provided that satisfactory tests will be carry out by the customer.

2.3. Characteristics established by agreement between the customer and the manufacturer.

2.3.1. Rolled products with limits of carbon fraction of total mass reduced in comparison with the limits specified in table 1, but no less than 0.05 %.

2.3.2. Rolled products with limits of carbon fraction of total mass reduced in comparison with the limits specified in table 1, but no less than 0.05 %, without taking into account the permissible deviations in the finished rolled products specified in table 2.

2.3.3. Rolled products with sulfur fraction of total mass from 0.020 to 0.040 %.

2.3.4. Rolled products with sulfur fraction of total mass of no more than 0.025 %.

2.3.5. Rolled products with a phosphorus fraction of total mass of no more than 0.030 %.

2.3.6. Rolled products with a copper fraction of total mass of no more than 0.025 %.

2.3.7. Bars with a diameter or thickness greater than 30 but lower 140 mm with the removal of burrs and crushed ends.

2.3.8. Hard-worked rolled products with hardness increased by 15 HB in comparison with the value specified in table 7.

2.3.9. Rolled products with standardized mechanical properties determined on samples cut out from heat-treated billets (hardening + temper) with dimensions specified in the order according to the requirements of table 8.

Table 8

Grade of steel	Mechanical properties of rolled products with dimensions:											
	Up to 16 mm				From 16 to 40 mm				From 40 to 100 mm			
	Yield point $\sigma_T$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> ) no less than	Ultimate rupture strength $\sigma_u$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Elongation $\delta$ , %	Impact energy KC. J (kgf · m)	Yield point $\sigma_y$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Ultimate rupture strength $\sigma_u$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Elongation $\delta$ , %	Impact energy KC. J (kgf · m)	Yield point $\sigma_y$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Ultimate rupture strength $\sigma_u$ , N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	Elongation $\delta$ , %	Impact energy KC. J (kgf · m)
	No less than				No less than				No less than			
25	375 (38)	550 – 700 (56 – 71)	19	35 (3.5)	315 (32)	500 – 650 (51 – 66)	21	35 (3.5)	–	–	–	–
30	100 (41)	600 – 750 (61 – 76)	18	30 (3.0)	355 (36)	550 – 700 (56 – 71)	20	30 (3.0)	295 (30)	500 – 650 (51 – 66)	21	30 (3.5)
35	430 (44)	630 – 780 (64 – 80)	17	25 (2.5)	380 (39)	600 – 750 (61 – 76)	19	25 (2.5)	315 (32)	550 – 700 (56 – 71)	20	25 (2.5)
40	460 (47)	650 – 800 (66 – 82)	16	20 (2.0)	400 (41)	630 – 780 (64 – 80)	18	20 (2.0)	355 (36)	600 – 750 (61 – 76)	19	20 (2.0)
45	190 (50)	700 – 850 (71 – 87)	14	15 (1.5)	430 (44)	650 – 800 (66 – 82)	16	15 (1.5)	375 (38)	630 – 780 (61 – 80)	17	15 (1.5)
50	520 (53)	750 – 900 (76 – 92)	13	–	460 (47)	700 – 850 (71 – 87)	15	–	400 (41)	650 – 800 (66 – 82)	16	–
55	550 (56)	800 – 950 (82 – 97)	12	–	490 (50)	750 – 900 (76 – 92)	14	–	420 (43)	700 – 850 (71 – 87)	15	–
60	580 (59)	850 – 1 000 (87 – 102)	11	–	520 (53)	800 – 950 (82 – 97)	13	–	450 (46)	750 – 900 (76 – 92)	14	–

## Notes:

1. The standards of mechanical properties are not rejection ones until 01.01.92; the determination is obligatory.
2. The standards of mechanical properties of steel 30 shall be applied to rolled products with dimensions up to 63 mm.
3. The standards of mechanical properties are specified for the rolled products with round cross-section. For rectangular cross-sections, the ranges of equivalent diameters are specified in Appendix 2.

2.3.10. Rolled products with standardized hardenability in accordance with Appendixes 3 and 4.

2.3.11. Rolled products made of steel of grades 35, 40, 45, 50, 55, 58 (55ππ) and 60 intended for surface induction hardening, with decarbonization (ferrite + transition zone) no greater than 0.5 % of the diameter or thickness for a side.

2.3.12. Pickled rolled products.

2.4. It is allowed to specify additional or increased characteristics not stipulated by this Standard in the specifications for particular production.

The list of additional characteristics is specified in Appendix 5.

2.5. Marking and packing of rolled products shall be in accordance with GOST 7566.

2.5.1. Packing of the sized rolled products shall be in accordance with GOST 1051; packing of such products with special surface finish, in accordance with GOST 14955.

2.5.2. Markings shall be put directly on products if they are not subject to packing, or on a label if they are packed in reels or coils.

### 3. ACCEPTANCE PROCEDURE

3.1. The rolled products shall be accepted in batches consisting of steel of the same tap, the same dimensions, and same conditions of heat treatment (if it is heat-treated).

By agreement between the manufacturer and the customer, a batch may be formed from steel of the same grade, of different taps of the same dimensions.

Each batch shall be accompanied by a quality certificate in accordance with GOST 7566.

If other deoxidizers (except for silicon) are used for producing semi-killed steel, then the appropriate note shall be made in the quality certificate.

If rolled products are accepted with the characteristics established by the customer according to clauses 2.2 and 2.3, then the test results concerning the ordered indicators shall be specified in the quality certificate.

3.2. The rolled products shall be subjected to acceptance tests.

3.3. For testing quality, the following objects shall be selected from a batch of rolled products:

1) one sample from a heat-ladle for chemical analysis in accordance with GOST 7565. Monitoring of the residual copper, nickel, chromium, arsenic, and nitrogen shall be carried out periodically, no less often than one time per quarter. If the steel is produced with taking into account the manganese equivalent, then the monitoring of the residual copper, nickel and chromium shall be carried out on each tap;

2) all the rods, strips, and bundles: for quality control of the surface and dimensions;

3) two rods, strips, or bundles: for the monitoring of the macroscopic structure on a fracture or pickled area, for the shock-bending test and for the determination of the depth of the bark;

4) 2 % rods, strips, or bundles but no less than 3 items for checking hardness;

5) One rod, strip, or bundle for tension test in the normalized condition; two rods, two strips, or two bundles for test in hardened (with temper) condition;

6) One rod, one strip or one bundle from a heat-ladle for determining the hardenability (for steels of all grades not containing boron); or two rods, two strips or two bundles from a heat-ladle for determining the hardenability (for steels of all grades containing boron);

7) One rod, one strip or one bundle from a heat-ladle for determining the magnitude of the grain;

8) Three rods, three strips or three bundles from a heat-ladle for the upsetting test;

If test results are unsatisfactory against even one of the indicators, then a repeated test shall be carried out against this indicator in accordance with GOST 7566.

The results of the repeated testing shall be applied to the whole batch.

#### 4. TEST METHODS

4.1. The chemical analysis of steel shall be carried out in accordance with the following GOSTs: from GOST 22536.0 to GOST 22536.9, GOST 22536.13, GOST 12359 or by another method with an accuracy of no less than the standard one. If disputes arise, then the chemical analysis shall be carried out in accordance with the following GOSTs: from GOST 22536.0 to GOST 22536.9, GOST 22536.13 and GOST 12359.

4.2. The quality of surface shall be checked by a visual inspection of the rolled products without the application of magnifying devices. If necessary, the scale-free hardening or pickling of the surface shall be carried out. For rolled products with a special surface finish and with a diameter up to 3 mm inclusive, the inspection shall be carried out by magnifying up to 10 times. The depth of location of defects on the surface of rolled products shall be determined by the control conditioning or notching with a file.

4.3. The geometrical dimensions and profile shall be determined by measuring tools in accordance with GOST 26877, GOST 162, GOST 166, GOST 427, GOST 2216, GOST 3749, GOST 5378, GOST 6507 and GOST 7502, or tools certified in accordance with GOST 8.001 or GOST 8.326.

4.4. Sampling from bundles for all types of tests shall be carried out at distance of no less than 1.5 loops from the end.

4.5. From each rod, strip or bundle selected for checking, the following objects shall be selected: one sample for the tension test and upsetting test,

one sample for determining the magnitude of grain, hardenability, and depth of bark;  
one sample of each type for the shock-bending test;  
one template for checking the macroscopic structure.

4.6. Sampling for the upsetting test shall be in accordance with GOST 7564

4.7. Sampling for test of mechanical properties shall be carried out in accordance with GOST 7564 (version 1).

4.8. The test for upsetting in hot condition shall be carried out in accordance with GOST 8817.

The samples shall be heated up to a temperature of forging (from 850 to 1 000 °C) and upset by 65 % in comparison with initial height. No revealed cracks or laps shall be on upset samples.

4.9. Brinell hardness shall be determined in accordance with GOST 9012. Hardness of rolled products with diameter or thickness less than 5 mm shall not be determined.

4.10. Tension test shall be carried out on samples of five times the length and with a diameter 5 or 10 mm in accordance with GOST 1497.

For rolled products with diameter or thickness up to 25 mm inclusively, the test may be carried out on not-machined samples.

The impact toughness test shall be carried out in accordance with GOST 9454 on type 1 samples.

The direction of the axis of the sample shall be along the direction of rolling,

4.11 In accordance with the requirements of table 3, the samples for tension tests of rolled products shall be cut out from the normalized billets with a diameter or side of square equal to 25 mm.

For rods with diameter less than 25 mm, the normalization shall be carried out in the cross-section of the finished rod (without cutting the sample from the billet),

*N o t e .* If dimensions of rods are less than 120 mm, then the sampling for mechanical tests may be carried out from re-forged or re-rolled billets with a cross-section from 90 to 100 mm.

4.12. In accordance with the requirements of table 8, the samples for the tension test of rolled products shall be cut out from the heat-treated billets with dimensions specified by the customer.

4.13. The conditions of heat treatment of billets (samples) for carrying out the tests for the mechanical properties are specified in appendixes 6 and 7.

4.14. The check of macroscopic structure on fracture or pickled templates shall be carried out without the application of magnifying devices in accordance with GOST 10243.

It is allowed to apply the methods of ultrasonic control and other non-destructive methods of quality control agreed in accordance with the established procedure.

4.15. The depth of the bark shall be determined in accordance with GOST 1763.

4.16. Hardenability shall be determined with the method of end quenching in accordance with GOST 5657.

4.17. Grain dimensions shall be determined in accordance with GOST 5639.

4.18. If the large profiles of rolled products have passed the tests for macroscopic structure, hardenability, and mechanical properties, then the listed tests for smaller profiles made of steel of the same tap are not obligatory at the manufacturer's premises.

4.19. At the manufacturing plant, statistical and non-destructive methods may be used according to a technique approved in accordance with the established procedure. When disputes arise or a periodic quality check is carried out, the test methods stipulated by this Standard shall be applied.

## **5. TRANSPORTATION AND STORAGE**

5.1. Transportation and storage shall be in accordance with GOST 7566 with the following addendum.

5.1.1. Transportation of the production shall be carried out by transport of all types according to the rules of freight transportation effective for transport of the given type. On railroads, transportation shall be carried out in covered or open carriages depending on weight and leading dimensions in accordance with GOST 22235. The weight of one freight package shall not exceed 10 000 kg for mechanized loading in open transport facilities and 1 250 kg for loading in covered ones. The means of packing shall be in accordance with GOST 7566.

When sending two or more freight packages with dimensions allowing the formation of a transport package with the dimensions in accordance with GOST 24597, the freight packages shall be grouped in transport packages in accordance with GOST 21929. The means of fastening shall be in accordance with GOST 21650.

Examples of identification numbers are as follows:

Round hot-rolled products with diameter 100 mm, with the usual accuracy of rolling B in accordance with GOST 2590-88, made of grade 30 steel, with group *a* surface quality, without heat treatment:

$$\text{Круг} \frac{100 - B \text{ ГОСТ } 2590-88}{30 - a \text{ ГОСТ } 1050-88} .$$

Square hot-rolled products with square side 25 mm, with usual accuracy of rolling B in accordance with GOST 2591-88, made of grade 35 steel, with group *z* surface quality, with heat treatment (T):

$$\text{Квадрат} \frac{25 - B \text{ ГОСТ } 2591-88}{35 - z - T \text{ ГОСТ } 1050-88} .$$

Strips with thickness 36 mm and width 90 mm of usual accuracy, with camber of class 2, nonflatness of class 2 in accordance with GOST 103-76, made of grades 45 steel, with group *б* surface quality, without heat treatment:

$$\text{Полоса} \frac{36 \times 90 - 2 - 2 \text{ ГОСТ } 103-76}{45 - б \text{ ГОСТ } 1050-88} .$$

Sized round rolled products, with diameter 10 mm, with tolerance range h11 in accordance with GOST 7417-75, made of grade 45 steel, with group *B* surface quality in accordance with GOST 1051-73, hard-worked (H):

$$\text{Круг} \frac{10 - h11 \text{ ГОСТ } 7417-75}{45 - B - H \text{ ГОСТ } 1050-88} .$$

Sized square rolled products, with side of square 15 mm, with tolerance range h11 in accordance with GOST 8559-75, made of grade 20 steel, with group *u* surface quality in accordance with GOST 1051-73, hard-worked (H):

$$\text{Квадрат} \frac{15 - h11 \text{ ГОСТ } 8559-75}{20 - B - T \text{ ГОСТ } 1050-88} .$$

Sized hexagonal rolled products, with diameter of inscribed circle of 8 mm, with tolerance range h11 in accordance with GOST 8560-78, made of grade 45 steel, with group *B* surface quality in accordance with GOST, 1051-73, with heat treatment (T):

$$\text{Шестигранник} \frac{8 - h11 \text{ ГОСТ } 8560-78}{45 - B - T \text{ ГОСТ } 1050-88} .$$

Rolled products with special surface finish, with diameter of 8 mm, with tolerance range h11, with group *B* surface quality in accordance with GOST 14955-77, made of grade 20 steel, hard-worked (H):

$$\text{Круг} \frac{8 - h11 \text{ ГОСТ } 4955-77}{45 - B - T \text{ ГОСТ } 1050-88} .$$

**Transformation of rectangular cross-sections to round ones  
with the same mechanical properties**

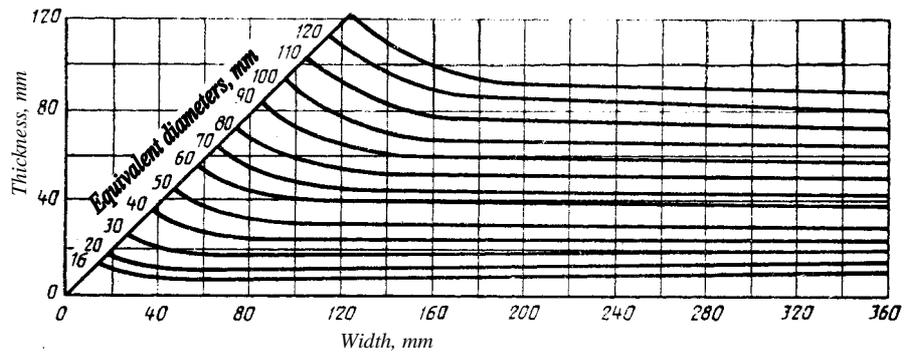


Fig. 1

**HARDENABILITY BANDS  
FOR STRUCTURAL CARBON STEEL**

Grade 35 steel

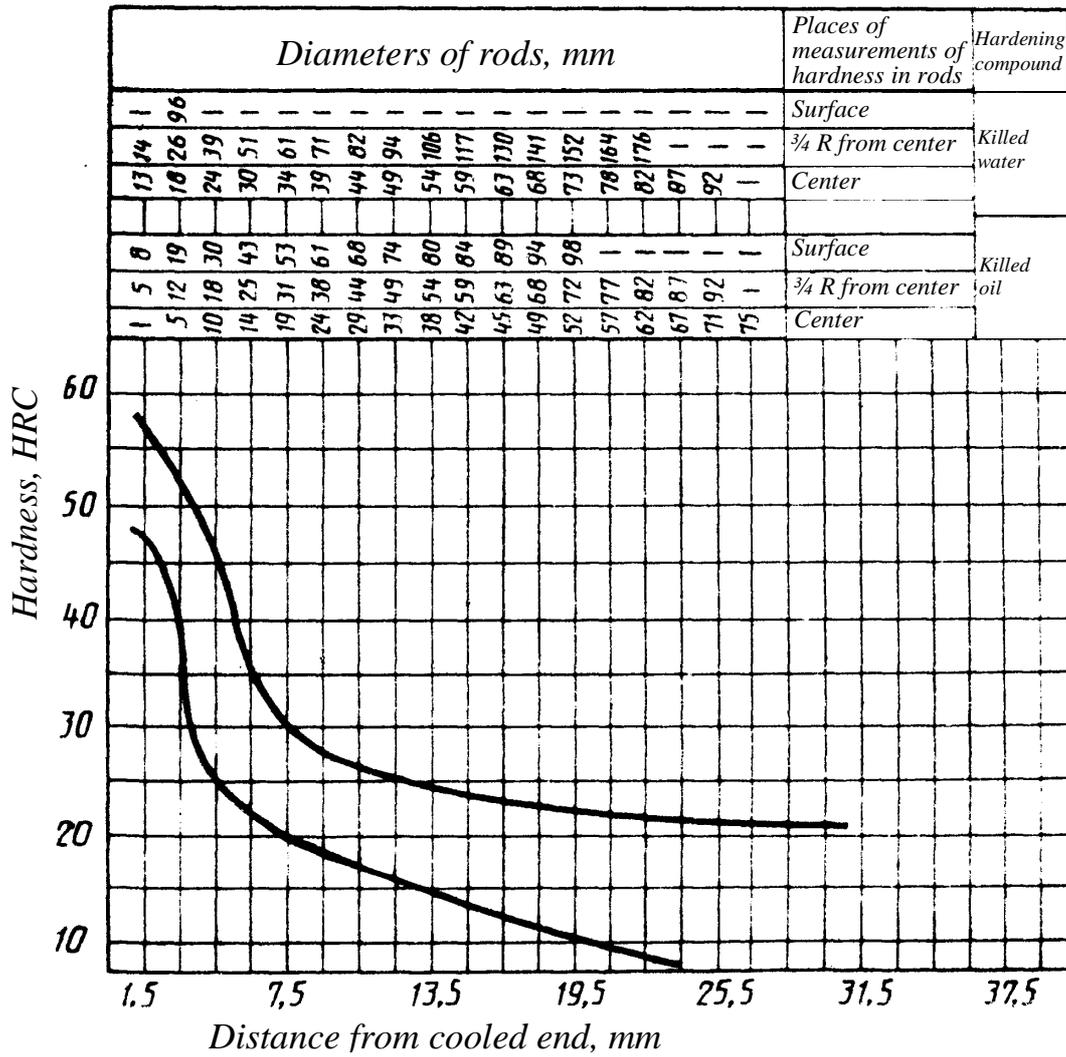


Fig. 2

Grade 40 steel

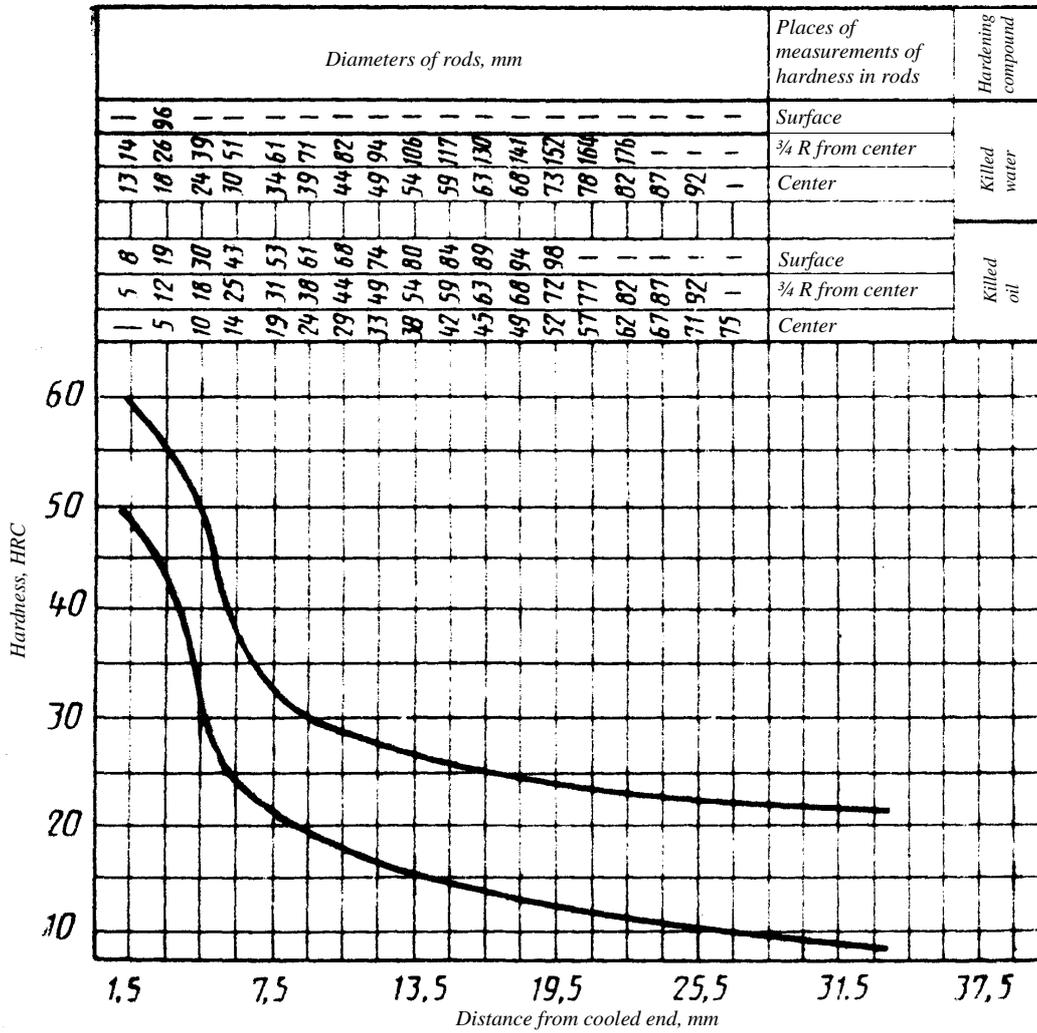


Fig. 3

Grade 45 steel

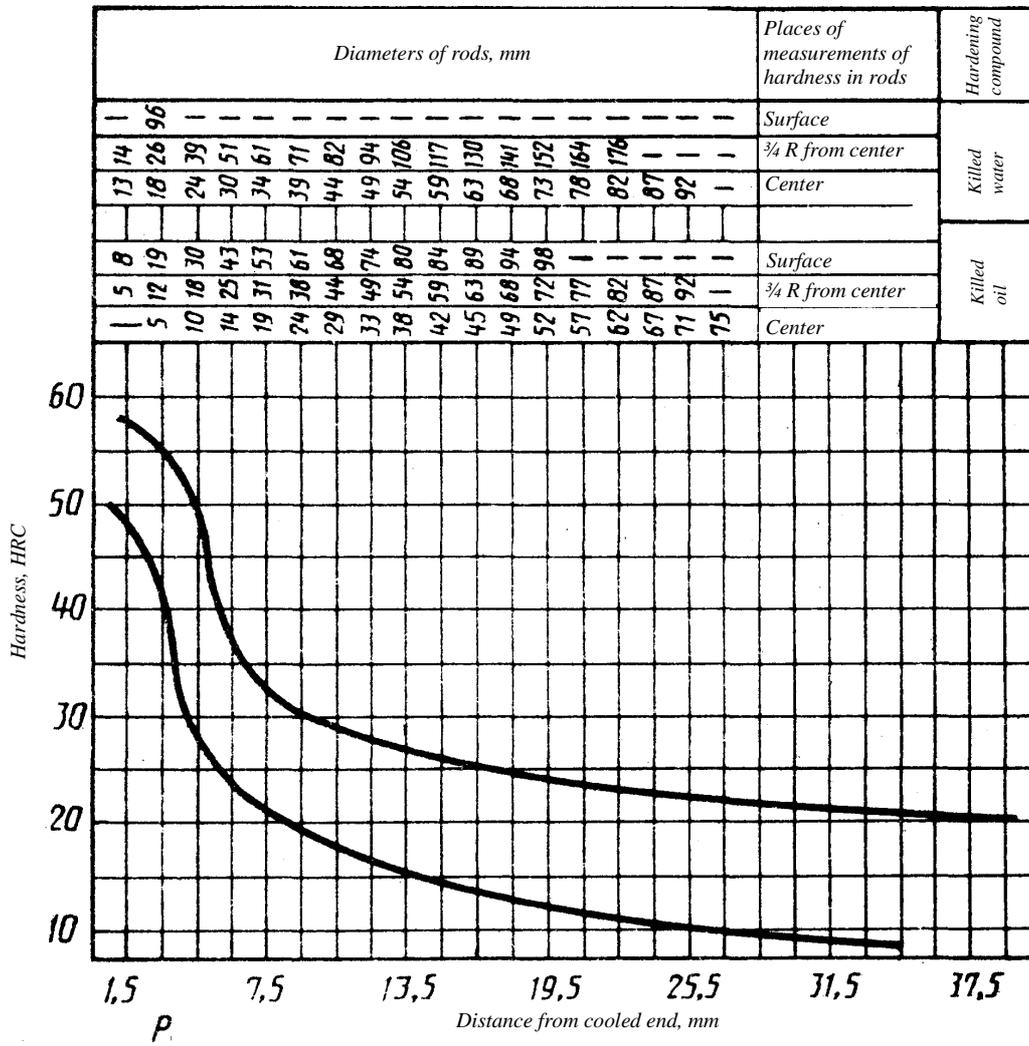


Fig. 4

**GRADE BAND PARAMETERS (LIMITS OF HARDNESS VARIATION  
HRC [HRC<sub>3</sub>] AND HRB ALONG THE LENGTH of A FACE SAMPLE)**

Table 9

Distance from face, mm	Hardness for hardenability bands of steel grades					
	35		40		45	
	Max.	Min.	Max.	Min.	Max.	Min.
1.5	HRC 56 (HRC <sub>3</sub> 57)	HRC 48 (HHRC <sub>3</sub> 49.5)	HRC 57 (HRC <sub>3</sub> 58)	HRC 49 (HHRC <sub>3</sub> 50.5)	HRC 58 (HRC <sub>3</sub> 59)	HRC 49 (HHRC <sub>3</sub> 50.5)
3.0	HRC 54 (HRC <sub>3</sub> 55)	HRC 43 (HRC <sub>3</sub> 44)	HRC 56 (HRC <sub>3</sub> 57)	HRC 44 (HRC <sub>3</sub> 45.5)	HRC 56 (HRC <sub>3</sub> 57)	HRC 44 (HRC <sub>3</sub> 45.5)
4.5	HRC 48 (HHRC <sub>3</sub> 49)	HRC 25 (HRC <sub>3</sub> 27)	HRC 51 (HRC <sub>3</sub> 52.5)	HRC 27 (HRC <sub>3</sub> 29)	HRC 53 (HRC <sub>3</sub> 54)	HRC 27 (HHRC <sub>3</sub> 29)
6.0	HRC 36 (HRC <sub>3</sub> 38)	HRC 21 (HHRC <sub>3</sub> 23)	HRC 36 (HRC <sub>3</sub> 37.5)	HRC 24 (HHRC <sub>3</sub> 26)	HRC 41 (HHRC <sub>3</sub> 42.5)	HRC 24 (HRC <sub>3</sub> 26)
7.5	HRC 29 (HRC <sub>3</sub> 31)	HRC 18 (HRC <sub>3</sub> 20)	HRC 32 (HHRC <sub>3</sub> 33.5)	HRC 22 (HHRC <sub>3</sub> 24)	HRC 35 (HRC <sub>3</sub> 36.5)	HRC 22 (HRC <sub>3</sub> 24)
9.5	HRC 28 (HRC <sub>3</sub> 30)	HRB 94	HRC 30 (HRC <sub>3</sub> 32)	HRC 20 (HRC <sub>3</sub> 22)	HRC 31 (HRC <sub>3</sub> 33)	HRC 20 (HRC <sub>3</sub> 22)
10.5	HRC 27 (HHRC <sub>3</sub> 29)	HRB 93	HRC 28 (HHRC <sub>3</sub> 30)	HRC 18 (HHRC <sub>3</sub> 20)	HRC 30.5 (HRC <sub>3</sub> 32.5)	HRC 19 (HHRC <sub>3</sub> 21)
12.0	HRC 26 (HRC <sub>3</sub> 28)	HRB 92	HRC 27 (HHRC <sub>3</sub> 29)	HRB 94	HRC 29 (HHRC <sub>3</sub> 31)	HRC 18 (HRC <sub>3</sub> 20)
13.5	HRC 25.5 (HHRC <sub>3</sub> 27.5)	HRB 91	HRC 26 (HHRC <sub>3</sub> 28)	HRB 93	HRC 28 (HHRC <sub>3</sub> 30)	HRB 94
15.0	HRC 25 (HRC <sub>3</sub> 27)	HRB 90	HRC 25.5 (HHRC <sub>3</sub> 27.5)	HRB 92	HRC 27.5 (HHRC <sub>3</sub> 29.5)	HRB 93
16.5	HRC 24.5 (HHRC <sub>3</sub> 26.5)	HRB 89	HRC 25 (HRC <sub>3</sub> 27)	HRB 91	HRC 27 (HHRC <sub>3</sub> 29)	HRB 92
18.0	HRC 24 (HHRC <sub>3</sub> 26)	HRB 88	HRC 24.5 (HRC <sub>3</sub> 26.5)	HRB 89	HRC 26.5 (HHRC <sub>3</sub> 28.5)	HRB 91
19.5	HRC 23.5 (HHRC <sub>3</sub> 25.5)	HRB 87	HRC 24 (HHRC <sub>3</sub> 26)	HRB 88	HRC 26 (HHRC <sub>3</sub> 28)	HRB 90
21.0	HRC 23 (HHRC <sub>3</sub> 25)	HRB 86	HRC 23.5 (HRC <sub>3</sub> 25.5)	HRB 87	HRC 25 (HRC <sub>3</sub> 27)	HRB 89
24.0	HRC 22 (HRC <sub>3</sub> 24)	HRB 85	HRC 23 (HRC <sub>3</sub> 25)	HRB 86	HRC 24 (HRC <sub>3</sub> 26)	HRB 88
27.0	HRC 21 (HHRC <sub>3</sub> 23)	HRB 84	HRC 22 (HRC <sub>3</sub> 24)	HRB 85	HRC 23 (HRC <sub>3</sub> 25)	HRB 87
30.0	HRC 20 (HRC <sub>3</sub> 22)	HRB 83	HRC 21 (HRC <sub>3</sub> 23)	HRB 84	HRC 22 (HRC <sub>3</sub> 24)	HRB 86
33.0	-	-	HRC 20.5 (HHRC <sub>3</sub> 22.5)	HRB 83	-	-
36.0	-	-	HRC 20 (HRC <sub>3</sub> 22)	HRB 82	-	-
39.0	-	-	-	-	-	-

**CHARACTERISTICS OF ROLLED PRODUCTS ESTABLISHED  
BY AGREEMENT BETWEEN THE CUSTOMER  
AND THE MANUFACTURER IN REFERENCE DOCUMENTS**

1. Rolled products with standardized nitrogen fraction of total mass in steel made in electric tap.
2. Rolled products with a lower manganese fraction of total mass reduced in comparison with standards of table 1 by magnitude of manganese equivalent equal to:  
$$\mathfrak{M}_m = 0.3 (\text{Cr } \%) + 0.5 (\text{Ni } \%) + 0.7 (\text{Cu } \%)$$
, where Cr, Ni, Cu are residual actual chromium, nickel, copper fractions of total mass in steel, not exceeding the standards specified in table 1.
3. Sized rolled products made of steel of grades 08, 55 and 60 in hard-worked or heat-treated condition with control of mechanical properties.
4. Rolled products with standardized impact toughness on type I samples at a temperature  $-40$  °C.
5. Rolled products with standardized impact toughness on type II samples at a temperature  $20$  °C and at negative temperatures.
6. Rolled products without monitoring of the reduction of the area.
7. Sized rolled products with special surface finish, with standardized hardness, in condition normalized with temper and hardened with temper.
8. Bars with standardized hardness in the normalized condition.
9. Rolled products with standardized hardness in the prescribed limits.
10. Rolled products without the monitoring of hardness.
11. Rolled products with standardized dimensions of austenitic grain.
12. Rolled products with standardized cleanness regarding non-metallic inclusions.
13. Rolled products with standardized cleanness regarding hair seams revealed by the magnetic method or by pickling on the surface of finished articles.
14. Small-scale batches of rolled products.

**MODES**  
**of heat treatments of billets for checking**  
**the mechanical properties specified in tables 3 and 4**

T a b l e 10

Grade of steel	Temperature of heating, °C		
	Normalization	Hardening	Temper
	Tensile test	Shock-bending test	
10	920	900	200
15	900	880	200
20	900	880	600
25	890	870	600
30	880	860	600
35	880	850	600
40	870	840	600
45	860	840	600
50	850	830	600
55	850	820	600
58 (55mm)	850	—	—
60	840	820	600

Recommended minimum times of conditioning:

30 minutes for the normalization or hardening,  
2 hours for temper 200 °C,  
2 hours for temper 200 °C.

Water shall be the cooling medium for hardening.

**MODES**  
**of heat treatments of billets for checking**  
**the mechanical properties specified in table 8**

T a b l e 11

Grade of steel	Hardening		Temper
	Temperature of heating, °C	Cooling medium	Temperature of heating, °C
25	860–900	Water	550–600 Cooling in air
30	850–890		
35	840–880	Water or oil	
40	830–870		
45	820–860		
50	810–850	Oil or water	
55	805–850		
60	800–840		

## DETAILS

### 1. DEVELOPED AND SUBMITTED by the USSR Ministry of Black Metallurgy

#### DEVELOPERS

V. T. Ababkov, Cand. Sci. (Tech.) (Project Head); V. D. Khromov, Cand. Sci. (Tech.); N. I. Elina

### 2. APPROVED AND INTRODUCED by Decree No. 3811, dated 24.11.88, of the USSR State Committee for Standards

### 3. IN REPLACE OF GOST 1050-74

### 4. REFERENCE DOCUMENTS

Number of reference document referred to	Number of clause, subclause
GOST 103-76	1.3, 2.1.1
GOST 162-80	4.3
GOST 166-80	4.3
GOST 427-75	4.3
GOST 1051-73	2.1.7, 2.5.1
GOST 1133-71	1.3
GOST 1497-84	4.10
GOST 1763-68	4.15
GOST 2216-84	4.3
GOST 2590-88	1.3
GOST 2591-88	1.3
GOST 2879-88	1.3
GOST 3749-77	4.3
GOST 4405-75	1.3
GOST 5378-88	4.3
GOST 5639-82	4.17
GOST 5657-69	4.16
GOST 6507-78	4.3
GOST 7417-75	1.3
GOST 7502-80	4.3
GOST 7564-73	4.6, 4.7
GOST 7565-81	3.3
GOST 7566-81	2.5, 3.2, 3.4, 5.1, 5.1.1
GOST 8559-75	1.3
GOST 8560-78	1.3
GOST 8817-82	4.8
GOST 9012-69	4.9
GOST 9454-78	4.10
GOST 10243-75	4.13
GOST 12359-81	4.1
GOST 14955-77	1.3, 2.1.7, 2.5.1
GOST 21120-75	2.2.12
GOST 21650-76	5.1.1

Number of reference document referred to	Number of clause, subclause
GOST 21929-76	5.1. 1
GOST 22235-76	5.1. 1
GOST 22536.0-87	4.1.
GOST 22536.1-88	4.1
GOST 22536.2-87	4.1
GOST 22536.3-88	4.1
GOST 22536.4-88	4.1
GOST 22536.5-87	4.1
GOST 22536.6-88	4.1
GOST 22536.7-88	4.1
GOST 22536.8-87	4.1
GOST 22536.9-88	4.1
GOST 22536.13-77	4.1
GOST 24597-81	5.1.1
GOST 26877-86	4.3
GOST 8.001-80	1.3
GOST 8.326-78	4.3

**Amendment No. 1 to GOST 1050-88 Sized bars with special surface finish made of structural quality carbon steel. General specifications****Approved and introduced by Decree No. 2188, dated 27.12.91, of the USSR Committee for Standardization and Metrology****Date of introduction 01.05.92**

Clause 1.1. The following note shall be added to Table 1: "3. Rolled profiles for taper washers in accordance with GOST 5157 shall be made of grades 20 and 35 steel."

The following clause shall be added to Section 1: "1.1.8. Depending on the order, the residual nickel and chromium fractions of total mass shall be no more than 0.40% in killed steel manufactured by scrap process and scrap-ore process.

Clause 1.3. The paragraph: "GOST 5157 for rolled profiles for taper washers" shall be added to this clause after the reference to GOST 4405.

Clauses 2.1.1-2.1.3. The symbols (H $\bar{D}$ ) shall be added after the words "non-standard"; word: "nonflatness" shall be replaced with "deviations from flatness".

Clauses 2.1.2, 2.1.3. The words: "quality of finish" shall be replaced with "tolerance range",

Clause 2.1.4. The symbol H shall be replaced with H $\bar{T}$ ; symbol T shall be replaced with TO.

Clauses 2.1.5, 2.1.6. The symbol  $a$  shall be replaced with 2 $\bar{T}$ .

Clauses 2.1.5, 2.1.7. The symbol  $\bar{o}$  shall be replaced with 3 $\bar{T}$  (3 times).

Clause 2.1.10 shall be reworded as follows: "2.1.10. Hardness (TB1) of bars without heat treatment shall not exceed 255 HB, hardness of sized hard-worked bars with special surface finish shall not exceed 269 HB".

Clause 2.1.11 The words: "in the normalized condition (M1) shall be added after the words "Rolled products".

Clause 2.2.3 Symbols (M $\bar{D}$ ) shall be added after word "standard".

Clause 2.2.4 Symbols: (K $\bar{D}$ ) shall be added.

Clause 2.2.5 shall be reworded as follows: "2.2.5. Sized rolled products with special surface finish, with range of tolerance h12".

Clause 2.2.6 The words: "(annealed, high-temperature tempered, normalized, normalized with temper), TO" shall be added.

Clause 2.2 7. The symbol: r shall be replaced with 1 $\bar{T}$ ;

The words: "and the test for hot upsetting (65)" shall be added to the first paragraph;

The paragraph: "The manufacturer is allowed not to carry out the test of rolled products with dimensions over 80 mm" shall be added."

Clause 2.2.8 The symbols (KYB) shall be added after the word "toughness".

Clause 2.2.9 The symbols (M2) shall be added after the word "properties".

Clause 2.2.10 The symbols (KMC) shall be added after the word "macroscopic structure".

Clause 2.2.11 The symbols: (TB2) shall be added after the word "hardness".

Clause 2.2.12 The symbols: (Y3K) shall be added after the word "monitoring".

Clause 2.2.13 The symbols: (TC) shall be added after the word "weldability".

Clause 2.2.14 The symbols: (IC) shall be added after the word "on the side".

Clause 2.2.15 shall be removed.

Clause 2.3.6. The value: 0.025 % shall be replaced with 0.25 %.

Clause 2.3.7 The symbols: (Y3) shall be added after word "burrs".

Clause 2.3.8 The symbols: (TB3) shall be added after word "hardness".

Clause 2.3.9 The symbols: (M3) shall be added after word "properties";

Table 8, header: the symbols: KC shall be replaced with KU (3 times).

Clause 2.3.10 The symbols: (TP) shall be added after word "hardenability".

Clause 2.3.11 The symbols: (2C) shall be added after word "on the side".

Clause 2.3.12 The symbol: (T) shall be added after word "pickling".

Section 2. The following clauses from 2.3.13 to 2.3.17 shall be added to this section:

"2.3.13, Sized rolled products a with tolerance range h10.

2.3.14. Hot-rolled bars with increased (B) and high (A) dimensional accuracy.

2.3.15. Rolled products with group 2ГП quality of surface and tested for hot upsetting (65).

The manufacturer is allowed not to carry out the test of rolled products with dimensions above 80 mm.

2.3.16. Rolled products made of steel of grades 45, 50 or 50A with the monitoring of hardness (TB4) on hardened samples according to the requirements specified in table 8A.

T a b l e 8a

Grade of steel	Rockwell hardness, HRC, no less than
45	45
50, 50A	50

2.3.17. The nitrogen fraction of total mass shall be no more than 0.008 % in basic oxygen steel intended for light-gage rolled products”.

Clause 3.3. List 1. The words: “one sample from a heat-ladle for chemical analysis in accordance with GOST 7565” shall be replaced with the words “one sample in accordance with GOST 7565 for chemical analysis”;

List 5. The words: “hardened with temper” shall be replaced with “hard-worked, annealed, high-temperature tempered, or hardened with tempers”;

List 9 shall be inserted: “9) two longitudinal samples from a tap for determining hardness after hardening”.

Clause 4.1. Reference: GOST 20536.13 shall be replaced with GOST 27809 (2 times).

Clause 4.7 shall be reworded as follows: “4.7. The sampling for the test of the mechanical properties listed in tables 3 and 5 shall be carried out in accordance with GOST 7564 (version 1); the sampling for the test of the mechanical properties listed in tables 4 and 8 shall be carried out in accordance with GOST 7564 (version 2)”.

Section 4. The following clause shall be added to this section: “4.7a. The sampling for test for determining the hardness after hardening shall be carried out according to the diagram specified in the Appendix 8.

The samples for checking may be cut from finished rolled products or open-hearth pig billet (during tap monitoring).”

Clause 4.8. The first paragraph shall be reworded as follows: “When testing for hot upsetting, the recommended temperature of heating the samples shall be from 850 to 1 000 °C. The temperature of heating of the samples shall be specified in the quality certificate.”

Section 4. The following clause shall be added to this section: “4.9a. Rockwell hardness after hardening shall be determined in accordance with GOST 9013 on an area located in the middle of the length of the sample. The surface of the area for measuring the hardness shall be scraped; the surface roughness Ra shall be no more than 1.25 microns in accordance with GOST 2789.”

Clause 4.13 The words: “for monitoring the hardness after hardening, as in Appendix 9” shall be added to this clause.

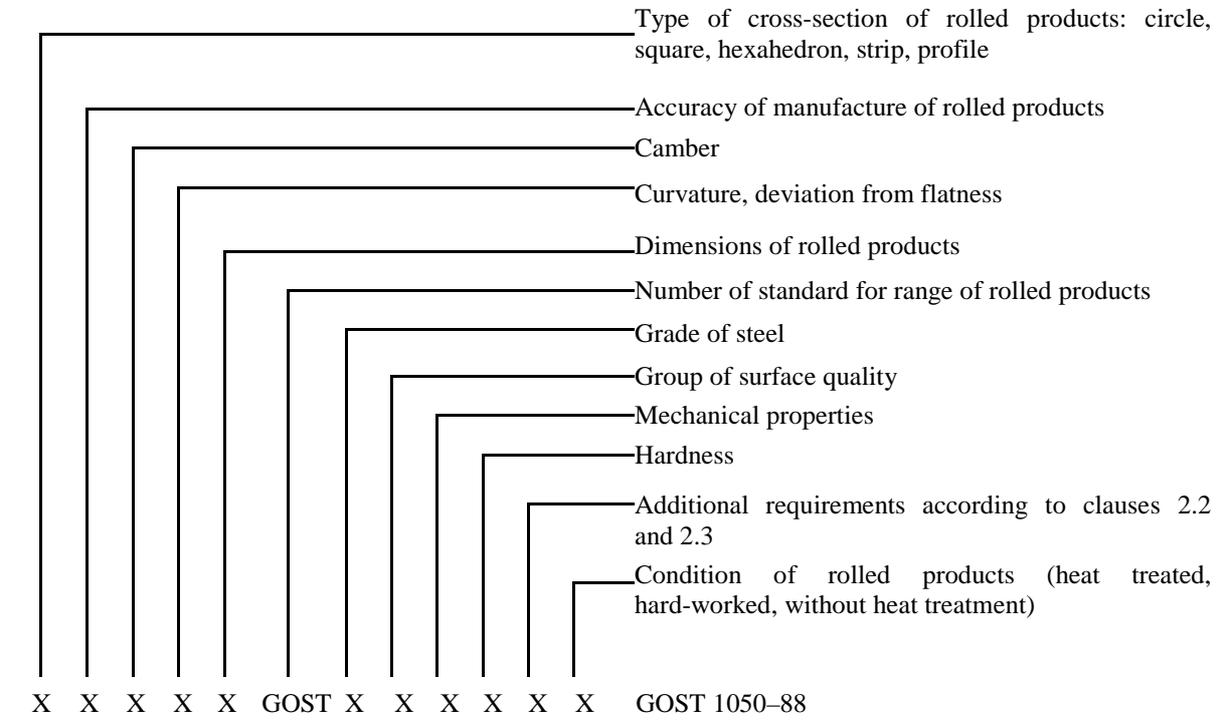
Clause 51.1. First paragraph. The words: “in accordance with GOST 22235” shall be removed;

Second paragraph. The words: “in accordance with GOST 21929” shall be removed;

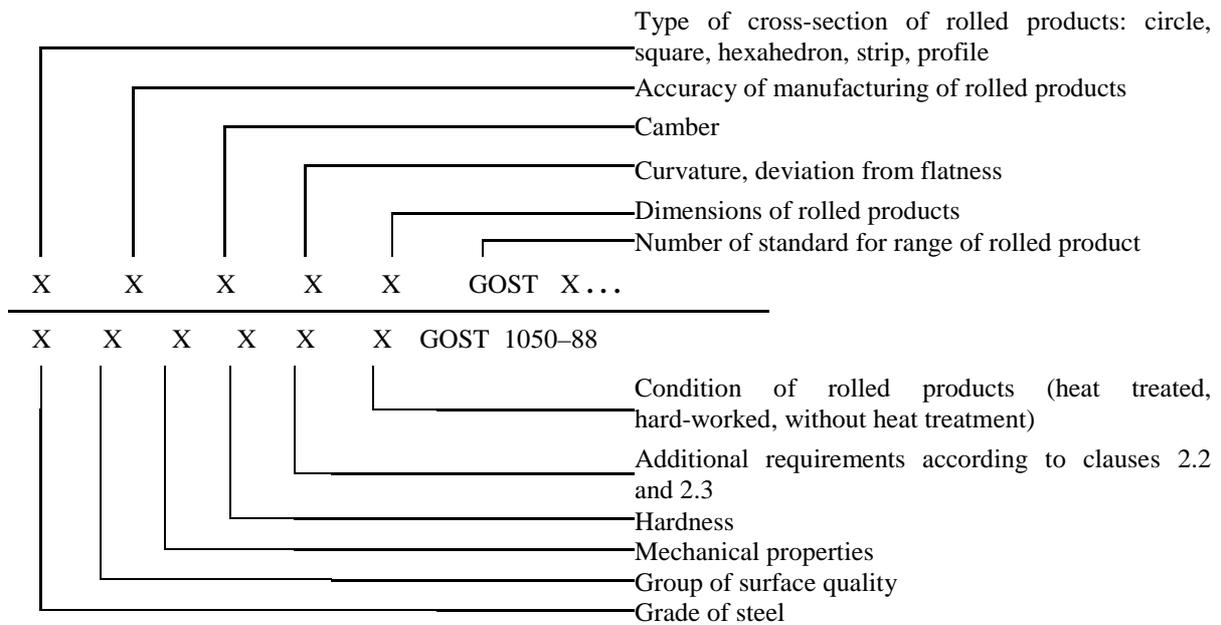
The words: “The means of packing shall be in accordance with GOST 7566” shall be replaced with the words: “Packing, and the means and ways of formation of packages shall be in accordance with GOST 7566”.

Appendix 1. Appendixes 8 and 9 shall be added to this Appendix:

**Examples of identification numbers of rolled products:  
Diagram 1 of identification numbers of rolled products**



In the design documentation, it is allowed to present examples of the identification numbers according to Diagram 2.



Examples of identification numbers:

Rolled products, round, with usual accuracy of rolling (B), class II with respect to curvature, with non-standard length (НД), with diameter of 100 mm in accordance with GOST 2590-88, made of grade 30 steel, with group 2ГП surface quality, with mechanical properties according to table 3 (M1), with hardness according to clause 2.1.10 (TB1), with monitoring the impact toughness according to table 4 (KYB), with removal of burrs (V3), with test for hot upsetting (65), without heat treatment:

*Круг В - II-НД-100 ГОСТ 2590-88/30-2ГП-М1-ТВ1-КУВ-У3-66 ГОСТ 1050-88*

Rolled products, square, with increased accuracy of rolling (Б), class I with respect to curvature, with standard length (МД), with side of square of 25 mm in accordance with GOST 2591-88, made of grade 35 steel, with group 1ГП surface quality, with mechanical properties according to table 8 (M3), with hardness according to table 7 (TB2), with macroscopic structure (KMC) standardized in numbers according to table 6, with decarbonization according to clause 2.2.14 (1C), heat treated (TO):

*Квадрат Б - I-МД-25 ГОСТ 2591-88/35-1ГП-М3-ТВ2-КМС-1С-ТО ГОСТ 1050-88*

Strips of usual accuracy of rolling (B), of class 2 camber, class 2 deviation from flatness, with length multiple to standard one (КД), with thickness of 36 mm, with width 90 mm in accordance with GOST 103-76, made of grade 45 steel, with group 3ГП surface quality, with mechanical properties according to table 3 (M1), with hardness according to clause 2.1.10 (TB1), with standardized hardenability (ПР), without heat treatment:

*Полоса В - 2-2-КД-86×90 ГОСТ 108-76/45-3ГП-М1-ТВ1-ПР ГОСТ 1050-88*

Hot-rolled profile for taper washers of standard length (МД), with dimensions  $2B \times H \times h = 32 \times 5.8 \times 4$  mm in accordance with GOST 5157-83, made of grade 35 steel, with group 3ГП surface quality, with mechanical properties according to table 3 (M1), with hardness according to clause 2.1.10 (TB1), without heat treatment:

*Профиль для косых шайб МД-82×5.8×4 ГОСТ 5157-83/35-3ГП-М1-ТВ1 ГОСТ 1050-88*

Sized rolled products round, with tolerance range h11, of standard length (МД), with diameter of 10 mm in accordance with GOST 7417-75, made of grade 45 steel, with group B surface quality in accordance with GOST 1051-73, with mechanical properties in accordance with table 5 (M2), with hardness according to clause 2.3.8 (TB3), with decarbonization in accordance with clause 2.3.11 (2C), hard-worked (НГ):

*Круг h11-МД-10 ГОСТ 7417-75/45-В-М2-ТВ3-2С-НГ ГОСТ 1050-88*

Sized rolled products, square, with tolerance range h11, with length multiple to standard one (КД), with side of square 15 mm in accordance with GOST 8559-75, made of grade 20 steel, with group Б surface quality in accordance with GOST 1051-73, with mechanical properties according to table 8 (M3), with hardness according to table 7 (TB2), with ensured weldability (ГС), hard-worked (НГ):

*Квадрат h11-КД-15 ГОСТ 8559-75/20-Б-М3-ТВ2-ГС-НГ ГОСТ 1050-88*

Sized hexagonal rolled products, with tolerance range h12, with non-standard length (НД), with diameter of the inscribed circle equal to 8 mm in accordance with GOST 8560-78, made of grade 45 steel, with group B surface quality in accordance with GOST 1051-73, with mechanical properties according to table 3 (M1), with hardness according to table 8A (TB4), heat treated (TO):

*Шестигранник h12-НД-8 ГОСТ 8560-78/45-В-М1-ТВ4-ТО ГОСТ 1050-88*

Rolled products with special surface finish, round, with tolerance range h11, with non-standard length (НД), with diameter of 8 mm, with group B surface quality in accordance with GOST 14953-77, made of grade 20 steel, with mechanical properties according to table 5 (M2), with hardness according to table 7 (TB3), hard-worked (НГ):

*Круг h11-НД-8 ГОСТ 14953-77/20-В-М2-ТВ3-НГ ГОСТ 1050-88*

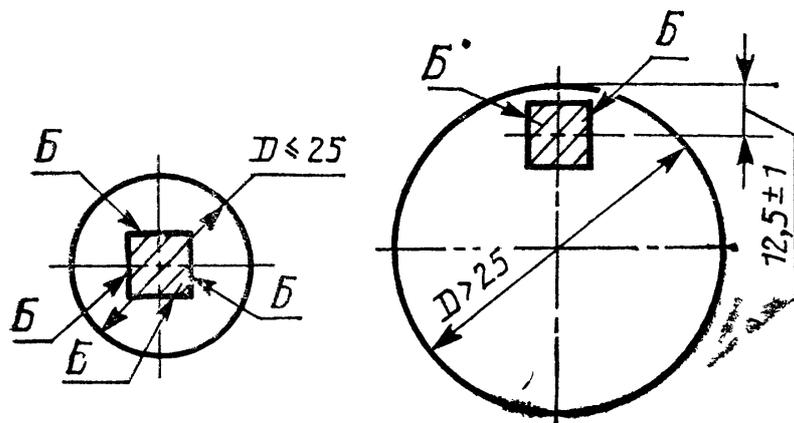
Examples of identification numbers which may be used in the design documentation:

Rolled products with a special surface finish, round, with tolerance range h11, with non-standard length (HД), with diameter 8 mm, with group B surface quality in accordance with GOST 14955-77, made of grade 20 steel, with mechanical properties according to table 5 (M2), with hardness according to table 7 (TB3), hard-worked (HГ)

$$K_{\text{пы}} \frac{h11 - \text{HД} - 8 \text{ ГOCT } 14955 - 77}{20 - B - M2 - TB3 - \text{HГ } \text{ГOCT } 1050 - 88}$$

APPENDIX 8  
(Obligatory)

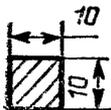
**Diagram of sampling for determining the hardness after hardening**



a for rolled products with a diameter up to 25 mm

b for rolled products with a diameter greater than 25 mm

Symbols



– Cross-section of sample; length of sample is from 55 to 69 mm,  
B area for measuring the hardness.

APPENDIX 9  
Recommended

**Conditions of heat treatment of samples for determining the hardness after hardening specified in table 8A**

Table 12

Grade of steel	Mode of hardening of samples	
	Temperature of heating, °C	Cooling medium
45	860 (±10)	Oil
50, 50A	850 (±10)	Oil

Notes:

1. The time of endurance during hardening (after the temperature of hardening is achieved) shall be 20 minutes

2 The temperatures of the oil shall be 65 °C (± 10)°