

Specn 1435-74

SECRET

संकेत : १४३५
 दिनांक : २८/११/८७
 स्थापना : BARRACKPORE
 ग्राम : 'CIMETAL'
 ICHAPUR-NAWABGANJ

वर्ग : १४३५
 एका संस्थापन (डी. पी. आई.)
 निरीक्षण नियंत्रणालय (घात)
 बकाल - बकाल-७२१४४, २४-पार्गना
 बकाल बंगाल

Diary No. 28/11/87

तारीख 1/12/87

Date

No. 0009/RS/S/TC

GOVERNMENT OF INDIA
 MINISTRY OF DEFENCE (DGT)
 CONTROLLERATE OF INSPECTION (METALS)
 P.O. ICHAPUR-743144, 24-PARGANAS
 WEST BENGAL

18 Nov 1987

To: The General Manager
 Ordnance Factory, VARANGAON - 425308

**SUPPLY OF GOST SPECIFICATION NO. GOST 1435-74
 FOR CARBON TOOL STEEL**

Reference your letter No. 0721/SED/PROJ dated 28-9-87 and this
 Controllerate post copy of even number dated 2-11-87.

A fresh copy of the specification GOST 1435-74 has since been
 received from CI(IGV), Secunderabad. Table No. 3 in Para 3.2 of Page 3
 as stipulated therein is reproduced below:-

Group of Steel	Purpose of Steel	Grade of Steel	Content in%		
			Chromium	Nickel	Copper
			Maximum		
1	For products of all types (except patented wire and strips)	U7, U8, U8G, U9, U10, U11, U12, U13	Maximum 0.20	0.25	0.25
2	For products of all types (except patented Wire and Strips)	U7A, U8A, U8GA, U9A, U10A, U11A, U12A, U13A	Maximum 0.15	0.20	0.20
3	For Cores	U 10A, U12A	Maximum 0.20	0.25	0.20
4	For patented wires and strips	U7, U8, U8G, U9, U10, U11, U12, U13, U7A, U8A, U8A, U9A, U10A, U11A, U12A, U13A	Maximum 0.12	0.12	0.20

Regd. 2. Para 5.10 of Page 13 may please be read as under :-

"Depth of hardenability of steel is determined in the section of specimens, subjected to hardening at temperature 760, 800 and 840°C with cooling in water (at 10-30°C)

A test ingot of weight about 10 Kg alongwith the sample for chemical analysis is taken while pouring out the melt for evaluating the steel hardenability. A sample of square section having size 20mm (with tolerance ± 1.5 mm) is forged or rolled from the ingot."

Shri Shale P.
 incorporated above
 information in original
 spec. cat. on 21/12/87

(P. K. DAS)
 SSO-I
 for CONTROLLER QUALITY ASSURANCE (METALS)

SECRET

This standard pertains to hot-rolled, forged, sized carbon tool steel, silver steel and steel for cores.

In the part of norms of chemical composition, the standard also pertains to ingots, sheets, strins, wire and other products.

1. GRADES

Grades of steel and chemical composition should correspond to the data, given in table 1.

Table: 1

Grade of steel	Content of elements, in %				
	Carbon	Manganese	Silicon	Sulphur maximum	Phosphorus
U7	0.65.0.74	0.20.0.40	0.15.0.35	0.030	0.035
U8	0.75.0.84	0.20.0.40	0.15.0.35	0.030	0.035
U8G	0.80.0.90	0.25.0.60	0.15.0.35	0.030	0.035
U9	0.85..0.94	0.15.0.35	0.15.0.30	0.030	0.035
U10	0.95.1.04	0.15.0.35	0.15.0.35	0.030	0.035
U11	1.05.1.14	0.15.0.35	0.15.0.35	0.030	0.035
U12	1.15.1.24	0.15.0.35	0.15.0.35	0.030	0.035
U13	1.25.1.35	0.15.0.35	0.15.0.35	0.030	0.035
U7A	0.65.0.74	0.15.0.30	0.15.0.35	0.020	0.030
U8A	0.75.0.84	0.15.0.30	0.15.0.35	0.020	0.030
U8GA	0.80.0.90	0.35.0.60	0.15.0.35	0.020	0.030
U9A	0.85.0.94	0.15.0.30	0.15.0.35	0.020	0.030
U10A	0.95.1.04	0.15.0.30	0.15.0.35	0.020	0.030
U11A	1.05.1.14	0.15.0.30	0.15.0.35	0.020	0.030
U12A	1.15.1.24	0.15.0.30	0.15.0.35	0.030	0.030
U13A	1.25.1.35	0.15.0.30	0.15.0.35	0.020	0.030

Note : 1. The grades of steel without the letter A belong to the group of quality steels; grades of steel with the letter A belong to the group of very quality steels (which contain less sulphur, phosphorus and admixtures of other elements).

2. Content of sulphur in the steel, obtained by the method of electro-slag remelting, should not exceed 0.015%.

3. The letters and figures in the designation of steel denote: U - carbon, the figure following it denotes the average content of carbon in decimal fraction (in percentage), - high content of manganese.

2. ASSORTMENT

2.1. As regards shape, dimensions and tolerances, the steel should correspond to the requirements of :

for forged round and square steel - GOST 1133-71;

for hot-rolled round steel - GOST 2590-71;

for hot-rolled square steel - GOST 2591-71, GOST 4693-77;

for hot-rolled hexagonal steel - GOST 2879-69;

for hot-rolled strip steel - GOST 4405-75 and GOST 103-76;

for forged steel - GOST 4405-75;

for sized steel - GOST 7417-75, GOST 8559-75 and GOST

8560-67;

for silver steel - GOST 14955-69.

2.2. Diameters of bars for cores and tolerances on them should correspond to the values, given in table 2.

Table : 2

Bar diameter	mm	Tolerances
5.05		-0.08
6.12		
10.90		
12.03		-0.10
12.43		

3. TECHNICAL REQUIREMENTS

3.1. The steel should be fabricated as hot-rolled, forged, sized with special surface finish-silver steel.

3.2. As regards purpose, depending upon the content of chromium, nickel and copper, steel of all grades is subdivided into five groups, indicated in table 3.

Table : 3

Group of steel	Purpose of steel	Grade of steel	Content, in %		
			Chromium	Nickel	Copper
				maximum	
1	2	3	4	5	6
1	For products of all types (except patented wire and strips)	U7, U8, U8G, U9, U10, U11, U12, U13	maximum 0.20	0.25	0.25
2	For products of all types (except patented wire and strips)	U7A, U8A, U8GA, U9A, U10A, U11A, U12A, U13A	maximum 0.15	0.20	0.20
		U10A, U12A	maximum		

1	2	3	4	5	6
4	For patented wire and strips	U7, U8, U8G, U9, U10, U11, U13, U7A, U8A, U8GA, U9A, U10A, U11A, U12A, U13A	maximum 0.12 0.12	0.12	0.20
5	For hot-rolled and cold-rolled sheets and strips, including those heat-treated having thickness upto 2.5 mm(except patented strips), also for hot-rolled and forged structural steel and cold-drawn polished steel(silver steel)	U7, U8, U8G, U9, U10, U11, U12, U13 U7A, U8A, U8GA, U9A, U10A, U11A, U12A, U13A	0.20- -0.40 0.20- -0.35	0.25 0.20	0.25 0.20

N O T E

1. In steel, intended for patented wire and strips, the total content of chromium, nickel and copper should not exceed 0.4%.

2. In steel of groups 1 and 5, fabricated by scrap process, increase in the content of nickel and copper by 0.05% each (compared to the values given in table 3) is allowed.

3. Group of steel should be indicated in the order. If the group of steel is not indicated, the steel is fabricated as per first or second group.

3.3. Bars and strips from hot-rolled and forged steel, bars from sized steel and silver steel should have uniformly trimmed ends. There should not be burrs and coarse indentations on the bar and strip ends.

Slight warpage at the ends of bars over a length of not more than 20 mm, during trimming with shears or on presses, is not a cause for rejection.

Note : By mutual agreement between manufacturer and customer it is allowed to manufacture the bars and strips without deburring or with the burrs removed from one side only.

3.4. Steel is manufactured as heat-treated. On customer's request the steel may be without heat-treatment.

3.5. Hardness of heat-treated steel along the bar or strip length and hardness of specimens (after hardening) should correspond to the norms, given in table 4.

3.6. Heat-treated steel bars of diameter (or thickness) less than 5 mm are not checked for hardness, but tensile tests are done as per customer's requirement. The norms of tensile tests are established by mutual agreement between both the parties.

3.7. Heat-treated steel may be manufactured with hardness lesser than the values given in table 4 or with more rigid tolerances on hardness, by mutual agreement between manufacturer and customer.

Table : 4

Steel grade	Hardness of heat-treated steel		Hardness of specimens	
	HB, maximum	Diameter of impression, in mm, minimum	Hardening temperature (in °C) and cooling medium	HRC, minimum
U7, U7A, U8, U8A, U8G, U8GA	187	4.4	800-820, water 780-800, water 780-800, water	62
U9, U9A	192	4.35		
U10, U10A	197	4.3		
U11, U11A, U12, U12A	207	4.2		
U13, U13A	217	4.1	760-780, water	62

3.8. Hardness of bars meant for cores should correspond to the values given in table 5.

Table : 5

Type of heat-treatment	Hardness		
	HB maximum	Diameter of impression, in mm, minimum	HRC, minimum
Annealing or tempering	269	3.7	-
Hardening	-	-	64

By mutual agreement between manufacturer and customer, the bars may have hardness not exceeding HB 229 (diameter of impression minimum 4 mm).

3.9. Microstructure of heat-treated steel in bars having diameter (or thickness) upto 60 mm inclusively should correspond to the following norms:

a) shape of pearlite - according to table 6.

Table : 6

Steel grade	Masters of microstructure, in numbers	
	Non-permissible	Permissible
U7, U7A, U8, U8A, U8G, U8GA, U9, U9A	1 and 10	2, 3, 4, 5, 6, 7, 8 and 9
U10, U10A, U11, U11A, U12, U12A, U13, U13A	1, 2, 9 and 10	3, 4, 5, 6, 7 and 8

b) cementite network structure is not allowed. Traces of broken cementite network structure should not exceed number 3. The steel, meant for hot working, is checked for presence of cementite network structure on customer's request. Bars having traces of broken cementite network structure, meant for cores, should correspond to numbers 1 and 2.

3.10. Depth of decarbonised layer (ferrite+transition zone) of hot-rolled and forged steel should not exceed:

0.30 mm for side-for steel having diameter (or thickness) from 6 to 10 mm;

0.40 mm per side - for steel having diameter (or thickness) above 10 to 16 mm;

0.50 mm per side - for steel having diameter (or thickness) above 16 to 25 mm;

0.60 mm per side - for steel having diameter (or thickness) above 25 to 40 mm;

0.85 mm per side - for steel having diameter (or thickness)

1.5% of the diameter (or thickness) per side - for steel having diameter (or thickness) above 60 mm.

3.11. Depth of decarbonised layer (ferrite+transition zone) of sized steel, meant for parts processed using high frequency current, should not exceed 1% of the actual diameter (or thickness) for each side of the bar.

For steel (not processed using high frequency current) the depth of decarbonised layer should not exceed: 1.5% of the diameter (or thickness) - when diameter (or thickness) of bar is upto 16 mm; 1.3% of the actual diameter (or thickness) when diameter (or thickness) of bar is above 16 mm.

In steel, meant for cores, the depth of decarbonised layer should not exceed 2% (per-side) of the bar diameter.

The purpose of steel should be indicated in the order.

3.12. Decarbonisation is not allowed in silver steel.

3.13. There should not be cracks, seams, laps, foreign matter, blisters and rolled-on impurities on the surface of hot-rolled and forged steel bars, meant for hot-working and cold-drawing.

The defects should be eliminated by smooth dressing or blanking. The depth of cleaning should not exceed (considering the actual bar dimension): half the tolerance on dimension - for bars having diameter (or thickness) less than 80 mm; tolerance on dimension - for bars having diameter (or thickness) from 80 to 140 mm; 4% of nominal dimension (diameter or thickness) - for bars having size of section above 140 mm.

Isolated minute lines on the bar surface, indentations and ripple marks within the limits of half the tolerance and shallow hair cracks of depth not exceeding 1/3 the tolerance

Fine seams, cracks and hair cracks of depth, not exceeding $\frac{1}{4}$ th the tolerance on dimension, are allowed without cleaning on the surface of metal which ^{is} supplied in bundles.

Note : Hair cracks are not allowed on the surface of bars, meant for fabricating parts by hot upsetting or heading (this should be indicated in the order). These defects are eliminated by turning or stripping.

3.14. Localised flaws are allowed on the surface of hot-rolled and forged steel bars, meant for cold machining (turning, planing, milling etc), if their depth (determined by filing or grinding) does not exceed: the tolerance value on the particular dimension - for dimensions 100 mm and above half the tolerance value on the particular dimension - for dimensions upto 100 mm (considering the nominal dimension).

Note : During manufacture of steel having bilateral limit deviations, the sum total of +ve and -ve limit deviations is taken as the tolerance value.

3.15. The type of processing to be done on the steel should be specified in the order.

3.16. The steel, meant for hot-upsetting and heading, is subjected to upsetting test in hot state. There should not be ruptures or cracks on the upsetted specimens.

3.17. The surface of sized steel should correspond to the requirements of GOST 1051-73, and for silver steel - GOST 14955-69.

The group of surface finish should be specified in the order.

3.18. There should not be cavities, flakiness, peeling-

off, cracks, blisters and slag inclusions (besides temper carbon-for metal of 5th group) in the section of strips and bars having diameter (or thickness) upto 100 mm inclusively.

The steel should have uniform, fine-grain section.

3.19. Steel of 5th group should be manufactured with standardised hardenability as per customer's requirements.

In the order the customer should indicate the hardenability number of steel according to scale No.3.

Steel meant for cores in finished form should have full hardenability.

4. ACCEPTANCE RULES

4.1. The steel is supplied in batches, consisting of bars, strips and bundles of a single melt, identical size and same heat-treatment regime.

4.2. 10% bars, strips and bundles out of a batch (but not less than 5) are taken for checking the dimensions.

4.3. Extent of sampling for checking the chemical composition is as per GOST 7565-73.

4.4. The following quantity is taken for checking the hardness of heat-treated steel:

for bars having diameter (or thickness) upto 30 mm and bundles - one bar or bundle from one tonne but not less than six out of a batch; for bars having diameter (or thickness) above 30 mm - 5% bars out of a batch, but not less than 5 bars; for strips - 2 strips from 1 tonne, but not less than 5 out of a batch.

4.5. One bar, strip or bundle out of a batch (but not less than 2 from a melt), for steel meant for cores - 2 bars out of a batch (but not less than 4 from a melt) are taken for checking the hardness of steel after hardening.

4.6. Two bars, strips or bundles out of a batch, for steel meant for cores - not less than 4 bars out of a batch are taken for checking the microstructure of steel (shape of pearlite and traces of cementite network structure).

Checking the microstructure of steel having diameter (or thickness) exceeding 60 mm is done by mutual agreement between manufacturer and customer.

4.7. Minimum 3 bars, strips or bundles out of a batch are taken for checking the depth of decarbonised layer.

4.8. All the bars, strips or bundles of a batch are taken for checking the surface quality.

4.9. Three bars or bundles out of a batch are taken for upsetting tests.

4.10. Minimum 3 bars, strips or bundles out of a batch are taken for checking the section.

4.11. If unsatisfactory results are obtained for any test, further testing is done as per GOST 7566-69.

5. TEST METHODS

5.1. The dimensions of hot-rolled and forged steel should be checked with universal measuring instrument or templates. Dimensions of sized steel and silver steel should be checked with micrometers and snap gauges.

5.2. Steel samples are selected : as per GOST 7565-73 for determining the chemical composition; as per GOST 12344-66, GOST 12348-66, GOST 12350-66, GOST 12352-66, GOST 12353-66, GOST 20560-75 for chemical analysis.

5.3. Hardness of heat-treated steel is checked as per GOST 9012-59 after removal of decarbonised layer.

The test should be done at a distance of about 100 mm from the end of bar or strip.

5.4. Hardness of steel after hardening is checked as per GOST 9013-59 on specimens, taken from finished profile and hardened at temperature indicated in table 4.

5.5. Evaluation of steel microstructure is done on lateral (w.r.t. extrusion during rolling or forging) sections at magnification $50\times$.

Magnification of $450-600\times$ may be used. Specimens for the sections are cut at a distance of not less than 20 mm from the bar end.

Recommended dimensions of the plane of section;

a) full plane of bar cross-section - for steel of size upto 25 mm;

b) half the plane of bar cross-section - for steel of size from 26 to 40 mm;

c) $\frac{1}{4}$ th of the plane of bar cross-section - for steel of size from 42 to 60 mm.

While cutting the specimens (for sections) from steel of diameter above 25 mm, the transverse template is cut along its diameter.

For checking the cementite network structure, the specimens are hardened at temperature given in table 4.

It is recommended to carry out pickling of the sections using 3-4% nitric acid solution in ethyl alcohol.

Evaluation of microstructure is done as per the enclosed scales No.1 and 2.

5.6. Depth of decarbonised layer of steel is checked as per GOST 1763-68 by metallographic method. Silver steel may be checked by thermoelectromotive force method.

Note : Depth of decarbonised layer of steel strips should be measured on the wider side.

5.7. Quality of steel surface is checked without using magnifying devices. If necessary the surface may be cleaned with special rings or coils.

5.8. Upsetting test in hot state is done as per GOST 8817-73.

During upsetting test the specimens are heated upto the temperature at which forging is done and upsetted upto 1/3 of their initial height.

5.9. Checking of section(fracture) is done in finished steel. Inspection of form of the section is done visually without using magnifying devices.

5.10. Depth of hardenability of steel is determined in the section of specimens, subjected to hardening at temperature: 760, 800 and 840°C with cooling in water (at 10-30°C).

A test ingot of weight about 10 kg alongwith the sample for chemical analysis is taken while pouring out the melt for evaluating the steel hardenability. A sample of square section having size 20 mm (with tolerance ± 1.5 mm) is forged or rolled

Three specimens of length 100 mm each are cut from the middle portion of the sample. The melt number and serial number are stamped on these specimens.

A notch of depth 3-5 mm is made at the centre of each specimen.

The forged specimens, before hardening, are annealed at 730-750°C, then they are held for 2 hours followed by gradual cooling in the furnace itself (upto 650°C) for 2-4 hours.

- Note : 1. Besides square specimens, the hardenability test may also be done on round specimen of diameter 21-23 mm, which are rolled out from the test ingot. For round specimens the depth of notch should be 5-7 mm.
2. Square specimens may be prepared by cutting from rolled or forged blank or any other stock.
3. It is recommended to remove the scales from the specimen surface, using abrasive tools or by pickling before heating (for hardening).

5.11. One specimen each is cut from the selected product units for carrying out the checks as per points 4.4-4.7 and 4.9-4.10.

6. MARKING AND PACKING

6.1. Marking is as per GOST 7566-69.

Stamping is done on each bar, having diameter (or thickness) above 40 mm.

The designation of steel, obtained by electroslog remelt process, should be additionally denoted the letter SH. e.g. U9A-SH.

6.2. As per customer's requirements the colour code is marked on the sides for large-sized steel, and at the bar ends for small-sized steel. The colour codes are established by mutual agreement between the manufacturer and customer.

6.3. Packing of steel should correspond to the requirements of GOST 7566-69.

6.3.1. Packing of sized steel is as per GOST 1051-73.

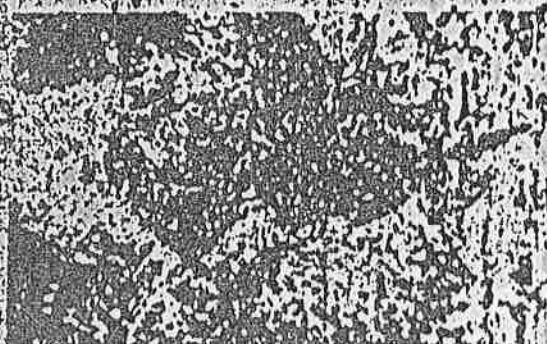
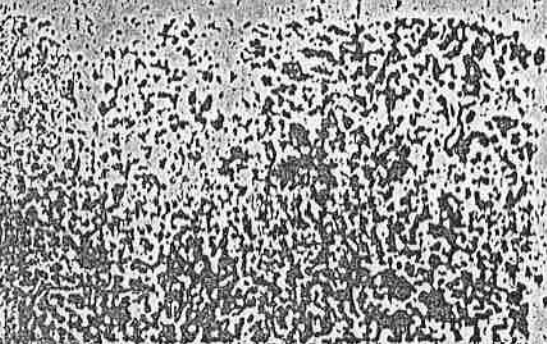
6.3.2. Packing of silver steel is as per GOST 14955-69.

6.4. Each batch of steel should be furnished with a quality certificate, filled according to the requirements of GOST 7566-69.

ГОСТ 1435-74 Спр. 18

SCALE NO. 1

ШКАЛА № 1

Эталон микроструктур инструментальной
углеродистой сталиMASTERS OF MICROSTRUCTURE OF
CARBON TOOL STEELЭталон № 1
MASTER NO. 1Эталон № 2
MASTER NO. 2

CH 92 OCT 1435-74



Diagram No 3
MASTER NO 3

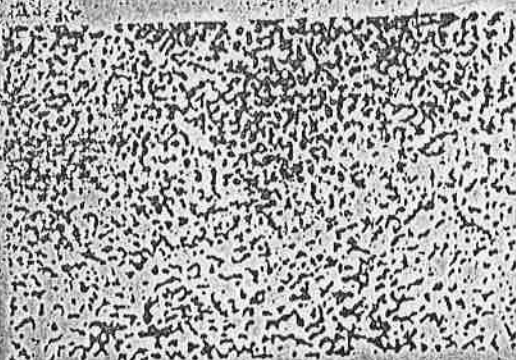


Diagram No 4
MASTER NO 4

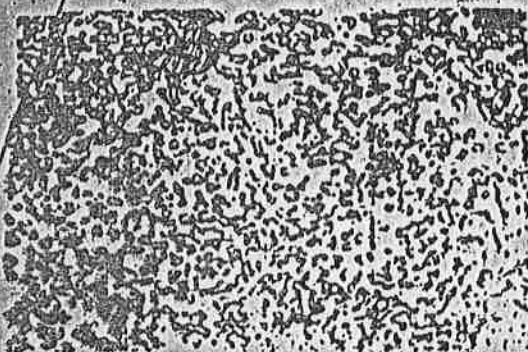


Diagram No 5
MASTER NO 5

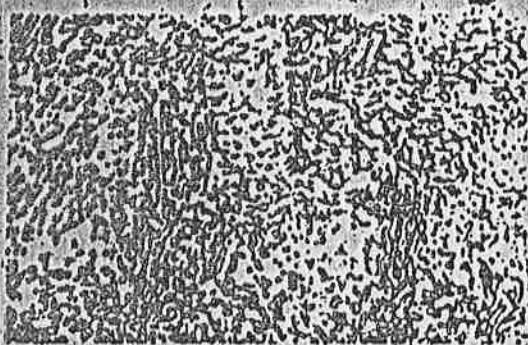




Станция № 6
MASTER NO. 6

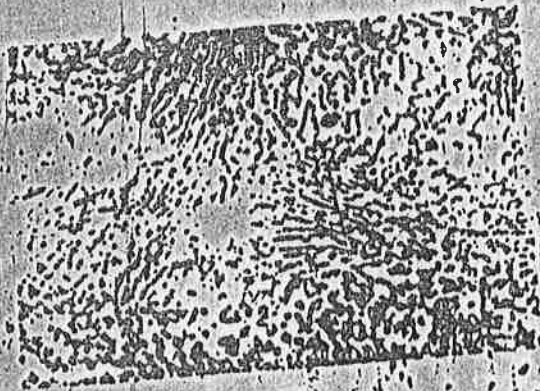


Станция № 7
MASTER NO. 7

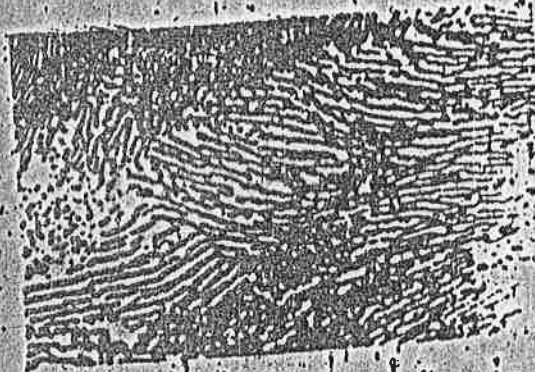


Станция № 8
MASTER NO. 8

Стр. 14 1007 023-74



Станок № 9
MASTER NO. 9



Станок № 10
MASTER NO. 10

ГОСТ 1435-74 Стр. 15

SCALE NO. 2

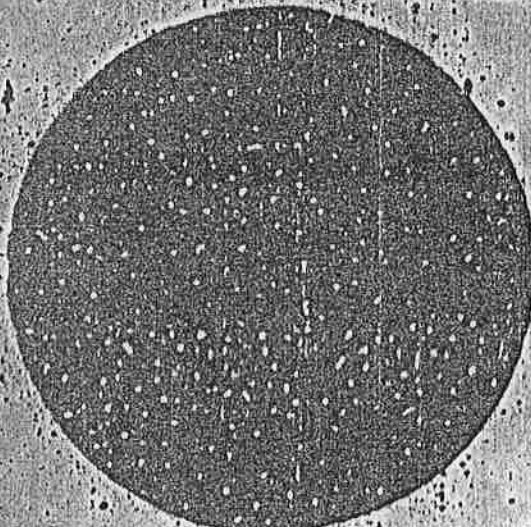
ШКАЛА № 2

TRACES OF CEMENTITE NETWORK

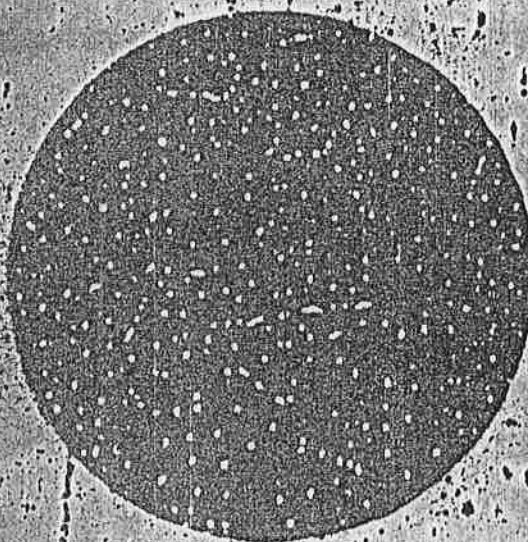
Остатки цементитной сети

инструментальной углеродистой стали

STRUCTURE OF CARBON TOOL STEEL.

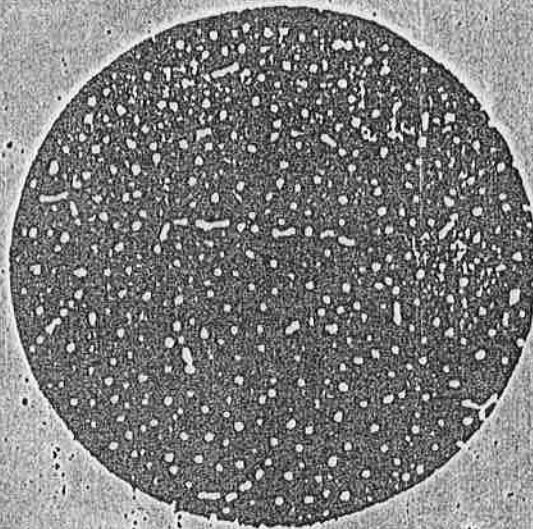


Балл 1, NO. 1

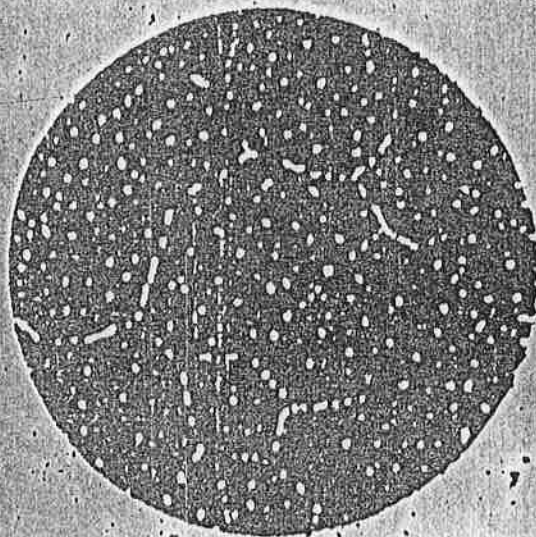


Балл 2, NO. 2

Стр. 16 ГОСТ 1433-74

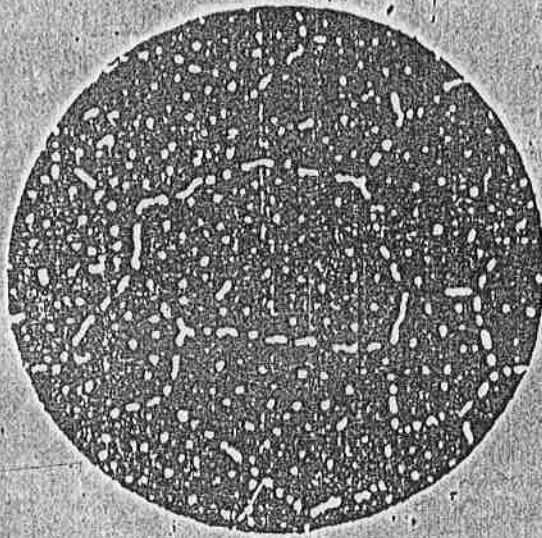


Балл 3 NO. 3



Балл 4 NO. 4

ГОСТ 1435-74 Сп. 17



Билл 5 NO. 5

EVALUATION OF HARDENABILITY OF CARBON TOOL STEEL.

SCALE NO.3

GROUP NO.	FORM OF FRACTURE (SECTION) AFTER HARDENING IN WATER AT TEMP °C		
	760	800	840
	SPEC-MEN 1	SPEC-MEN 2	SPEC-MEN 3
0			
I			
II			
III			
IV			
V			

ОБЪЯСНЕНИЕ УСЛОВИЙ ЛЕГЕНДЫ ФРАКТУРЫ (СЕКЦИОН)

 НЕУДОВЛЕТВОРИТЕЛЬНО UNHARDENED
 ВОЗМОЖНОСТЬ ТОУГХ (ДУКТИЛЕ) ЯДРА
 СЛ. ВОЗМОЖНОСТЬ ПРОЦЕССА
 ПЕРЕГРЕВ SUPER HEATING
 ТРЕЩИНЫ CRACKS

- Notes :
1. Holding period after heating: 20 minutes at temperature 760 and 800°C; 15 minutes - at 840°C.
 2. The group(number) is established as per depth of hardening(in mm), denoted above the figures of fractures(sections) of the specimens, hardened at temperature 800°C.
 3. The group(number) and legend of the fracture (section) should be indicated in the order: "Group II, hardening at 760, 800, 840°C, tough core".

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Other documents referred to in this standard:

GOST 1133-71;	GOST 2590-71;	GOST 2591-71;
GOST 4693-77;	GOST 2879-69;	GOST 4406-75;
GOST 103-76;	GOST 7417-75;	GOST 8559-75;
GOST 8560-67;	GOST 14955-69;	GOST 1051-73;
GOST 7565-73;	GOST 7566-69;	GOST 12344-66;
GOST 12348-66;	GOST 12350-66;	GOST 12352-66;
GOST 12355-66;	GOST 20560-75;	GOST 9012-59;
GOST 9013-59;	GOST 1763-68;	GOST 8917-73;

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