

STATE STANDARD OF USSR

CARBON STRUCTURAL QUALITY STEEL GAUGED BAR
WITH SPECIAL SURFACE FINISH

General specifications

GOST 1050-88

Official edition

GOVERNMENT COMMITTEE OF USSR FOR CONTROL OF PRODUCT QUALITY & STANDARDS

MOSCOW

Translated by **RUSSTRANS**
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B. METALS AND METAL PRODUCTS**Group B32**

Amendment № 1 GOST 1050—88 Rolled section, calibrated, with special surface finish made from good quality structural carbon steel. General specifications.

Approved and introduced into effect by the degree № 2188 dated 27.12.91 of the state committee of standardization and metrology of USSR

Date of Introduction 01.05.92

Point 1.1. Table 1, add the note — 3: «3. Profile for taper washers as per GOST 5157 are manufactured from steel of grades 20 and 35».

Section 1, add the point - 1.1.8: «1.1.8. According to the order, the killed steel made by scrap-process and scrap-ore process, may have the residual fraction of total mass of nickel and chromium not more than 0.40 % each».

Point 1.3 after the references on GOST 4405 add the paragraph; «GOST 5157 –for profile of taper washers ».

Points 2.1.1-2.1.3 after word «non-standard», add the designation: (HД);

Replace word: «non-flatness» by «deviation from flatness».

Points 2.1.2, 2.1.3. Replace word: «class of accuracy» with «tolerance zone».

Point 2.1.4. Replace designations: H with HГ; T with TO.

Points 2.1.5, 2.1.6. Replace designation: a with 2ГП.

Points 2.1.5, 2.1.7. Replace designation: б with 3ГП (3 times).

Point 2.1.10 To be rephrased as follows: «2.1.10. Hardness (TB1) for rolled section without heat-treatment should not exceed 255 HB, for calibrated and with special surface finish of cold-worked — 269 HB ».

Point 2.1.11 after word «rolled-stock» add the words: «in the normalized condition (M1)».

Point 2.2.3 after word «standard» add designation: (MД). Point 2.2.4 add designation: (KД).

Point 2.2.5 To be rephrased as follows: «2.2.5. Rolled-stock calibrated and with special surface finish with tolerance zone h12 ».

Point 2.2.6 add words; «(annealed, highly-tempered, normalized, normalized with tempering)-TO».

Point 2.2.7. Replace designation: r with 1ГП;

Add the following words in first paragraph: « and heat setting test (65)»;

Add the paragraph; «manufacturer may not carry out the test of rolled-stock with dimensions above 80 mm».

Point 2.2.8 after word «impact strength» add designation: (KYB).

Point 2.2.9 after word «properties» add designation: (M2).

Point 2.2.10 after word «macrostructure» add designation; (KMC).

Point 2.2.11 after word «hardness» add designation: (TB2).

Point 2.2.12 after word «inspection» add designation: (Y3K).

Point 2.2.13 after word «weldability» add designation: (ГC).

Point 2.2.14 after words «on the side» add designation: (1C).

Point 2.2.15 to be deleted.

Point 2.3.6. Replace value: 0.025 % with 0.25 %.

Point 2.3.7 after word «burr» add designation: (Y3).

Point 2.3.8 after word «hardness» add designation: (TB3).

Point 2.3:9 after word «properties» add designation: (M3);

Table 8. Header. Replace designation: KC with KU (3 times).

Point 2.3.10 after word «hardenability» add designation: (ИП)..

Point 2.3.11 after words «on the side» add designation: (2C).

Point 2.3.12 after word «pickling» add designation: (T).

Section 2 add points — 2.3.13-2.3.17; «2.3.13. Rolled-stock calibrated with tolerance zone h10.

2.3.14. Hot rolled-stock with good (B) and high (A) accuracy of the dimensions.

2.3.15. Rolled-stock with surface quality group 2ГП with heat setting test (65).

Manufacturer may not carry out the test of rolled-stock with dimensions above 80 mm.

2.3.16. Rolled stocks of steel grades 45, 50, 50A with testing of the hardness (TB4) on hardened specimens in compliance with the requirements, specified in table 8a,

Table 8a

Steel grade	Rockwell's hardness, HRC, minimum
45	45
50, 50A	50

2.3.17. Fraction of total mass of nitrogen not more than 0,008 % in oxygen-converter steel for rolled sheets».

Point 3.3. Specification 1. Replace words: «for chemical analysis — one test sample from melt — ladle as per GOST 7565» with «for chemical analysis- test samples as per GOST 7565»;

Specification 5. Replace words; «Hardening with tempering» with «cold-harden, annealed, high-tempered or hardened with tempering»;

Add specification — 9; «9) For determination of hardness after hardening— two longitudinal samples from melt».

Point 4.1. Replace the reference: GOST 22536.13 with GOST 27809 (2 times).

Point 4.7 rephrase as follows: «4.7. Sampling for test of mechanical properties as per table 3 and 5 should be carried out as per GOST 7564 (variant 1), as per table 4 and 8 as per GOST 7564 (variant 2)».

Section 4 add point - 4.7a: « 4.7a. Sampling for determination of hardness after hardening should be carried out as per the diagram given in the appendix 8.

Test samples for inspection can be cut out from finished rolled-stock or from re-rolled blanks (in case of inspection as per melt)».

Point 4.8. Rephrase the first paragraph as follows: «Recommended heating temperature of samples during heat setting test 850—1000 °C. Heating temperature of samples should be specified in the quality certificate».

Section 4 Add point — 4.9a: «4.9a. Rockwell's hardness after hardening is determined as per GOST 9013 at an area located on middle length of sample. Surface area for measuring the hardness should be dressed; during this the surface roughness parameter Ra should not be more than 1.25 microns as per GOST 2789 ».

Point 4.13. Add words; «for hardness test after hardening — in the appendix 9».

Point 5.1.1. First paragraph. Delete words: «as per GOST 22235 »;

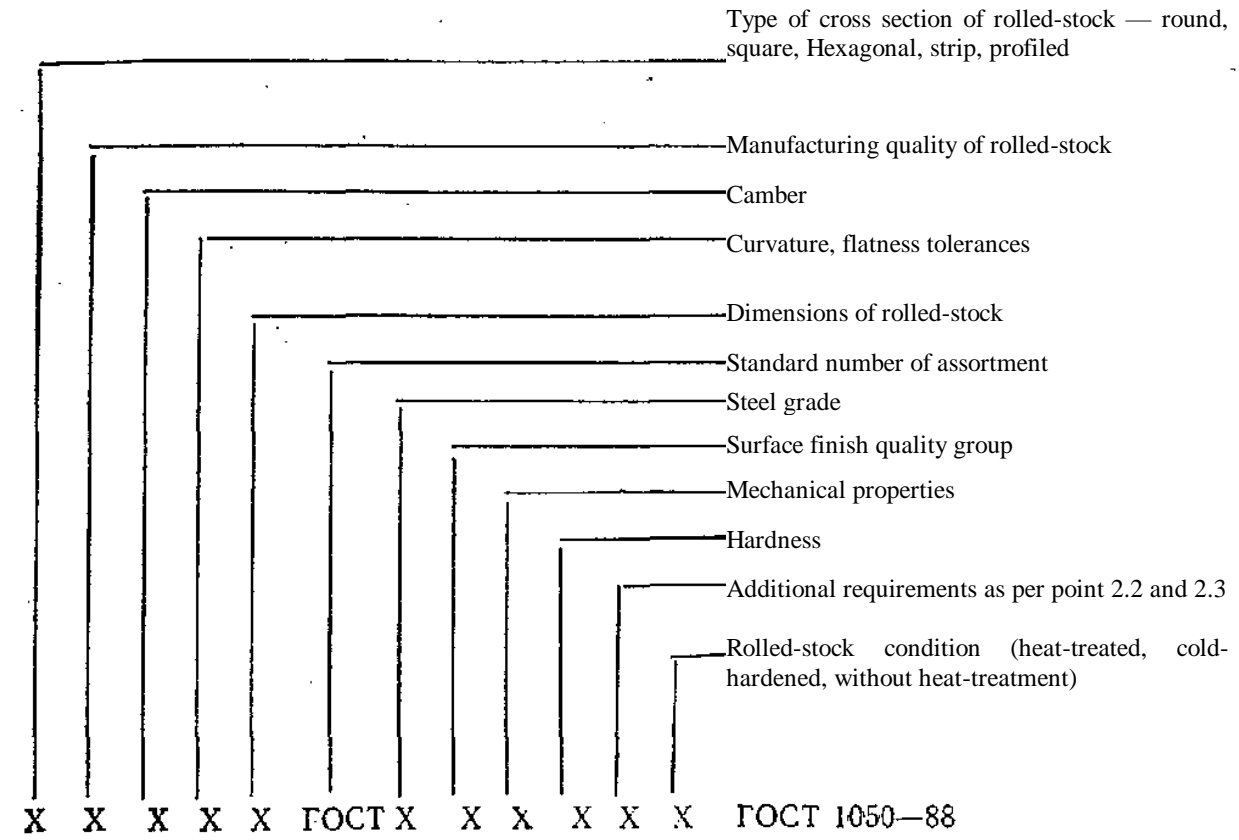
Second paragraph. Delete words: «as per GOST 21929»;

Replace words: «Means of packing — as per GOST 7566 » with «Packing, means and method of formation of packs - as per GOST 7566».

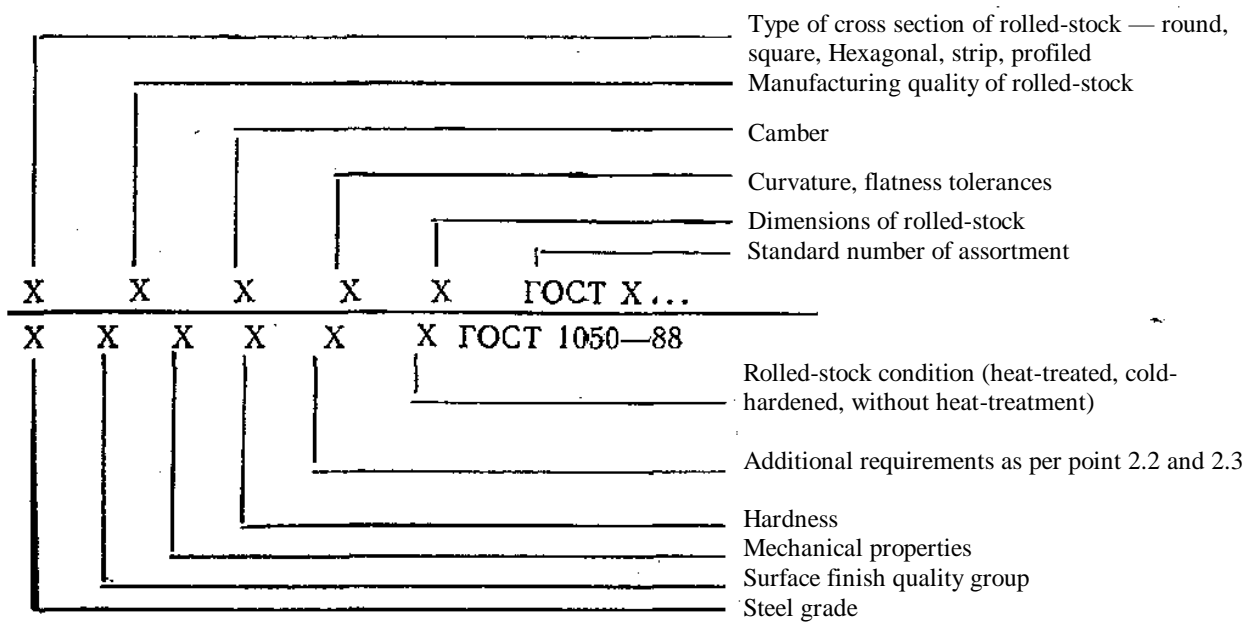
Appendix 1. Add into new editions; Add to appendices — 8, 9:

«APPENDIX 1»
Obligatory

Examples of conventional designation of rolled stocks
Diagram 1 conventional designation of rolled stock



In the design documentation, the conventional designation according to the system given in diagram 2 is permitted



Examples of conventional designations

Rolled-stock sectional, round, ordinary rolling accuracy (B), II class as per curvature, non-standard lengths (HД), diameter 100 mm as per GOST 2590—88, from steel of grade 30, with surface quality group 2ГП, with mechanical properties as per table 3 (M1), with hardness as per point 2.1.10 (TB1), with control of impact strength as per table 4 (KYB), with removed burr (Y3), with heat setting test (66), without heat-treatment:

Round (Круг) B-II-НД-100 GOST 2590—88/30-2ГП-M1-TB1-KYB-Y3-66 GOST 1050-88

Rolled-stock sectional, square, good rolling accuracy (Б), Ist class as per curvature, standard length (МД), with square side of 25 mm as per GOST 2591-88, from steel of grade 35, with surface quality group of 1ГП, with mechanical properties as per table 8 (M3), with hardness as per table 7 (TB2), with normalized macrostructure in points (KMC) as per table 6, with decarbonization as per point 2.2.14 (1C), heat-treated (TO):

Square (Квадрат) Б-1-МД-25 GOST 2591—88/35—1ГП-M3-TB2-KMC-1C-TO GOST 1050-88

Rolled band, ordinary rolling accuracy (B), cambers of class 2, flatness deviation of class 2, multiples of standard lengths (КД), thickness 36 mm, width 90 mm as per GOST 103-76, from steel of grade 45, with surface quality group of 3ГП, with mechanical properties as per table 3 (M1), with hardness as per point 2.1.10 (TB1), with normed hardenability (ПП), without heat-treatment:

Band (Паласа) B-2—2-КД-36x90 GOST 103—76/45—3ГП-M1-TB1-ПП GOST 1050-88

Hot-rolled profile for taper washers, standard length (МД), with the sizes 2BxHxh= 32x5.8x4 mm as per GOST 5157—83, from steel of grade 35, with surface quality group 3ГП, with mechanical properties as per table 3 (M1), with hardness as per point 2.1.10 (TB1), without heat-treatment:

Profile for taper washers МД-32X5.8X4 GOST 5157—83/35—3ГП-M1-TB1 GOST 1050—88

Calibrated rolled-stock, round, with tolerances zone h11, standard length (МД), diameter 10 mm as per GOST 7417—75, from steel of grade 45, with surface quality of group B as per GOST 1051—73, with mechanical properties as per table 5 (M2), with hardness as per point 2.3.8 (TB3), with decarbonization as per point 2.3.11 (2C), cold-hardened (HF):

Round (Круг) h11-МД-10 GOST 7417—75/45-B-M2-TB3-2C-HF GOST 1050—88

Calibrated rolled-stock, square, with tolerance zone h11, multiples of standard lengths (КД), with square side of 15 mm as per GOST 8559—75, from steel of grade 20, with surface quality group Б as per GOST 1051—73, with mechanical properties as per table 8 (M3), with hardness as per table 7 (TB2), with guaranteed weldability (ГC), cold-hardened (HF):

Square (Квадрат) h11-КД-15 GOST 8559—75/20-Б-M3-TB2-ГC-HF GOST 1050—88

Calibrated rolled-stock, hexagonal, with tolerance zone h12, non-standard length (HД), diameter of initial round 8 mm as per GOST 8560—78, from steel of grade 45, with surface quality group B as per GOST 1051—73, with mechanical properties as per table 3 (M1), with hardness as per table 8a (TB4), heat-treated (TO):

Hexagonal (Шестигранник) h12-НД-8 GOST 8560—78/45-B-M1-TB4-TO GOST 1050—88

Rolled-stock with special surface finish, round, with tolerance zone h11, non-standard length (HД), diameter 8 mm, with surface quality group B as per GOST 14955—77 from steel of grade 20, with mechanical properties as per table 5 (M2), with hardness as per table 7 (TB3) cold-hardened (HF):

Round (Круг) h11-НД-8 GOST 14955—77/20-B-M2-TB3-HF GOST 1050-88

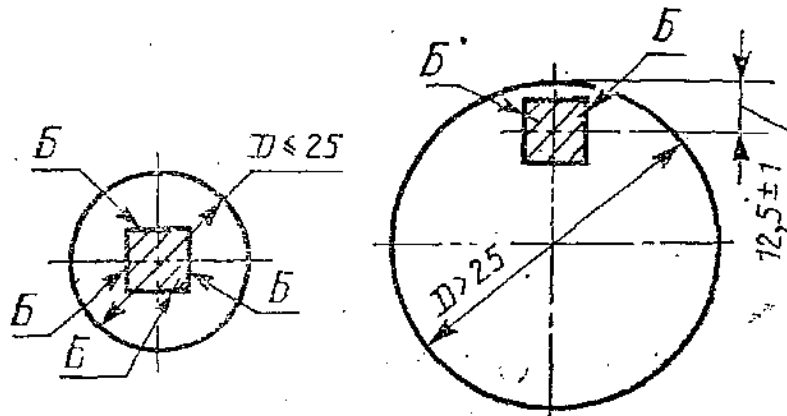
Example of conventional designation, which is permitted to use in design documents:

Rolled-stock with special surface finish, round, with tolerance zone, non-standard length (HД), diameter 8 mm, surface quality group B as per GOST 14955—77, from steel of grade 20, with mechanical properties as per table 5 (M2), with hardness as per table 7 (TB3), cold-hardened (HГ):

$$\text{Round (Kpyз)} \frac{h11 - \text{HД} - 8 \text{ GOST } 14955 - 77}{20 - B - M2 - TB3 - HГ \text{ GOST } 1050 - 88}$$

APPENDIX 8
Obligatory

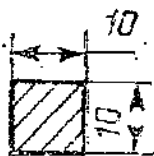
Sampling for determination of hardness after hardening



a- for rolled-stock of diameter up to 25 mm

б- for rolled stocks of diameter above 25 mm

Conventional designations



– Cross-section of sample; sample length 55-60mm.
Б- Area for measuring the hardness

APPENDIX 9
Recommended

Heat-treatment modes of samples for determination of hardness (given in tab. 8a) after the hardening

Table 12

Steel grades	Hardening modes of samples	
	Hardening temperature, °C	Cooling medium
45	860±10	Oil
50, 50A	850±10	Oil

Note:

1. Holding time during hardening (after obtaining the hardening temperature)- 20 min
2. Oil temperature (65±10) °C».

(ИYC № 4 1992)

S t a t e s t a n d a r d o f U S S R

Carbon structural quality steel gauged bar
with special surface finish

General specifications

GOST 1050-88

ОКП 09 5000.11 4100.11 5000

Date of introduction 01.01.91

Non-observance of this standard is prosecuted under the law

This standard sets the general specifications for hot-rolled and forged sectional rolled-stock from good 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 upto 250 mm, and also for calibrated rolled-stock and with special surface finish of all grades.

As a part of the norms of chemical composition this standard covers other type of rolled-stocks, ingots, forgings, die-forging from steel of the grades which are listed above, and also from steel of grades 05кп, 08кп, 08пс, 10кп, 10пс, 11кп, 15кп, 15пс, 18кп, 20кп and 20пс.

1. BASIC PARAMETERS AND DIMENSIONS

1.1. Grades and chemical composition of steel as per ladle sample should correspond to the specifications given in table 1.

Table 1

Steel grades	fraction of total mass of elements, %			
	Carbon	Silicon	Manganese	Chromium, not more than
05кп	Not more than 0.06	Not more than 0.03	Not more than 0.40	0.10
08кп	0.05—0.12	Not 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	Not 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	Not more than 0.06	0.30—0.50	0.15
15кп	0.12—0.19	Not 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	Not more than 0.06	0.30—0.50	0.15
20кп	0.17—0.24	Not 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	Not more than 0.20	0.15
60	0.57—0.65	0.17—0.37	0.50—0.80	0.25

Note:

1. As per the deoxidation rate, steels are designated: Un-killed — кп, Semi-killed— пс, killed— without index.

2. Steel of grade 05кп should not be used in the newly developed and modified technologies.

1.1.1. Fraction of total mass of sulphur in steel should not be more than 0.040 %, phosphorus — not more than 0.035 %.

For steel of grades 11кп and 18кп, used for plating, the fraction of total mass of sulphur should not be more than 0.035 %, phosphorus— not more than 0.030%.

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

1.1.3. In steel of grades 35, 40, 45, 50, 55 and 60, intended for manufacturing of patented wire, the fraction of total mass of manganese should be 0.30—0.60 %, nickel – not more than 0.15 %, chromium - not more than 0.15 %, copper — not more than 0.20 %. Fraction of total mass of sulphur and phosphorus — according to requirements of standards of wire, but should not exceed the norms given in point 1.1.1.

1.1.4. In steel of grades 08пс, 10пс, 15пс and 20пс, intended for manufacturing the rolled sheet for cold die forging, fraction of total mass of manganese upto 0.25 % of the lower limit is permitted.

1.1.5. In case of using other deoxidants (except for silicon) in necessary quantity, the fraction of total mass of silicon less than 0.05 % in the steel of grades 08пс, 10пс, 15пс and 20пс is permitted.

1.1.6. In steel, the fraction of total mass of arsenic not more than 0.08 % is permitted.

1.1.7. The fraction of total mass of nitrogen in oxygen-converter steel should not exceed 0.006% for rolled sheets and strips; 0.008 % — for other types of rolled-stock.

1.2. In rolled-stock, billets, forgings and products meant for further processing, deviations on chemical compound from the norms given in table 1, as per the table 2 is permitted.

Table 2

Name of element	Permissible deviation, in %
Carbon	± 0.01
Silicon for killed steel	± 0.02
Manganese	± 0.03
Phosphorus	± 0.005

- 1.3. The assortment of rolled-stock should correspond to the requirements of:
- GOST 2590 — for hot-rolled stock of round shape;
 - GOST 2591 or other standard documentation for hot-rolled stock of square shape;
 - GOST 1133 — for forged of round and square shape;
 - GOST 2879 — for hot-rolled of hexagonal shape;
 - GOST 103 — for hot-rolled band;
 - GOST 4405 — for forged band;
 - GOST 7417 — for calibrated round shape;
 - GOST 8559 — for calibrated square shape;
 - GOST 8560 — for calibrated hexagonal shape;
 - Standard documentation — for calibrated band:
 - GOST 14955 — with special surface finish.

Examples of conventional designations are given in the appendix 1.

2. TECHNICAL REQUIREMENTS

2.1. Characteristics of basic design

2.1.1. Rolled-stock sections of non-standard length with maximum deviations for ordinary quality (accuracy) of dimensions, curvature, ovality and other requirements

for the shape, sickle-shape and flatness of class 2 as per GOST 103 (for bands).

2.1.2. Calibrated rolled-stock of non-standard length with accuracy class — h11. Ovality — within the limits of tolerance on diameter.

2.1.3. Rolled-stock with special surface finish of non-standard length with accuracy class — h11, Ovality — not more than half of the maximum deviations on diameter.

2.1.4. Rolled-stock section without heat treatment, calibrated and with special surface finish, cold hardened — H or heat-treated (annealed, high-tempered, normalized, normalized with tempering, hardened with tempering) — T.

2.1.5. Rolled-stock section of two groups of surface quality; a & б. Rolled-stock of surface quality group a — is intended mainly for hot mechanical working, group б — mainly for cold mechanical working.

2.1.6. Surface of rolled-stock of surface quality group “a” should not have unrolled blowholes, rolling skins, folds (rolling-laps), cracks, dirt pits and cracks.

2.1.6.1. Defects on surface should be dressed. The width of dressing should be minimum five times the depth.

Dressing depth, considering from the actual size, should not exceed:

Half of the tolerance on dimension — for rolled-stock of sizes less than 80 mm;

Tolerance on dimension - for rolled-stock of sizes from 80 to 140 mm;

5 % of diameter or thickness — for rolled-stock of sizes from 140 to 200 mm;

6 % of diameter or thickness — for rolled-stock of sizes above 200 mm

In one section of rolled-stock of sizes (diameter or thickness) more than 140 mm maximum two dressing upto maximum depth is permitted.

2.1.6.2. On surface of rolled-stock, separate hair-line marks, dents and ripple marks of depth within the limits of half the tolerance on dimensions, as well as the unrolled blowholes and dirt pits (hair lines) of depth not exceeding $\frac{1}{4}$ of the tolerances on dimension but not more than 0.20 mm considered from the actual dimension may be allowed without dressing.

2.1.7. On the surface of rolled-stock with surface quality group “б”, presence of local defects of depth not exceeding the minus tolerance limit on dimension, for rolled-stock of sizes less than 100 mm, is permitted; and for rolled-stocks of size 100 mm and more - the defects of depth not exceeding the tolerances on dimension.

Depth of the defects is counted from the nominal size.

1.1.8. Section rolled-stock should be trimmed.

Scuffing of the ends and burrs are permitted.

Edge camber of section rolled-stock of sizes up to 30 mm is not specified, above 30 mm — should not exceed 0,1 of diameters or thickness. Section rolled-stock of sizes up to 40 mm with non-standard length may be manufactured with un-trimmed edges.

2.1.9. Surface quality and the requirement for trimming of edges of the calibrated rolled-stock should correspond to GOST 1051 groups Б & В, with special surface finish— GOST 14955 groups Б, Г & Д.

In rolled-stock with special surface finishes, the decarbonization is not permitted.

2.1.10. Hardness of section rolled-stock should not exceed 255 HB, of calibrated and with special surface finish — 269 HB.

2.1.11 Mechanical properties of rolled-stock should correspond to the norms given in table 3.

Table 3

Steel grade	Mechanical properties, not less than			
	Yield limit σ_T , N/mm ² (kgf/mm ²)	Ultimate strength, σ_B , N/mm ² (kgf/mm ²)	Relative elongation, δ	Relative compression, ψ
			%	
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

Note:

1. The norms of mechanical properties given in table 3, belongs to rolled-stocks with diameter or thickness upto 80 mm. For rolled-stock of diameter or thickness over 80 mm decrease in relative elongation by 2% and relative compression by 5 % (absolute) is permitted.

Norms of mechanical properties for the billets re-forged from bars of diameter or thickness above 120 to 250 mm in rolled-stock of diameter or thickness from 90 to 100 mm should correspond to the specification given in table 3.

2. As per the agreement between the manufacturer and the customer, for steel of grades 25-60 decrease of ultimate strength by 20 N/mm² (2 kgf/mm²) in comparison with the norms specified in table 3 is permitted, in this case, the norms of relative elongation will increase by 2 % (absolute).

2.1.12. The macrostructure of rolled-stock should not have shrinkages, micro porosity, gas holes, spillage, internal cracks, slag inclusions and flakes.

2.2. The characteristics established by the customer

2.2.1. Rolled-stock from steel of grades 20, 25, 30, 35, 40, 45, 50 with fraction of total mass of boron 0.002-0.006 %.

In this case, add the letter P at the end of steel grade designation.

2.2.2. Rolled-stock from killed steel with fraction of total mass of silicon 0.17-0.27 %.

2.2.3. Rolled-stock of standard length.

2.2.4. Rolled-stock of multiples of standard length.

2.2.5. Calibrated rolled-stock of non-standard length.

2.2.6. Rolled-stock section with heat-treatment.

2.2.7. Rolled-stock with surface quality group r — without unrolled gas holes and dirt pits (hair-lines).

Rolled-stock is intended mainly for hot setting, upsetting and die forging.

2.2.8. Rolled-stock from steel of grades 25, 30, 35, 40, 45, 50 with inspection of impact strength on heat-treated (hardening + tempering) samples.

Norms of impact strength should correspond to table 4.

Table 4

Steel grade	Impact strength KCU, J/cm ² (kgf.m/cm ²), not less than
25	88(9)
30	78(8)
35	69(7)
40	59(6)
45	49(5)
50	38(4)

2.2.9. Rolled-stock calibrated in cold hardened or heat-treated condition with standard mechanical properties according to the requirements, specified in table 5.

2.2.10. Rolled-stock with macrostructure standardized in points according to the requirements specified in table 6.

2.2.11. Rolled-stock with standard hardness according to the requirements given in table 7;

Table 5

Steel grade	Mechanical properties of rolled stock, not less than					
	Cold-hardened			Annealed or highly-tempered		
	Ultimate strength, σ_B , N/mm ² (kgf/mm ²)	Relative elongation, δ_5 , in %	Relative compression, ψ , in %	Ultimate strength, σ_B , N/mm ² (kgf/mm ²)	Relative elongation, δ_5 , in %	Relative compression, ψ , in %
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

Macrostructure of steel in points, maximum								
Central porosity	Pointed non-uniformity	Segregate square	General freckle-type segregation	Regional freckle type segregation	Shrinkage segregation for rolled-stocks of dimensions		subcutaneous bubbles	Inter-granular cracks
					Upto 70 mm	Above 70 mm		
3	3	3	2	1	1	2	Not permitted	

Note. For rolled-stock of size 70 mm and above with surface quality group "6" the subcutaneous gas bubbles of point 2 at a depth not more than the 1/2 of tolerance on diameter or thickness is permitted.

Table 7

Steel grade	Hardness number. HB, not more than			
	For hot-rolled and forged stock		For the calibrated rolled-stock and with special surface finish	
	Without heat treatment	After annealing or high tempering	Cold-hardened	Annealed or highly-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

Continuation of table 7

Steel grade	Hardness number. HB, not more than			
	For hot-rolled and forged stock		For the calibrated rolled-stock and with special surface finish	
	Without heat treatment	After annealing or high tempering	Cold-hardened	Annealed or highly-tempered
48	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-stock with ultrasonic inspection of internal defects as per GOST 21120

2.2.13. Rolled-stocks with guaranteed weldability.

2.2.14. Rolled-stock made from steel of grades 35, 40, 45, 50, 55, 58 (55mm), 60 intend for casehardening by high-frequency current, with decarbonization (ferrite + transition zone) not more than 1.5 % of diameter or thickness on side.

2.2.15. Rolled-stock with surface quality group r with heat-setting test.

Manufacturer may not carry out the test of rolled-stock with dimensions above 80 mm, if customer carries out the satisfactory tests.

2.3. Characteristics set as per the agreement between manufacturer and customer.

2.3.1. Rolled-stock with decreased fraction of total mass of carbon relative to the values given in table 1, but not less than 0.05 %.

2.3.2. Rolled-stock with decreased fraction of total mass of carbon relative to the values given in table 1, but not less than 0.05 %, without taking into account the permissible deviations in the finished rolled-stock, which are specified in table 2.

2.3.3. Rolled-stock with fraction of total mass of sulphur 0.020-0.040 %.

2.3.4. Rolled-stock with fraction of total mass of sulphur not more than 0.025 %.

2.3.5. Rolled-stock with fraction of total mass of phosphorus not more than 0.030 %.

2.3.6. Rolled-stock with fraction of total mass of copper not more than 0.025 %.

2.3.7. Section rolled-stock of diameter or thickness from 30 to 140 mm with removal of burrs and scuffing of edges.

2.3.8. Cold-hardened rolled-stock with increased hardness by 15 HB relative to the values given in table 7.

2.3.9. Rolled-stock with standardized mechanical properties determined on samples, taken from heat-treated billets (hardening + tempering), of sizes specified in the order, according to requirements of table 8.

Table 8

Steel grade	Mechanical properties of rolled-stock of size											
	Upto 16 mm				From 16 upto 40 mm				From 40 upto 100 mm			
	Yield limit σ_T , N/mm ² (kgf/mm ²), not less than	Ultimate strength, σ_B , N/mm ² (kgf/mm ²)	Relative elongati- on, δ_5 , in %	Impact load KC. j (kgf.m)	Yield limit σ_T , N/mm ² (kgf/mm ²)	Ultimate strength, σ_B , N/mm ² (kgf/mm ²)	Relative elongatio n, δ_5 , in %	Impact load KC. j (kgf.m)	Yield limit σ_T , N/mm ² (kgf/mm ²),	Ultimate strength, σ_B , N/mm ² (kgf/mm ²)	Relative elongation, δ_5 , in %	Impact load KC. j (kgf.m)
25	375 (38)	550—700 (56—71)	19	35 (3.5)	315 (32)	500—650 (51—66)	21	35 (3.5)	—	—	—	—
30	400 (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	490 (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—1000 (87—102)	11	—	520 (53)	800—950 (82—97)	13	—	450 (46)	750—900 (76—92)	14	—

Note:

1. Norms of mechanical properties was not a rejection factor till 01.01.92, determination is compulsory.
2. Mechanical properties of steel 30 covers the rolled-stock of sizes upto 63 mm.
3. Values of mechanical properties are given for rolled-stock of round shape, for square sections range of equivalent diameters are given in the appendix

2.3.10. Rolled-stock with standardized hardenability according to appendices 3 and 4.

2.3.11. Rolled-stock from steel of grades 35, 40, 45, 50, 55, 58 (55mm) 60, intended for case hardening by high frequency current, with decarbonization (ferrite +transition zone) not more than 0.5 % of diameter or thickness on side.

2.3.12. Rolled-stock in pickled condition.

2.4. It is permitted to specify high characteristics which are not specified by present standard in the specifications on concrete production.

The list of additional characteristics is given in the appendix 5.

2.5. Marking and packing of rolled-stock — as per GOST 7566,

2.5.1. Packing of the calibrated rolled-stock — as per GOST 1051, with special surface finish— as per GOST 14955.

2.5.2. Marking is carried out directly on product if the product is not subject to packing, and on label if product is packed in bundles, rolls and coils.

3. ACCEPTANCE PROCEDURES

3.1. Rolled-stocks are accepted in batches consisting of steel of one melt, one size and one mode of heat treatment (while manufactured in heat-treated condition).

As per the agreement between the manufacturer and the customer, a batch is permitted to make from steel of one grade from several melt and with one size.

Each batch should have quality certificate as per GOST 7566.

In case of using other deoxidants (except for silicon) for semi-killed steel, the quality certificate should have a corresponding note about the same.

For the rolled-stock accepted with characteristics, established by the customer according to the points 2.2 and 2.3, the results of tests on ordered parameters should be specified in the quality certificate.

3.2. Rolled-stocks are subject to acceptance test.

3.3. For quality control of rolled-stocks the samples should be taken from a batch in following way:

1) For chemical analysis — one sample from melt - ladle as per GOST 7565. The manufacturer should carry out the test for residual copper, nickel, chromium, arsenic and nitrogen periodically minimum once in a quarter. While manufacturing the steel considering the manganese equivalent, the inspection of residual copper, nickel and chromium should be carried out for each melt;

2) For inspection of surface quality and dimensions — all bars, bands and rolls;

- 3) For inspection of macrostructure in fracture or pickling, for impact bend test, determination of depth of decarbonized layer — two bars, bands or rolls;
 - 4) For inspection of hardness — 2 % bars, bands or rolls, but not less than 3 pieces;
 - 5) For tensile test— one bar, band or roll for the test in normalized condition, two bars, two bands or two rolls for test in hardened with tempering condition;
 - .6) For determination of hardenability — one bar, band or roll from melt - ladle of all steel grades which are not containing boron, and two bars, two bands or two rolls from melt - ladle of steel of the grades containing boron;
 - 7) For determination of grain size— one bar, band or roll from melt - ladle;
 - 8) For setting test — three bars, bands or rolls,
- 3.4. In case of unsatisfactory test results even for one parameter, the re-test should be carried out as per GOST 7566.
- Results of re-testing are applicable to whole batch.

4. TEST METHODS

4.1. The chemical analysis of steel is carried out as per GOST 22536.0—GOST 22536.9, GOST 22536.13, GOST 12359 or other methods ensuring the standard accuracy. In case of any difference, the chemical analysis should be carried out as per GOST 22536.0—GOST 22536.9, GOST 22536.13, GOST 12359.

4.2. Surface quality should be checked by visual inspection without using of any magnifying devices. If necessary carry out polishing or pickling of surface; Use magnifying device upto 10^x for rolled-stock with special surface finish of diameter upto 3 mm inclusive. Depth of defect on surface of rolled-stock is determined by dressing or filing.

4.3. Geometrical dimensions and the shape is determined by measuring instruments as per GOST 26877, GOST 162, GOST 166, GOST 427, GOST 2216, GOST 3749, GOST 5378, GOST 6507, GOST 7502, or with the help of the instruments certificated as per GOST 8.001 or GOST 8.326.

4.4. Sampling from rolls for all types of tests should be carried out at a distance not less than 1.5 coil from the end of the roll.

4.5. For carrying out the tensile test and setting test, for determination of grain

size, hardenability and depth of decarbonized layer, take one test sample each from all selected specimens of bars, bands or rolls;

For impact strength test - one sample of all type;

For inspection of macrostructure — one template.

4.6. Sampling for setting tests — as per GOST 7564.

4.7. Sampling for test of mechanical properties should be carried out as per GOST 7564 (variant 1).

4.8. Test for setting in hot condition is carried out as per GOST 8817.

Samples are heated upto forging temperature 850—1000 °C and are forged upto 65 % of initial height. The forged sample should be free of cracks and folds.

4.9. Brinell hardness is determined as per GOST 9012; Hardness of rolled-stocks of diameter or thickness less than 5 mm is not determined.

4.10. Tensile test is carried out as per GOST-1497 on samples of five-time length of diameter 5 or 10 mm.

For rolled-stock of diameter or thickness upto 25 mm inclusive, test may be carried out on samples without machining.

Test for impact strength is carried out as per GOST 9454 on samples of type 1.

Direction of axis of sample — along the direction of rolling.

4.11. Samples for tensile tests of rolled-stock according to requirements table 3 are cut out from the normalized billets of diameter or the side of square 25 mm.

For bars of diameter less than 25 mm, normalization should be carried out in finished section of bar (without cutting of billets),

Note. From bars of size more than 120 mm, sampling for mechanical test may be carried out from re-forged or re-rolled billets of section 90-100 mm.

4.12. Samples for tensile tests of rolled-stock according to the requirements of table 8 should be cut from heat-treated billets of size, specified by the customer.

4.13. Heat treatment modes of billets (samples) for carrying out the tests of mechanical properties are given in appendices 6 and 7.

4.14. Inspection of macrostructure on fracture or pickled templates should be carried out without using magnifying devices as per GOST 10243.

It is permitted to use ultrasonic inspection methods (Y3K) and others nondestructive methods, approved in established order.

4.15. Depth of decarbonized layer is determined as per GOST 1763.

4.16. Hardenability is determined by the end quenching method as per GOST 5657.

4.17. Grain size is determined as per GOST 5639.

4.18. The manufacturer may not carry out the testing for macrostructure, hardenability and mechanical properties for small sized profiles as such the big sized profiles have already passed the above specified tests manufactured from the same melt.

4.19. The manufacturer may use the statistical and nondestructive methods of inspection, approved in established order. In case of any difference and during periodical tests, the methods specified by present standard should be used.

5. TRANSPORTATION AND STORAGE

5.1. Transportation and storage — as per GOST 7566 with the following addition.

5.1.1 Transportation of products is carried out by all types of transport according to rules of transportation of the cargos, in force for particular type of transportation. By railway, the transportation is carried out depending upon the weight and overall dimensions in covered or open wagons as per GOST 22235. The weight of cargo packs should not exceed 10000 kg during mechanized loading in open wagons, in covered 1250 kg. Stacking means — as per GOST 7566.

While dispatching two and more cargos, dimensions of which allows formation of transportation packs (stacking) with overall dimensions as per GOST 24597, then the cargo should be formed into transportation pack (stacked) as per GOST 21929. Fastening means - as per GOST 21650.

APPENDIX 1
Obligatory

Examples of conventional designation

Hot-rolled round shape stock, diameter 100 mm, ordinary rolling accuracy B as per GOST 2590—88, from steel of grade 30, with surface quality group “a”, without heat treatment:

$$\text{Round (Круг)} \frac{100 - B \text{ GOST 2590} - 88}{30 - a \text{ GOST 1050} - 88}$$

Hot-rolled square shape stock, with side of square 25 mm, ordinary rolling accuracy B as per GOST 2591—88, from steel of grade 35, with surface quality group “r”, heat-treated— T:

$$\text{Square (Квадрат)} \frac{25 - B \text{ GOST 2591} - 88}{35 - r - T \text{ GOST 1050} - 88}$$

Band rolled-stock, thickness 36 mm and width 90 mm, ordinary accuracy, camber class 2, non-flatness class 2 as per GOST 103—76, from steel of grade 45, with surface quality group б, without heat treatment:

$$\text{Band (Полоса)} \frac{36 \times 90 - 2 - 2 \text{ GOST 103} - 76}{45 - б - \text{GOST 1050} - 88}$$

Calibrated round shape rolled-stock, diameter 10 mm, with tolerance field h11 as per GOST 7417—75, from steel of grade 45, with surface quality group Б as per GOST 1051—73, cold-hardened — H:

$$\text{Round (Круг)} \frac{10 - h11 \text{ GOST 7417} - 75}{45 - Б - H \text{ GOST 1050} - 88}$$

Calibrated square shape rolled-stock, with side of square 15 mm, with tolerance field h11 as per GOST 8559—75, from steel of grade 20, with surface quality group B as per GOST 1051—73, cold-hardened - H:

$$\text{Square (Квадрат)} \frac{15 - h11 \text{ GOST 8559} - 75}{20 - B - H \text{ GOST 1050} - 88}$$

Calibrated hexagonal rolled-stock, diameter of the initial round 8 mm, with tolerance field h11 as per GOST 8560—78, from steel of grade 45, with surface quality group B as per GOST 1051—73 heat-treated — T:

$$\text{Hexagonal (Шестигранник)} \frac{8 - h11 \text{ GOST 8560} - 78}{45 - B - T \text{ GOST 1050} - 88}$$

Rolled-stock with special surface finish, diameter 8 mm, with tolerance field h11 and surface quality group B as per GOST 14955—77, from steel of the grade 20, cold-hardened — H:

$$\text{Round (Круг)} \frac{8 - h11 \text{ GOST 14955} - 77}{20 - B - H \text{ GOST 1050} - 88}$$

APPENDIX 2
Obligatory

Conversion of rectangular sections into round sections with the same mechanical properties

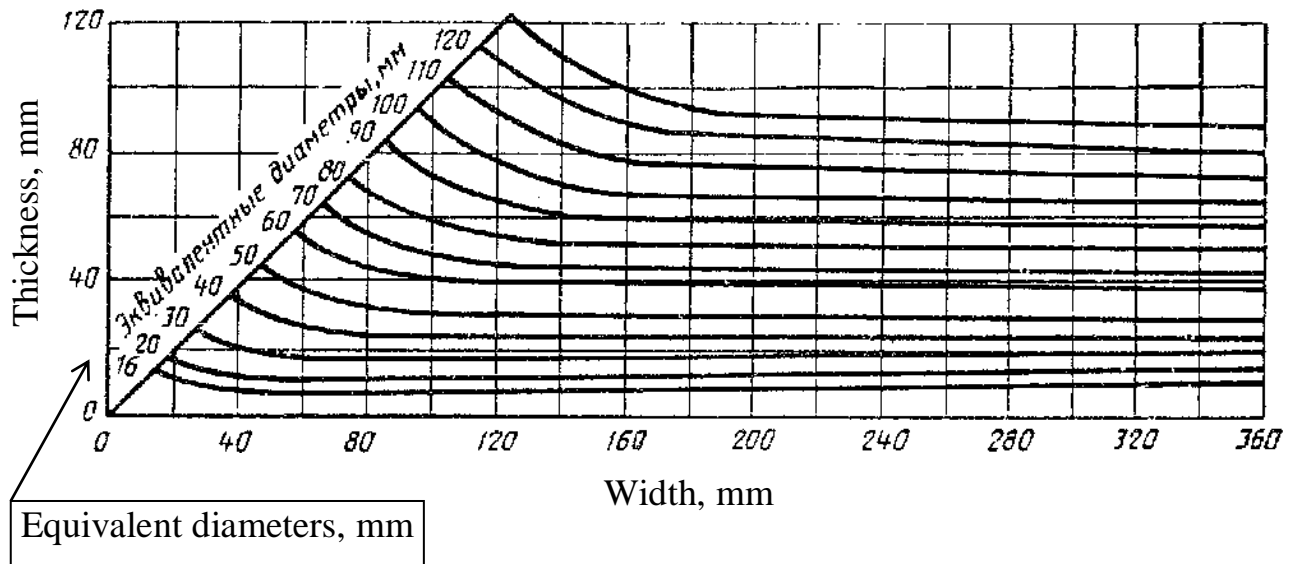


Fig. 1

APPENDIX 3
Obligatory

Hardenability ranges (graph) of structural carbon steel

Steel of grade 35

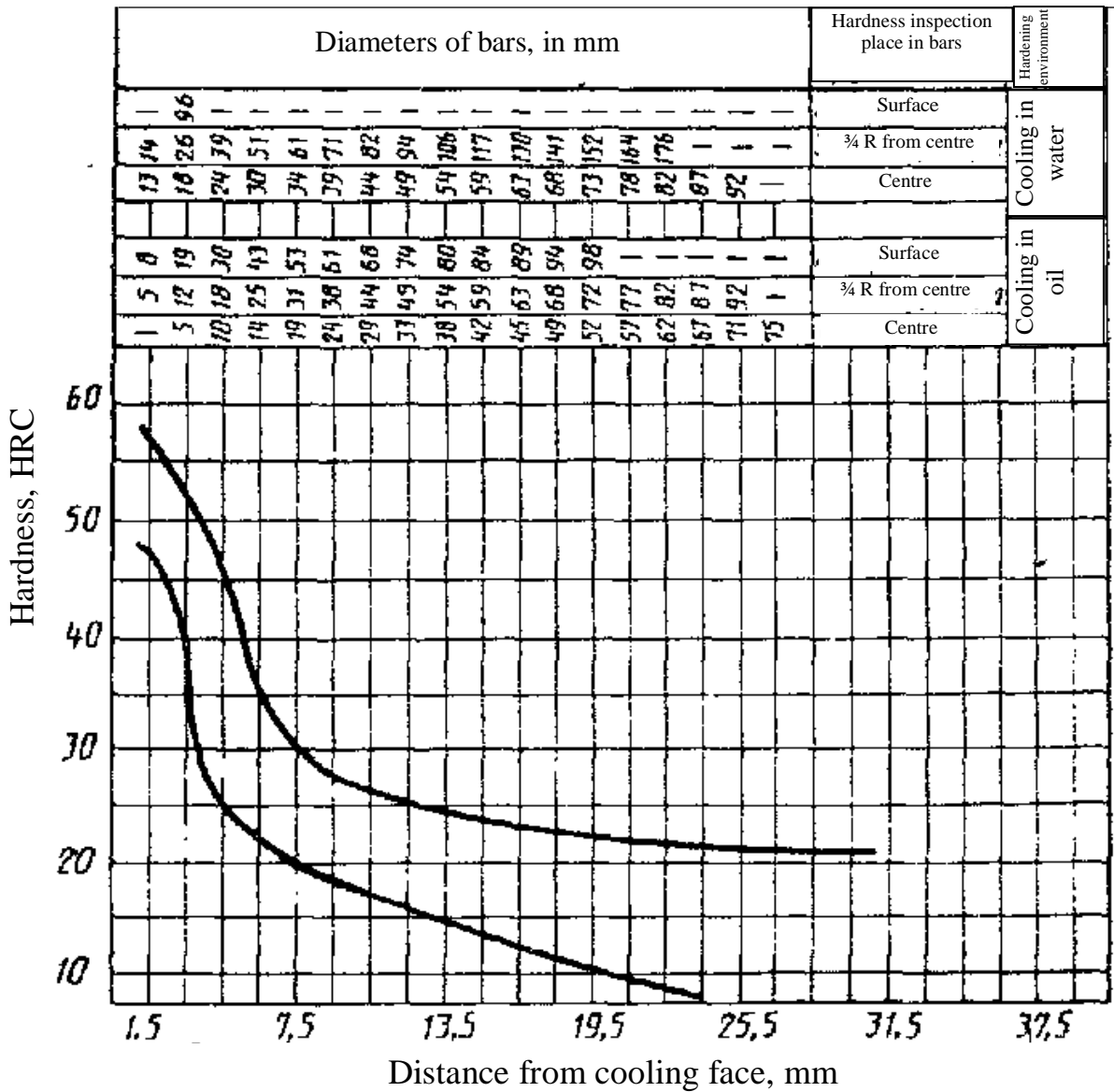


Figure 2

Steel of grade 40

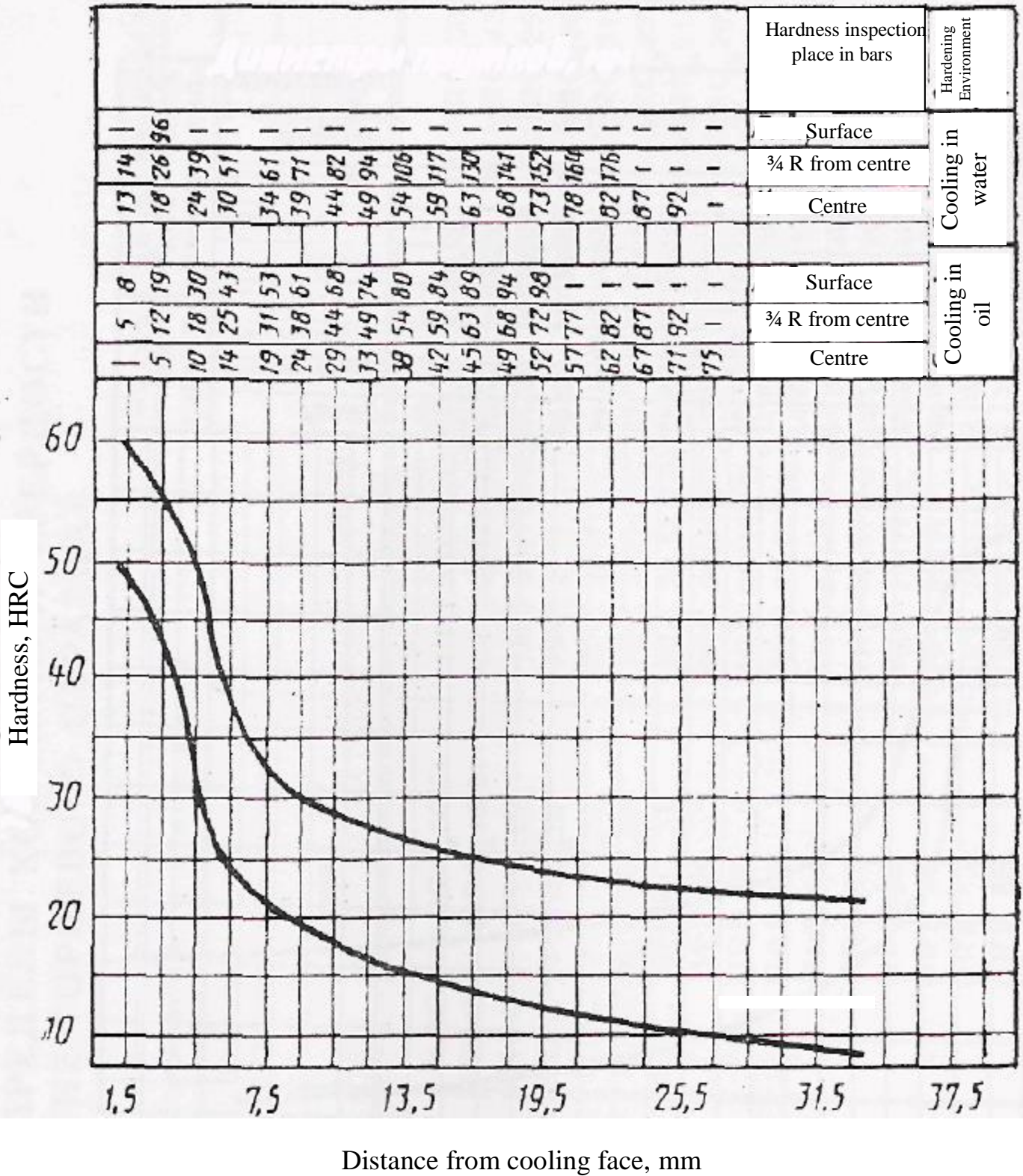


Fig 3

PARAMETERS OF BRANDED BANDS (ERROR LIMITS OF HARDNESS HRC (HRC₃) AND HRB ALONG THE LENGTH OF THE FACE SAMPLE)

Table 9

Distance from face, mm расстояние, мм	Hardness for bands of steel grades гарок					
	35		40		45	
	Maximum <i>с.</i>	Minimum	Maximum <i>к.</i>	Minimum	Maximum <i>макс.</i>	Minimum <i>ин.</i>
1,5	HRC 56(HRC ₃ 57)	HRC 48(HRC ₃ 49,5)	HRC 57(HRC ₃ 58)	HRC 49(HRC ₃ 50,5)	HRC 58(HRC ₃ 59)	HRC 49(HRC ₃ 50,5)
3,0	HRC 54(HRC ₃ 55)	HRC 43(HRC ₃ 44)	HRC 56(HRC ₃ 57)	HRC 44(HRC ₃ 45,5)	HRC 56(HRC ₃ 57)	HRC 44(HRC ₃ 45,5)
4,5	HRC 48(HRC ₃ 49)	HRC 25(HRC ₃ 27)	HRC 51(HRC ₃ 52,5)	HRC 27(HRC ₃ 29)	HRC 53(HRC ₃ 54)	HRC 27(HRC ₃ 29)
6,0	HRC 36(HRC ₃ 38)	HRC 21(HRC ₃ 23)	HRC 36(HRC ₃ 37,5)	HRC 24(HRC ₃ 26)	HRC 41(HRC ₃ 42,5)	HRC 24(HRC ₃ 26)
7,5	HRC 29(HRC ₃ 31)	HRC 18(HRC ₃ 20)	HRC 32(HRC ₃ 33,5)	HRC 22(HRC ₃ 24)	HRC 35(HRC ₃ 36,5)	HRC 22(HRC ₃ 24)
9,5	HRC 28(HRC ₃ 30)	HRB 94	HRC 30(HRC ₃ 32)	HRC 20(HRC ₃ 22)	HRC 31(HRC ₃ 33)	HRC 20(HRC ₃ 22)
10,5	HRC 27(HRC ₃ 29)	HRB 93	HRC 28(HRC ₃ 30)	HRC 18(HRC ₃ 20)	HRC 30,5(HRC ₃ 32,5)	HRC 19(HRC ₃ 21)
12,0	HRC 26(HRC ₃ 28)	HRB 92	HRC 27(HRC ₃ 29)	HRB 94	HRC 29(HRC ₃ 31)	HRC 18(HRC ₃ 20)
13,5	HRC 25,5(HRC ₃ 27,5)	HRB 91	HRC 26(HRC ₃ 28)	HRB 93	HRC 28(HRC ₃ 30)	HRB 94
15,0	HRC 25(HRC ₃ 27)	HRB 90	HRC 25,5(HRC ₃ 27,5)	HRB 92	HRC 27,5(HRC ₃ 29,5)	HRB 93
16,5	HRC 24,5(HRC ₃ 26,5)	HRB 89	HRC 25(HRC ₃ 27)	HRB 91	HRC 27(HRC ₃ 29)	HRB 92
18,0	HRC 24(HRC ₃ 26)	HRB 88	HRC 24,5(HRC ₃ 26,5)	HRB 89	HRC 26,5(HRC ₃ 28,5)	HRB 91
19,5	HRC 23,5(HRC ₃ 25,5)	HRB 87	HRC 24(HRC ₃ 26)	HRB 88	HRC 26(HRC ₃ 28)	HRB 90
21,0	HRC 23(HRC ₃ 25)	HRB 86	HRC 23,5(HRC ₃ 25,5)	HRB 87	HRC 25(HRC ₃ 27)	HRB 89
24,0	HRC 22(HRC ₃ 24)	HRB 85	HRC 23(HRC ₃ 25)	HRB 86	HRC 24(HRC ₃ 26)	HRB 88
27,0	HRC 21(HRC ₃ 23)	HRB 84	HRC 22(HRC ₃ 24)	HRB 85	HRC 23(HRC ₃ 25)	HRB 87
30,0	HRC 20(HRC ₃ 22)	HRB 83	HRC 21(HRC ₃ 23)	HRB 84	HRC 22(HRC ₃ 24)	HRB 86
33,0	—	—	HRC 20,5(HRC ₃ 22,5)	HRB 83	—	—
36,0	—	—	HRC 20(HRC ₃ 22)	HRB 82	—	—
39,0	—	—	—	—	—	—

APPENDIX 5
Recommended**CHARACTERISTICS OF ROLLED-STOCK, ESTABLISHED AS PER
THE AGREEMENT BETWEEN THE CUSTOMER AND THE
MANUFACTURER IN THE REFERENCE DOCUMENTS**

1. Rolled-stock with standardized fraction of total mass of nitrogen in the steels of electric melt.
2. Rolled-stock with decreased fraction of total mass of manganese, reduced against the norms specified in table 1, by value of manganese equivalent, which is equal to:
 3. $\Sigma M = 0.3 (\text{Cr}\%) + 0.5 (\text{Ni}\%) + 0.7 (\text{Cu}\%)$, where Cr, Ni, Cu- actual residual fraction of total mass of Chromium, Nickel and Copper in steel, not exceeding the norms, specified in table 1.
4. The calibrated rolled-stock from steel of grades 08, 55 and 60 in cold-hardened or heat-treated state with guaranteed mechanical properties.
5. Rolled-stock with standardized impact strength on sample of type I at temperature minus 40°C.
6. Rolled-stock with standardized impact strength on sample of type II at temperature plus 20°C and at minus temperatures.
7. Rolled-stocks without guaranteed relative compression.
8. Calibrated rolled-stock and with special surface finish with standardized hardness in normalized with tempering and hardening with tempering condition.
9. Rolled-stock section with standardized hardness in normalized state.
10. Rolled-stock with standardized hardness in the given limits.
11. Rolled stocks without guaranteed hardness.
12. Rolled-stock with standardized austenite grain size.
13. Rolled-stock with standardized quality on non-metallic inclusions.
14. Rolled-stock with standardized quality as per hairline, revealed on surface of finished parts by magnetic method or pickling.
15. Rolled-stock of low-tonnage batches.

APPENDIX 6
Recommended

MODES

Of heat treatment of billets for inspection of mechanical properties given in table 3 and 4

Table 10

Steel grade	Heating temperature, in °C		
	Normalization	Hardenings	Tempering
	Tensile test	Impact band 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 (55ПП)	850	—	—
60	840	820	600

Recommended minimum holding time:

During normalizing or hardening -30 minutes;

During tempering at 200°C - 2 hour;

During tempering at 600°C - 1 hour;

Cooling medium during hardening – water

MODES

Of heat treatment of billets for inspection of mechanical properties given in table 8

Table 11

Steel grade	Hardening		Tempering
	Heating temperature, in °C	Cooling medium	Heating temperature, in °C
25 30	860—900 850—890	Water	550-600 cooling in air
35 40 45	840—880 830—870 820—860	Water or oil	
50 55 60	810—850 805—850 800—840	Oil or water	

Replacement of GOST 1050—74

Reference technical-standard documents

Document no	Point no.
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

Continuation

Document no	Point no.
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	4.3
GOST 8.326—78	4.3

Value	Unit		
	Name	Designation	
		International	Russian
MAIN SI UNITS			
Length	METRE	m	М
Weight	KILOGRAM	kg	КГ
Time	SECONDS	s	с
Electric current strength	AMPERE	A	А
Thermodynamic temperature	KELVIN	K	К
Quantity of substance	MOLE	mol	Моль
Intensity of light	CANDLE	cd	кд
ADDITIONAL SI UNITS			
Plane angle	RADIAN	rad	рад
Space angle	STERADIAN	sr	ср

DERIVED SI UNITS HAVING SPECIAL NAMES

Value	Unit			Expression in main and additional SI units.
	Name	International	Russian	
Frequency	Hertz	Hz	Гц	s^{-1}
Force	Newton	N	Н	$m \cdot kg \cdot s^{-2}$
Pressure	Pascal	Pa	Па	$m^{-1} \cdot kg \cdot s^{-2}$
Energy	Joule	J	Дж	$m^2 \cdot kg \cdot s^{-2}$
Power	Watt	W	Вт	$m^2 \cdot kg \cdot s^{-3}$
Charge of electricity	Coulomb	C	Кл	$c \cdot A$
Electric Voltage	Volt	V	В	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-1}$
Electric capacitance	Farad	F	Ф	$m^{-2} \cdot kg^{-1} \cdot s^4 \cdot A^2$
Electric resistance	Ohm	Ω	Ом	$m^2 \cdot kg \cdot s^{-3} \cdot A^{-2}$
Electric conductivity	siemens	S	См	$m^{-2} \cdot kg^{-1} \cdot s^3 \cdot A^2$
Magnetic induction flow	Weber	Wb	Вб	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-1}$
Magnetic induction	Tesla	T	Тл	$kg \cdot s^{-2} \cdot A^{-1}$
Inductivity	Henry	H	Гн	$m^2 \cdot kg \cdot s^{-2} \cdot A^{-2}$
Light flow	Lumen	lm	лм	Kd.sr
Luminescence	Lux	lx	лк	$m^{-2} \cdot kd \cdot sr$
Radio nuclei activeness	Beckerrel	Bq	Бк	s^{-1}
Absorbed dose of ionized radiation.	Grey	Gy	Гр	$m^2 \cdot s^{-2}$
Equivalent radiation dose	Zivert	Sv	Зв	$m^2 \cdot s^{-2}$