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K. A. Pavlovsky

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USSR STATE STANDARD

CARBON STEEL AND ALLOY STEEL FOR MAKING SHELLS

GOST B 10230-75

This supersedes GOST 10230-62 and is Valid up to 01.01.90

GOST B 10230-75

The present standard relates to carbon steel and alloy steel produced in the form of graded, hot-rolled, forged steel and bright-drawn steel and intended for the manufacture of parts of shells and mines.

As far as norms for chemical composition are concerned, this standard relates to ingots, forgings and stampings.

1. CLASSIFICATION

1.1. Depending on chemical composition and properties, steel is divided into two categories as below:

quality steel and

high quality steel - A

(Revised edition, Rev. No. 2)

1.2. Depending on the method of manufacture, steel is divided into two categories as below:

hot-rolled and forged steel and

bright-drawn steel.

1.3. Depending on the purpose for which it is used, steel

Gas-cutting is resorted to only for cutting samples.

2.4. Obliquity in cutting must not exceed:

5 mm for rods of diamter or side of square upto 120 mm and 8 mm for rods of diameter or side of square over 120 mm.

Examples of conventional designation to be used in the order for the product:

Hot-rolled, square section steel with side of square 46 mm, made to increased rolling accuracy Б (B) to GOST 2591-71, grade 45X1 (45 Kh1) (45 Cr1) intended for hot upset forging (group "d") to upset forging group 50 and heat treated.

$$\text{Square} = \frac{\begin{matrix}(B)\\ 46\text{-Б GOST 2591-71}\end{matrix}}{\begin{matrix}45\ \text{X1-}z\text{-50-T GOST B 10230-75}\\ 45\ \text{Cr1-d-50-T} \qquad (V)\end{matrix}},$$

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Bright-drawn steel of diameter 15 mm, accuracy class 4 as defined in GOST 7417-75, grade 35, surface quality group B(V) as defined in GOST 1051-73, cold worked.

$$\text{Round Cold} = \frac{\begin{matrix}15\text{-4 GOST 7417-75}\\ \\ 35\text{-B-H GOST B 10230-75}\\ (V)(N) \qquad (V)\\ (CW)\end{matrix}}{}$$

2.2, 2.4 (Revised edition, Rev. No. 2)

3. TECHNICAL REQUIREMENTS

3.1. Chemical composition of these steels must conform to the values set out in Table 1: chemical composition of steels of grades 10, 15, 20, 25, 30, 35, 40, 45 and 50 must conform to GOST 1050-74;

Table 1

Grade of steel	Proportion of various elements by weight, %				
	Carbon	Silicon	Manganese	Chromium	Nickel
Carbon steel					
C-45	0,40—0,50	0,17—0,40	0,50—0,80	max. 0,30	max. 0,25
C-50	0,45—0,55	0,17—0,40	0,50—0,80	" 0,30	" 0,25
C-55	0,50—0,60	0,17—0,40	0,50—0,80	" 0,30	" 0,25
C-60	0,55—0,65	0,17—0,40	0,50—0,80	" 0,30	" 0,25
C-65	0,60—0,70	0,17—0,40	0,50—0,80	" 0,30	" 0,25
C-70	0,65—0,75	0,17—0,40	0,50—0,80	" 0,30	" 0,25
11Ю (П-11) (11Ал	0,08—0,13	Не более 0,13 max.	0,25—0,50	0,20	0,15
Alloy steel					
С-45Х (45Х) (45 Cr)	0,40—0,50	0,17—0,40	0,50 0,80	0,90—1,20	max. 0,25
С-50Х (50Х)	0,45—0,55	0,17—0,40	0,50—0,80	0,80—1,10	" 0,25
45Х1 (45Х12)	0,40—0,50	0,17—0,40	0,50—0,80	1,10—1,40	" 0,25
46Х1	0,42—0,50	0,17—0,40	0,50—0,80	1,20—1,50	" 0,25
45Х3 (45Х30)	0,40—0,50	0,17—0,40	0,50—0,80	2,40—2,90	" 0,25
48Х3 (46Х30)	0,44—0,52	0,17—0,40	0,50—0,80	2,40—2,90	" 0,25
60Х3 (60Х30)	0,55—0,63	0,17—0,40	0,20—0,50	2,40—2,90	" 0,25
С-35ХМ (0ХМ)	0,30—0,38	0,17—0,40	0,50—0,80	0,90—1,20	" 0,25
60Х2М (60cr2 Mo)	0,55—0,63	0,17—0,40	0,20—0,50	1,40—1,80	" 0,25
60Х2Н (60Х2Н1,5)	0,55—0,63	0,17—0,40	0,20—0,50	2,10—2,50	1,30—1,70
С-35ХГС (35ХГСА)	0,32—0,39	1,30—1,60	0,80—1,10	1,10—1,40	max. 0,25
35Х3НМ (Х3НМ)	0,32—0,39	0,17—0,40	0,25—0,50	2,40—2,90	1,10—1,50
13ХН3М (ХНМ-1)	0,39—0,47	0,17—0,40	0,25 0,50	1,00—1,40	3,00 3,40
48ХН3Я	0,44—0,52	0,17—0,40	0,25—0,50	1,10—1,45	3,00—3,40
60Х2Н2М (60ХНМ)	0,55—0,63	0,17—0,40	0,20—0,50	1,40—1,80	1,70—2,10
63Х2Н2МФ (60ХНМФ)	0,60—0,67	0,17—0,40	0,10—0,20	2,30—2,60	2,30—2,60
36ХС2Н3МФ (БРО)	0,32—0,40	1,65—2,00	0,35—0,60	0,60—0,90	3,25—3,60
53ХМЮ (53Cr Mo Al)	0,49—0,55	0,17—0,37	0,50—0,80	1,0 —1,4	max. 0,30

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Table 1 Contd.

Grade of steel	Proportion of various elements by weight, %					
	Molybdenum	Aluminium	Vanadium	P	S	Cu
				Not more than		
Carbon steel						
C-45	—	—	—	0,045	0,045	0,30
C-50	—	—	—	0,045	0,045	0,30
C-55	—	—	—	0,045	0,045	0,30
C-60	—	—	—	0,045	0,045	0,30
C-65	—	—	—	0,045	0,045	0,30
C-70	—	—	—	0,045	0,045	0,30
11Ю (П-11) (11Ал)	—	0,02—0,07	—	0,025	0,030	0,20
Alloy steel						
С-45Х (45Х)	—	—	—	0,035	0,035	0,30
С-50Х (50Х)	—	—	—	0,035	0,035	0,30
45Х1 (45Х12)	—	—	—	0,035	0,035	0,30
46Х1	—	—	—	0,035	0,035	0,30
45Х3 (45Х30)	—	—	—	0,035	0,035	0,30
48Х3 (46Х30)	—	—	—	0,035	0,035	0,30
60Х3 (60Х30)	—	—	—	0,035	0,035	0,30
С-35ХМ (0ХМ)	0,25—0,40	—	—	0,030	0,030	0,30
60Х2М	0,25—0,40	—	—	0,035	0,035	0,30
60Х2Н (60Х2Н1,5)	—	—	—	0,035	0,035	0,30

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Table 2

Element	Steel grade	Lim.dev. %
Carbon	Carbon steels and	+ 0.02 - 0.01
	Chromium steels	± 0.01
Silicon	All grades, not alloyed with silicon (except for 11 Al)	± 0.03
	C-35CrMnSi and 36CrSi2Ni3MoVa	± 0.05
Manganese	All grades	± 0.05
Chromium	Alloy steels	± 0.05
Nickel	60Cr2Ni and 35Cr3NiMo	- 0.05
	Other grades, alloyed with nickel	- 0.10
Molybdenum	Alloyed with molybdenum	± 0.03
Vanadium	Alloyed with vanadium	± 0.02
Sulphur		+ 0.005
Phosphorus	All grades	+ 0.005

Table 3

Grade of steel	Hot-rolled steel		Annealed or high-temperatured steel	
	Diameter of impression, mm, not less than	HB max.	Diameter of impression, mm, not less than	HB max.
11A1	5.2	131	5.4	121
C-45	3.9	241	4.3	197
C-50	3.9	241	4.2	207
C-55	3.8	255	4.1	217

3.8. Mechanical properties of carbon steel of other grades as well as C-50 and C-55 grade steel of diameter or side of squre over 65 mm are established by mutual consent.

3.9. Mechanical properties of bright-drawn carbon steel of grades 35, 40, 45 and 50 of size section upto 50 mm in the cold worked condition must meet the requirements set out in Table 5. Mechanical properties of 10, 15, 20, 25 and 30 grades steel must meet the requirements of GOST 1050-74.

Table 5

Steel grade	Yield limit, kgf/mm^2	Relative reduction, %	Diameter of impression, mm	Brinell hardness number, max.
	Not less than			
35	57	20	4.0	229
40	58	20	3.9	241
45	61	20	3.9	241
50	65	20	3.8	255

3.10. Mechanical properties of carbon steel of groups "a" and "c" intended for hot and cold processing under pressure are not standardised.

3.11. Mechanical properties of alloy steel of size of section upto 200 mm, determined on heat treated specimens must meet the requirements set out in Table 6. Norms for mechanical properties for sizes of section over 200 mm as well as norms for mechanical properties and heat treatment schedules for steels of grades 43CrNi3Mo, 63Cr2Ni2MoVa and 36CrSi2Ni3MoVa are established by mutual consent.

Table 6 Contd.

Grade of steel	Heat treatment schedule (recommended)					Mechanical properties			Size of section of blank for heat treatment (round, square) mm
	Hardening			Tempering		Ultimate strength, σ_B, MPa (kgf/mm^2)	Relative reduction, ψ, %	Impact strength, KUC, J/cm^2 (kgf/cm^2)	
	First hardening	Second hardening	Cooling medium	Temperature, °C	Cooling medium	Not less than			
35Cr3NiMo	900-920	-	Oil	630-650	Air	-	-	-	-
		930-950	"	170-190	"	i) 1568 (160)	35	39(4)	in specimen
						ii) 1813 (185)	"	-	"
48CrNi3Mo	850-870	-	"	650-680	"	980(100)	"	49(5)	25
60Cr2N12Mo	840-860	-	"	620-670	"	"	"	"	"
40CrVaA	As per GOST 4543-71								
53CrMoAl	870-890	-	"	"	Air	"	"	"	"

Note: 1. In the case of 35Cr3NiMo grade steel with ultimate strength not less than 1813 MPa (185 kgf/mm^2) the specimen may be heat treated to the schedule: hardening at 900 to 920°C, cooling in oil, tempering at 170 to 190°C, cooling in air.

2. Steel of grade 35Cr3NiMo with ultimate strength not less than 1813 MPa (185 kgf/mm^2) is made with diameter 40 to 50 mm only against special order.

(Revised edition, Rev. No. 2)

Note: Depth at which the defects lie and the depth upto which the defects are dressed are reckoned from the nominal size for group "b" and from the actual size for groups "a", "c" and "d".

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3.14. The surface of rods, intended for hot or cold processing under pressure (group "a", "c" and "d") must be free from cracks, scab, rolling laps and holes and contaminations rolled or forged into the metal.

Local defects must be removed by oblique chipping or dressing, to a width which must be at least 5 times the depth.

The depth of dressing of rods must not exceed the norms set out in Table 7.

There should not be more than two dressings to the maximum depth in a single section of rod of size over 140 mm.

Isolated minor grooves, dents and waviness not exceeding half the tolerance and minor blow holes rolled or forged into the metal with depth not exceeding 1/4 of the tolerance (sum of deviations) on size but not exceeding 0.2 mm may be left undressed on the surface of the rods.

Note: The permissible depth of dressing of defects in particular cases may be altered from the above by mutual consent.

3.15. Blow holes, rolled or forged into the metal are not permitted on the surface of the rods intended for making parts by cold processing under pressure (group "c") and by hot upsetting, upset forging and stamping (group "d").

3.13 to 3.15 (Revised edition, Rev. No. 2)

3.16. Local defects are not permitted on the surface of rods

a) with carbon content restricted to a narrower range than specified para 3.1. Even so, the difference between the upper and lower limits must not be less than

0.06 % for carbon steels and chromium steels and

0.05 % for other steels;

b) with sulphur and phosphorus content in alloy steel reduced by 0.005 % each;

c) with standardised purity as to non-metallic occlusions. Contamination with non-metallic occlusion in 35Cr3NiMoA grade steel must not exceed index number 3.5; in 35Cr3NiMo steel it must not exceed index number 4.

d) with standardised calcinability;

e) Delected (Revision No. 2);

f) with hardness of alloy steel measured if it is being supplied without heat treatment;

g) with inspection carried out by non-destructive testing method.

The norms and requirements for testing against items "c", "d", "f" and "g" above and the non-destructive testing methods to be used are established by mutual consent.

3.19 to 3.21 (Revised edition, Rev. No. 2)

3.22. Steel of size (diameter or side of square) upto 200 mm intended for hot upsetting, upset forging and stamping (group "d") is tested by upsetting down to 1/2 (50) or 1/3 (65) of the initial height of the specimen.

The upsetting group must be specified in the order. There should be no flake or cracks in the upset specimens.

Note: Upsetting test need not be carried out on rods of

4. ACCEPTANCE RULES

4.1. General rules for acceptance of steel as given in GOST 7566-81 are applicable.

4.2. Steel is presented for acceptance in batches. A batch must consit of steel from a single melt-ladle, steel of a single dimension, a single cooling schedule after rolling (or forging) and a single heat treatment schedule.

The weight of a batch of open hearth steel must be not less than 20 tons, that of electrosteel not less than 4.5 tons, that of steel made by other methods of melting is fixed depending on the production process adopted.

Note: Steel may be supplied in batches of lower weight, by mutual consent.

(Revised edition, Rev. No. 1)

4.3. A single sample is drawn from the melt - ladle for determining grain size.

4.4. A single sample is drawn from the melt - ladle for determining calcinability.

4.5. The sampling scale for determining mechanical properties, macrostructure and upsetting test is as follows:-

- two rods from each melt - ladle from any part of the ingot - for rods of diameter less than 75 mm;

- four rods from the top and bottom portions of the first and last ingots (siphons) in the pouring sequence - for rods of diameter 75 mm and over.

Specimens are cut from the selected rods as below:

- one specimen each - for tensile tests;

particular method to be used.

(Revised edition, Rev. No. 2)

5.4. Sampling procedure for chemical analysis is as given in GOST 7565-81.

5.5. Sampling procedure for mechanical tests and upsetting tests is as given in GOST 7564-73.

(Revised edition, Rev. No. 2)

5.6. Tensile test is carried out on specimens of round section, the diameter being 5 or 10 and the length 5 times the diameter, in accordance with GOST 1497-73.

5.7. Impact strength test is carried out on type I specimen in accordance with GOST 9454-78.

5.8. Macrostructure inspection is carried out in accordance with paras 3.12 and 3.13 and GOST 10243-75. Other methods of macrostructure inspection capable of bringing out the conformity of rods with the requirements of the present standard may also be used.

Stone-like and naphthalene fractures are judged with respect to agreed specimens.

(Revised edition, Rev. No. 2)

5.9. Steel from a single melt - ladle which has undergone mechanical testing in rods of a larger diameter need not be inspected after it has been rolled into smaller profiles. Similarly, steel from a single melt - ladle which has undergone mechanical testing in the form of an intermediate profile need not inspected after it has been rolled into smaller profiles.

in addition, have the siphon number stamped on them, or in the case of top teeming, the ingot number in the order of pouring and the letters A, Б (B) and C (S), beginning with the main part of the ingot as also the letters У (U) and П (P), beginning with the lower part of the ingot after trimming.

On rods of diameter over 75 mm, these markings are punched on the ends representing the main part of the ingot. On smaller rods and in case rods are broken to length in the cold condition, the stamp is punched on the side of the rod at a distance of 50 to 100 mm from the end. Ends of rods lettered in this manner must be marked with indelible paint and the place where the letters are stamped must be circled with paint.

6.3. Each batch must be accompanied by a quality certificate in accordance with GOST 7566-81.

The quality certificate must, in addition contain the following particulars:

heat treatment;

number of rods (for profiles which are supplied in numbers i.e. not by weight).

Number of rods which have been painted or otherwise marked distinctly to denote defective places.

6.4. These rods may be carried by any form of transport.

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is divided into four groups as below:

a) for hot processing under pressure (except for upset forging, upsetting and stamping);

b) for cold machining by cutting;

c) for cold processing under pressure and

d) for hot upset forging, upsetting and stamping.

(Revised edition, Rev. No. 2)

2. ASSORTMENT

2.1. Hot-rolled and forged steel is available with diameter or side of square 5 to 250 mm. Bright-drawn steel is available with diameter or side of square 3 to 100 mm.

2.2. As far as shape, dimensions and permissible deviations are concerned, hot-rolled and forged steel as well as bright-drawn steel must meet the requirements of GOST 2590-71, GOST 2591-71, GOST 7417-75, GOST 8559-75, GOST 4693-77 and GOST 1133-71.

Note: Fillets at corners of hot-rolled and forged rods with side of square upto 100 mm conforming to GOST 2591-71 must not exceed 0.15 of the side of square.

2.3. Rods must be evenly trimmed. Burrs must be removed from rods of size over 100 mm intended for hot processing under pressure, (groups "a" and "d"). Deburring is done only at customer's request on rods of size upto 100 mm, intended for hot processing under pressure (groups "a" and "d") and for rods intended for cold processing under pressure (group "c").

Rods cut in presses, press-shears and hammers may have crushed edges.

that of grades 40X (40Kh) (40Cr); 40XФA (40KhFA) (40CrVaA), 30XГC (30KhGS) (40 CrMnSi) and 30XГCA (30KhGSA) (30CrMnSiA) must meet the requirements of GOST 4543-71.

3.2. Copper content by weight may go upto 0.25 % by mutual consent, in 11ЮО (11Yu) (11Al) grade steel.

3.3. Residual nickel content by weight may go upto 0.5 % in steel made by the scrap process (except for 11Al grade). Aluminium content by weight may be in the range of 0.02 to 0.09 % in 11 Al grade steel.

(Revised edition, Rev. No. 2)

3.4. If the norms for mechanical properties and other requirements of the present standard are met, deviations in chemical composition of finished rolled stock and forgings are permitted in accordance with the requirements set out in Table 2. Under the same condition, deviations in the other grades must conform to GOST 1050-74 and GOST 4543-71.

3.5. Steel may be manufactured with or without heat treatment (which may consist of annealing, normalizing or high-tempering).

3.6. Hardness of carbon steel and alloy steel intended for cold machining by cutting (group "b") and carbon steel for cold processing under pressure (group "c") must meet the requirements set out in Table 3. Hardness of steel of grades 10, 15, 20, 25, 30, 35, 40, 45, and 50 must meet the requirements of GOST 1050-74. Hardness of steels of grades 40Cr, 40CrVaA, 30CrMnSi and 30CrMnSiA must conform to GOST 4543-71.

(Revised edition, Rev. No. 2)

Table 1 Contd.

Grade of steel	Proportion of various elements by weight, %					
	Molybdenum	Aluminium	Vanadium	P	S	Cu
				Not more than		
C-35ХГС (35ХГСА)	—	—	—	0.035	0.030	0.30
35Х3НМ (Х3НМ)	0.15–0.25	—	—	0.035	0.030	0.30
43ХН3М (ХН3М-1)	0.20–0.40	—	—	0.030	0.030	0.30
48ХН3М	0.20–0.45	—	—	0.030	0.030	0.30
60Х2Н2М (60ХНМ)	0.25–0.40	—	—	0.035	0.035	0.30
63Х2Н2МФ (60ХНМФ)	0.20–0.30	—	0.10–0.15	0.030	0.030	0.30
36ХС2Н3МФ (БРО)	0.60–0.90	—	0.10–0.15	0.030	0.030	0.30
53ХМЮ	0.15–0.30	0.07–0.15	—	0.030	0.030	0.30

Note: 1. The letter C to the left of the numerals indicates that the particular grade of steel is used for making shells and mines.

2. Designation of chemical elements in steel is as given in GOST 4543-71.

Ю (Yu) (Al); Х (Kh) (Cr); М (M) (Mo);

Н (N) (Ni); Г (G) (Mn); Ф (F) (Va);

С (S) (Si) - in the middle of the designation.

3. Quality steel of grades 45Cr1, 46Cr1, 45Cr3, 48Cr3, 35Cr3NiMo, 48CrNi3Mo and 60Cr2Ni2Mo may be ordered with sulphur and phosphorus content not exceeding 0.025 % each.

The letter A is added to the designation of the steel grade in this case.

(Revised edition, Rev. No. 2)

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Grade of steel	Hot-rolled steel		Annealed or high-tempered steel	
	Diameter of impression, mm, not less than	HB max.	Diameter of impression, mm, not less than	HB max.
C-60, C-65, 45Cr1, 46Cr1, C-45Cr	3.8	255	4.0	229
C-70, C-50Cr	3.7	269	4.0	229
45Cr3	3.8	255	3.9	241
C-35CrMnSi	-	-	3.9	241
36CrSi2Ni3MoVa	-	-	3.6	285
C-35CrMo, 35Cr3NiMo, 48Cr3, 60Cr3, 60Cr2Ni2Mo, 60Cr2Mo 60Cr2Ni, 63Cr2Ni2MoVa, 53CrMoAl	-	-	3.8	255
	-	-	4.0	229

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3.7. Mechanical properties of hot-rolled, forged and heat treated steel of grades G50 and C55 intended for cold machining (group "b") must meet the requirements set out in Table 4.

Table 4

Grade of steel	Rod size, mm	Yield limit, kgf/mm^2	Relative reduction, %
		Not less than	
C-50	upto 45	34	20
	46 to 65	30	20
C-55	upto 45	35	20
	46 to 55	32	20
	56 to 65	30	20

Table 6

Grade of steel	Heat treatment schedule (recommended)					Mechanical properties			Size of section of blank for heat treatment (round, square), mm
	Hardening			Tempering		Ultimate strength, σ_B, MPa (kgf/mm^2)	Relative reduction Ψ, %	Impact strength, KUC, J/cm^2 (kgf/cm^2)	
	Temperature, °C		Cooling medium	Temperature, °C	Cooling medium	Not less than			
	First hardening	Second hardening							
40Cr	As per GOST 4543-71								
C-45Cr	840-860	-	Oil	500-550	Water or oil	980(100)	35	49(5)	25
C-50Cr	830-850	-	"	"	"	"	"	39(4)	"
45Cr1	840-860	-	"	"	"	"	"	49(5)	"
46Cr1	840-860	-	"	"	"	"	"	"	"
46Cr3	860-880	-	"	600-650	Air	"	"	"	"
48Cr3	"	-	"	"	"	"	"	"	"
60Cr3	"	-	"	620-670	"	"	"	"	"
C-35CrMo	850-870	-	"	530-580	"	931(95)	40	69(7)	"
60Cr2Mo	840-860	-	"	620-670	"	980(100)	35	49(5)	"
60Cr2Ni	850-870	-	"	600-650	"	"	"	"	"
30CrMnSi	As per GOST 4543-71								
30CrMnSiA	As per GOST 4543-71								
C-35CrMnSi	940-960	-	"	700-720	Air	-	-	-	-
		880-900	"	220-240	"	1568(160)	35	29(3)	in specime

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3.12. Macrostructure must not have any shrinkage cavity, porosity, holes, rokes, blowholes, cracks, peeling, slag occlusions, foreign matter, rippled surface, patchy liquation, flakes, visible without the use of magnification devices. The macrostructure should also not contain any stone-like or napthalene fractures.

3.13. Non-uniformity of fracture, liquation square and discontinuity in the fracture do not constitute grounds for rejection. Edge defects such as isolated blowholes under the shell and slag occlusions must not exceed the norms set out in Table 7.

Dotted non-uniformity must not exceed index number 3, central porosity must not exceed index number 2, sub-shrinkage liquation must not exceed index number 1 - all as defined in GOST 10243-75.

Patchy liquation must not exceed index number 1 for carbon steel rods of diameter 120 mm and over.

Table 7

Steel group	Rod size, mm	Depth *
a, c, d	Over 200	6 %
	141 - 200	5 %
	80 - 140	Sum of permissible deviations
	less than 80	Half the sum of permissible deviations
b	100 and over	Sum of permissible deviations
	less than 100	Minus tolerance

Depth - Depth at which defects lie (for group "b") or depth of dressing of defect for gropus a, c and d, mm as a percentage of the size, not more than.

intended for cold machining (group "b"), if their depth, as determined by control dressing or chipping, exceeds the norms set out in Table 7.

3.17. Surface quality of bright-drawn rodsmust meet the requirements of GOST 1051-73.

3.18. A batch may contain rods with isolated local defects. The defective place must be painted or marked distinctly by any other method. The length of the portions so marked must not exceed 200 mm. When metal is handed over for long storage, these defective places must be marked with a chisel. The number of such rods must be mentioned in the certificate. The useful part of the rod must be a multiple of the blank length necessary. The defective part of metal is not taken into account (for purposes of payment).

3.19. Austenite grain must be no coarser than number 4, generally and no coarser than number 5, (as defined in GOST 5639-82), if the customer so requires.

Note: Austenite grain size need not be checked in steel of grades 40CrVaA, 35Cr3NiMo, 63Cr2Ni2MoVa (60CrNiMoVa) and 36CrSi2Ni3MoVa (BRO), provided the austenite grain size is no coarser than number 5.

3.20. Contamination of quality and high-quality alloy steel with hair-line cracks must meet the norms laid down in GOST 4543-71.

The norms for contamination of carbon steel with hairline cracks are established by mutual consent.

3.21. At the customer's request, steel is manufactured to the following special specifications:

size over 80 mm upto 01.01.85 provided upsetting meets the requirements of the present standard.

3.23. Steel of size (diameter or side of square) upto 30 mm, intended for cold processing under pressure (group "c"), is tested for upsetting in the cold condition in accordance with the requirements set out in Table 8. The upsetting group must be specified in the order.

There should no flake or cracks on the upset specimens.

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Table 8.

Upsetting group	Extent of deformation in cold upsetting	Method of manufacture	Condition of material	Grade of steel
50	Down to 1/2 the initial height of the specimen	Hot-rolled	Without heat treatment	10, 15, 11Al
		Bright-drawn	Cold-worked	10, 15
		Hot-rolled, Bright-drawn	Heat-treated	11Al
66	Down to 1/3 the initial height of the specimen	Bright-drawn	Cold-wored	10, 15, 11Al
		Hot-rolled, Bright-drawn	Heat-treated	
66И (66I)	Down to 1/3 the initial height of the heat treated and turned specimen	Hot-rolled	Without heat treatment	10, 15, 11Al
75И (75 I)	Down to 1/4 the initial height of the heat treated and turned	Hot-rolled	With or without, heat treatment	Established by mutual consent

3.22, 3.23 (Added, Rev. No. 2)

- two specimens each - for determining impact strength;

- one metallographic section each - for inspection of macrostructure by fracture (except for carbon steels and chromium steels and

- three specimens each - for upsetting test.

(Revised edition, Rev. No. 2)

4.6. Five rods from a batch are selected for checking hardness.

4.7. Surface quality is checked on 100 % of the rods of a batch. Dimensional checks are made on 10 % of the rods of a batch.

5. TEST METHODS

5.1. Chemical composition of steel is determined in accordance with GOST 22536.0-77 - GOST 22536.10-77 and GOST 22536.13-77, GOST 12344-78, GOST 12345-80, GOST 12346-78, GOST 12347-77, GOST 12348-78, GOST 12350-78, GOST [illegible]-81, GOST 12352-81, GOST 12354-81, GOST 12355-78, GOST 20560-81 or by other methods capable of providing the accuracy of determination specified in this standard.

(Revised edition, Rev. No. 2)

5.2. Measuring instruments of the appropriate accuracy must be used for checking the dimensions of rods.

5.3. Surface quality is checked without using magnification devices. The surface may be brightened or etched, if necessary. The depth at which the defects lie is determined by control filing or chipping.

Nondestructive testing methods must be used from 01.01.86 for inspecting surface quality. The order must specify the

5.10. Austenite grain size is determined as described in GOST 5639-82.

5.11. Calcinability is determined by the end quenching method as described in GOST 5657-69.

5.12. Brinell hardness is determined as described in GOST 9012-59.

5.13. Upsetting test in the hot and cold condition is carried out as described in GOST 8817-82.

5.14. Inspection for non-metallic occlusions is carried out by the Ш 1 (Sh1) or Ш4 (Sh4) method as described in GOST 1778-70.

5.15. Inspection for hairline cracks is carried out on the finished parts by the magnetic method or by etching, using a method agreed upon between the customer and the manufacturer.

5.16. The ultrasonic method described in GOST 21120-75 must be used from 01.01.86 for inspecting internal defects. The quality group is 2. The flaw detector must be tuned with respect to a control specimen with a flat bottom reflector of diameter 3 mm.

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5.15, §16 (Added, Rev. No. 2)

6. MARKING, PACKING AND TRANSPORT

6.1. Steel must be packed and transported as specified in GOST 7566-81.

Bright-drawn steel must be packed in accordance with the requirements of GOST 1051-73.

6.2. Rods of diameter or side of square over 75 mm must,

of addition, have the siphon number stamped on them, or in the case of top teeming, the ingot number in the order of pouring and the letters A, B (B) and C (S), beginning with the main part of the ingot as also the letters Y (U) and П (P), beginning with the lower part of the ingot after trimming.

On rods of diameter over 75 mm, these markings are punched on the ends representing the main part of the ingot. On smaller rods and in case rods are broken to length in the cold condition, the stamp is punched on the side of the rod at a distance of 50 to 100 mm from the end. Ends of rods lettered in this manner must be marked with indelible paint and the place where the letters are stamped must be circled with paint.

6.3. Each batch must be accompanied by a quality certificate in accordance with GOST 7566-81.

The quality certificate must, in addition contain the following particulars:

heat treatment;

number of rods (for profiles which are supplied in numbers i.e. not by weight).

Number of rods which have been painted or otherwise marked distinctly to denote defective places.

6.4. These rods may be carried by any form of transport.

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