ORDNANCE FACTORY PROJECT, HYDERABAD

FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item GOST 931-78

Drawing No. Date Typed 2-5-84

Sheet No.

BRASS SHEETS AND STRIPS

GOST 931-78*
(CT C3B 957-78)
Supersedes
GOST 931-70.

TECHNICAL SPECFICATIONS

By order No.2523 Dated 19th September 1978, of the USSR STATE COMMITTIE ON STANDARDS, THIS STANDARD IS VALID.

Non-observance of this standard is punishable by law.

FROM: 01-07-1979
TO : 01-07-1984

The present standard covers hot rolled and cold rolled sheets and cold rolled strips.

This standard conforms to C B 957-78.

1. GAUGES

1.1 Thickness of hot rolled sheets and tolerances for thickness should conform to the values indicated in Table-1.

1.1a Width and Length of hot rolled sheets should conform to the values indicated in Table 1a.

1.2 (excluding, alteration No.1).

1.3 Thickness of cold rolled sheets and tolerances for thickness should conform to the values indicated in table-2.

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TABLE.1 : As per enclosure.

NOTE:

1. As per agreement between consumer and manufacturer, it is allowed to manufacture hot rolled sheets of other dimensions(Sizes).

2. Theoretical weight of $1m^2$ sheets is indicated in reference annexure 1.

TABLE 1a: As per enclosure.

NOTE

1. As per agreement between consumer and manufacturer, it is allowed to manufacture sheets of other dimensions widthwise and lengthwise.

2. Each dimension widthwise must conform to any length from the values indicated in table 1a. provided that the length exceeds the width.

3. Maximum length corresponding to thickness and width (within the limits, indicated in table 1a) is restricted with the weight of accepted ingot.

TABLE 2 : As per enclosure.

NOTE:

1. As per agreement between consumer and manufacturer, it is allowed to manufacture cold rolled sheets of other dimensions thicknesswise with allowance as per the nearest to larger dimension.

2. Sheets from brass grade ЛМц 58-2, Л062-1 are manufactured with thickness from 1 to 12mm. Sheets from Brass, grade ЛС 59-1, are manufactured with thickness from 3 to 12mm.

3. Theoretical weight of $1m^2$ sheets is indicated in reference annexure 1.

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1.3a Width and length of cold rolled sheets should conform to the values indicated in table 2a.
Table 2a: As per enclosure.

NOTE:
1. As per agreement between consumer and manufacturer, it is allowed to manufacture cold rolled sheets of other dimensions widthwise and lengthwise.

2. Sheets from brass of grade ЛС 59-1 are manufactured with dimensions 600x1500mm only.

1.4 Tolerances for cold rolled sheets should not exceed the following values:

- for sheets upto thickness 3mm
Width + minus 5mm;
length-minus 10mm

- for sheets with thickness exceeding 3mm;
width - minus 10mm
length - minus 20 mm;

1.5 It is allowed to manufacture short measuring (Small sized) hot rolled and cold rolled sheets in quantity not exceeding 15% of weights of the batch. Minimum dimensions of short measuring sheets should be specified in the order. In case it is not specified in the order dimensions of short measuring sheets should be at least 500 x 1000 mm.

1.6 Thickness and tolerances on thickness of cold rolled strips should conform to the values indicated in table-3

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1.7 Width of cold rolled strips and tolerances for width should conform to the values indicated in Table No.4

1.8 The lengths of strips shall be within 500 to 2000mm. The strip shall be of specified, multiple to specified, with the interval of 500mm, and unspecified lengths. Tolerance on length for strip of specified and multiple to specified lengths shall be - minus 10mm.

As per the agreement between consumer and manufacturer, it is allowed to manufacture strips of other dimensions lengthwise.

TABLE 3 : As per enclosure.

NOTE:

1. Strips from brass of grade Л062-1, Л059-1 and ЛМЦ 58-2 are manufactured with thickness from 1 to 10 mm. Theoretical mass of $1m^2$ strip is indicated in reference Annexure 1.

2. As per the agreement between consumer and manufacturer, it is allowed to manufacture cold rolled strips of other dimensions thicknesswise with allowance nearest to the larger dimension.

TABLE 4 : As per enclosure.

NOTE:

1. As per agreement between consumer and manufacturer it is allowed to manufacture cold rolled strips of other dimensions widthwise.

2. As per agreement between consumer and manufacturer, it is allowed to manufacture cold rolled strips in coils.

3. Recommended width of strip is indicated in reference annexure-2.

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The following abbreviations are used:

1. Manufacturing method.
2. Cold rolled - Х
3. Hot rolled - Г
4. Section shape - Rectangular - Х Р
5. Manufacturing accuracy.

Standard accuracy thickness wise and width wise - Н; Higher accuracy thicknesswise and widthwise - Г Г .

Standard accuracy thickness wise and higher accuracy widthwise - К

Higher accuracy thickness wise and standard accuracy widthwise - Ч .

CONDITIONS:

Soft = М
Half hard - П
Half Hard - Т
Extra hard - О
Spring hard - ЖТ

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Length -
unmeasuring - ІД
Measuring - А
Multiple measuring - К Д
Antimagnetic - АМ.

In place of absence of data the symbol "X" is put (Except for designation of length).

2. SPECIFICATIONS:

2.1. Sheets are manufactured hot rolled and cold rolled, strips - cold rolled in confirmity with requirements of the present standard.

Hot rolled sheets are manufactured from brass, grade Л63, Л062-1, Л 59-1 and ЛМц 58-2 as per GOST 15527-70.

Cold rolled sheets and strips are manufactured from brass, grade Л 90, Л 85, Л 80, Л 68, Л63, ЛМц 58-2; Л 062-1 and ЛС 59-1 as per GOST 15527-70.

As per the specification of consumer sheets and strips should be antimagnetic inconformity with GOST 15527-70.

2.2. As per the condition of material cold rolled sheets and strips should be manufactured:-

From brass, grade Л 90, Л85, Л 80 and ЛМц58-2, soft, half hard and hard.

From brass grade Л 59-1 - soft and hard;

From brass grade Л68- soft, Half hard, hard and extra hard.

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From brass, grade /163 - soft, half hard, hard, extra hard and spring hard;
from brass, grade /1062-1-hard
Extra hard sheets and strips are manufactured with thickness upto 2mm inclusive.

2.3 The surface of sheets and strips should be smooth, clean, free, soiling - causing difficulty to examine. Separate small surface defects, not damaging sheets and strips while checking trimming beyond the tolerances, thicknesswise, are allowed.

Insignificant, local darkenings, reddening and temper colours are allowed for soft sheets and strips.

2.4 Soft sheets and strips should be pickled.

2.5 Sheets and strips should be flat.

The sag (deflection) should not exceed 1.0mm each 100mm of width and 20mm each 1000 mm of length.

2.6 Sheets and strips should be evenly trimmed. The obliquity of trimming, which increases the width and length of sheets and strips beyond the tolerance, is not allowed.

Sheets and strips should not have significant burrs, wavy, crumple and scably edges.

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Crescent shaped strip with thickness upto 4mm should not exceed 5mm per 1 m of length, thickness above 4mm - 8mm per 1 m of length.

Hot rolled sheets can be manufactured with rolled edges, without trimming.

2.7. Mechanical properties of sheets and strips should conform to the values indicated in table 5.
TABLE - 5 : As per enclosure.

NOTE:

1. Elongation is determined for sheets and strip with thickness 0,5mm and more. As per the agreement between consumer and manufacturer, half hard sheets and strips from brass, grade ЛМЦ58-2, can be, within the limit of accuracy not less than 470, 8 x 10^6 Па (48 kgf/mm^2) and elongation not less than 12%.

2. In (Erichsen test) cupping test the depth of drawing of spherical dome is indicated in reference annexure - 3.

3. Hard sheets and strips are manufactured with thickness upto 5mm, extra-hard with thickness upto 2mm and width upto 600mm. As per agreement between consumer and manufacturer strips, grade Л C 59-1 in hard condition are manufactured with thickness upto 8 mm.

4. Upper limit of tensile strength can be higher, but not more than 1, 9x10^2 Па (2 Kgf/mm^2), while maintaining minimum elongation, indicated in table 5.

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Example of conventional designations.

Hot rolled sheet, of rectangular section, with dimension 5x600x1500mm, measuring length, from brass, grade Л 63;

Sheet ГТ РХХ 5x600x1500 МАЛ63
GOST 931-78.

Cold rolled sheets of rectangular section, soft, with dimension 4x1000x2000mm, measuring length, from brass, grade ЛМц 58-2;

Sheet ДТ РХМ 4 x 1000 x 2000 М А -
ЛМц58-2 GOST 931-78.

Cold rolled strip, of rectangular section, high accuracy manufacture, half hard, with dimension 1,2x300mm, length in multiple of 600mm, from antimagnetic brass, grade Л 68;

Strip РДТ 1,2x300x600 КПЛ6 В АМ
GOST 931-78.

2-8. Cold-rolled sheets and strips of thickness 1.0-10.0 mm, should withstand the bending test along the rolling in the cold state, without the appearance of traces of fissures and cracks ;

Soft through 180°, half hard through 90° around a mandrel, with a radius of rounding equal to the thickness of the sheet or strip.

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Description of Item : Gost 931-78
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Date Typed:
Date verified:

3. ACCEPTANCE RULES

3.1. Sheets and strips are accepted in batches. Batches should consist of sheets and strip of same gauge, same method of manufacture, same grade of brass, same condition of material, same accuracy of manufacture and accompany same (document) about quality.

The weight of batch is unrestricted.

3.2. For checking chemical properties two sheets or two strips are selected from the batch. Manufacturer can carry out checking of chemical properties on samples from molten metal.

3-3. Surface conditions of each sheet and each strip are checked.

3-4. Dimensions of each sheet and each strip are checked.

3-5. (Sagging) deflection of two sheets or two strips from the batch are checked.

3-6. Two sheets or two strips from each complete and incomplete 1000 kg. sheets or strips are selected for tensile and bending tests;

3-7. In case even one sample fails in any of the tests, twice quantity of samples is selected from the batch that has shown unsatisfactory results and subjected to a repeat test. Results of repeat test covers for all batches.

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4. TEST METHODS

4.1. Chemical composition of sheets and strips should be determined as per GOST 1652.0-77-GOST 1652.13-77 and GOST 9716.0-79 - GOST 9716.4-75.

Sample selection for determining the chemical composition is carried out as per GOST 24231-80.

4-2. Inspection of surface of sheets and strips should be carried out without using additional instruments.

4-3. It is allowed to check the quality of surface and micro structure of sheets and strips using sample, in conformity to the set order.

4-4. Measurement of thickness of the sheets and strips should be carried out with micro meter as per GOST 6507-78 (CT C B 352-75) at a distance not less than 100mm from the vertex of an angle and not less than 15mm from the edge of the sheet or 10mm from the edge of strip.

Measurement of width and length of sheets and strips should be carried out by measuring with metallic tape-measure as per GOST 7502-80 or measuring scale as per GOST 427-75, or vernier caliper as per GOST 166-73.

4-5. Measurement of camber height of centre of sheets and strips should be carried out as per the marking out of the plate as per GOST 10905-75.

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Camber height of centre of sheets and strips are measured using indicator as per GOST 9696-75, fastened to bracket and moves parallel to the plane of marking of plate, or depth gauge indicator as per GOST 7661-67 or other method, ensuring - sufficient accuracy.

4-6. Tensile tests of sheets and strip with thickness 0.5mm and more should be carried out as per GOST 1497-73 on long samples, thickness less than 0.5mm - as per GOST 11701-66 on short samples of type I and II with width 12.5mm.

Selection of sample for Tensile test are carried out as per GOST 24047-80.

4-7. Bending test should be carried out as per GOST 14019-80.

4-8. Measurement of crescent - shaped are carried out in the following way; place the strip on even plane surface, place a hard steel scale of length 1m. to strip, and using feeler gauge or metallic scale, the maximum distance between scale and strip is measured.

5. PACKING : MARKING : TRANSPORTATION AND STORAGE

5-1. Sheets 0,4-1,5 thick and strip 0,4-1,5 mm thick and width over 200mm should be packed in continuity or grated wooden crates.

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It is allowed to pacl the sheets and strips in packets, Sheets and strips upto 1.5mm thick inclusively packed in packets having double side protection with wooden panels, sheets and strips, more than 1.5mm thick - having single side protection with wooden panel. Packets should be tied with wire or steel packing bands not less than at three places.

Sheets and strips over 1.5mm thick are tied in stacks with steel packing band or wire if the weight of stack does not exceed 80 Kg.

The sheets and strips of other sizes should be delivered unpacked.

As per the agreement between consumer and manufacturer other types of packing is allowed, and also manufacture of cold rolled sheets and strips in rolls is allowed.

5-2. Weight of packages should not exceed 2000 Kg.

5-3. When despatching sheets and strips in rail containers and when wagon loading to same address they are allowed unpacked in box and may not be covered with boards.

When loading in containers and wagons sheets and strips should be placed and fastened in such a way, that it can be easily removed/shifted inside the container or the wagon during transportation, sheets and strips should be protected from corrosion, contaminations and mechanical damages.

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Description of Item: Gost 931-78
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5-4. The end of each sheet or strip should bear the following inscription in inelible water colour;

Name, Trade mark of manufacturer,
Brass grade;
Batch number;
Stamp of Inspection department.

When sheet and strip, tied to stacks, indicated data are inscribed on tag, fastened to stack.

5-5. Marking of packages, using tags or inscriptions as per GOST 14192-77C, by inscribing following additional designations;

Name or trade mark of manufacturer;
Conventional Designation of sheets or strips;
Batch number.

5-6. Packing list with (indicated) data, specified in para 5.5, and also net weight of batch should be put in each container.

5-7. Each batch of sheets should be provided with (documents) certifying the quality of products and confirming to the requirements of present standard and contents;

Name; trade mark of manufacturer;
Conventional designation of sheet and strip;
Test results (asper the Specification of customer)
Batch number and weight of despatched sheets and strips.

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Description of Item — Gost 931-79
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5-8. During transportation and storage, sheets and strips should be protected against the action of moisture, mechanical damages and effects of active and chemical reagents.

ANNEXURE 1 : As per enclosure

NOTE:

While calculating theoretical weight density of brass, grade M90, M 85 and M 80 accepted equal to 8.7gm/Cm^3 and brass, grade M68, M 63, M C-59-1 and M58-2 - equal to 8.4gm/Cm^3.

ANNEXURE 2 : As per enclosure

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ANNEXURE-1
Reference

THEARETICAL WEIGHT $1M^2$ of HOT ROLLED AND COLD ROLLED BRASS SHEET AND STRIP

Sheet or strip thickness in MM	Thearetical weight 1 M^2 of sheet or strip, kg from brass, grade		Sheet or strip thickness in mm	Thearetical weight 1 M^2 of sheet or strip, kg from brass, grade	
	Л90, Л85, Л80	Л68, Л63 ЛСb9-1 ЛМц Л58-2, Л62-1		Л90, Л85, Л80	Л68, Л63, ЛС59-1, ЛМУ58-2, Л62-1
0.4	3.48	3.40	4.5	39.15	38.15
0.5	4.35	4.25	5.0	43.50	42.50
0.6	5.22	5.10	5.5	47.85	46.75
0.7	6.09	5.95	6.0	52.20	51.00
0.8	6.96	6.80	6.5	56.55	55.25
0.9	7.83	7.65	7.0	60.90	59.50
1.0	8.70	8.50	7.5	65.25	63.75
1.1	9.57	9.35	8.0	69.60	68.00
1.2	10.44	10.20	9.0	78.30	76.50
1.3	11.31	11.05	10.0	87.0	85.0
1.35	11.75	11.48	11.0	95.70	93.50
1.4	12.18	11.90	12.0	104.40	102.00
1.5	13.05	12.75	13.0	113.10	110.50
1.6	13.92	13.60	14.0	121.80	119.00
1.65	14.36	14.03	15.0	130.50	127.00
1.8	15.66	15.30	16.0	139.20	136.00
2.0	17.40	17.00	17.0	147.90	144.50
2.2	19.14	18.70	18.0	156.60	153.00
2.25	19.58	19.13	19.0	165.30	171.50
2.5	21.75	21.25	20.0	174.0	170.00
2.75	23.93	23.38	21.0	182.70	178.50
3.0	26.10	25.50	22.0	191.40	187.00
3.5	30.45	29.75	25.0	217.50	212.50
4.0	34.80	34.00			

ANNEXURE-2
RECOMMENDED

Recommended width of strip:

40,42,45,48,50,52,56,60,63,65,70,75,80,85,
90,95,100,105,110,120,125,130,140,150,160,170,
180,190,200,210,220,230,240,250,260, 280,300,320
340,360,380,400,420,450,480,500,530,560.

ANNEXURE - 3

Reference

DURING CUPPLING TEST PRESSING DEPTH OF SPHERICAL HOLD DUE TO PUNCH OF 10MM RADIUM

MM

Condition of Material	Brass Grade	Exrusion depth of pressing (Aqueizing) with sheet or strip thickness			
		0,40-0.45	0.50	0.60-1.0	1,2-1.5
Soft	68	Not less than 10,0	Not less than 11.0	Not less than 11.5	Not less than 12.0
	63	Not less than 9.5	Not less than 9.5	Not less than 10.0	Not less than 10.5
Half Hard	68	8.0-10.0	9.0-11.0	9.5-11.5	11.0-13.0
	63	7.0-9.0	7.0-9.0	7.5-9.5	8.0-10.0

TABLE - 1

MM

Thickness	Tolerances for thickness at the width					
	600 to 700	710 to 1000	1000 to 1250	1250 to 1500	1500 to 2500	2500 to 3000
5.00 6.00	-0.45	-0.50	-0.60	-0.80	-1.00	-
7.00 8.00	-0.50	-0.60				
9.00 10.00	-0.60	-0.70	-0.80	-1.00	-1.20	-1.40
11.00 12.00 13.00 14.00	-0.70	-0.80	-1.00	-1.20	-1.40	-1.60
15.00 16.00	-0.80	-1.00	-1.20	-1.40	-1.60	-1.80
17.00 18.00 19.00		-1.20				
20.00 21.00 22.00	-1.00	-1.40	-1.40	-1.60	-1.80	-2.00
24.00 25.00	-1.20	-1.60	-1.40	-1.80	-2.00	-

TABLE - 1a

MM

Sheet Width	Tolerances for Width	Sheet Length	Tolerances for Length
600 710 1000	-15	1000 1410 1500 2000	-20
1250 1500 2000 2500	-20	2500 3000 4000	-30

TABLE - 2

MM

Thickness	Tolerances for thickness at the width		
	Upto 600	From 600 to 800	From 800 to 1000
0.40 0.50	-0.06	-0.09	-
0.60 0.70 0.80	-0.08	-0.10	
0.90	-0.09		
1.00 1.10	-0.10	-0.12	-0.16
1.20 1.30 1.40	-0.12	-0.14	
1.50 1.60 1.80	-0.14	-0.16	-0.20
2.00 2.20	-0.15	-0.18	-0.22
2.50 3.00	-0.18	-0.20	-0.24
3.50 4.00	-0.20	-0.24	-0.28
4.50 5.00	-022	-0.27	-0.32
5.50 6.00 6.50	-0.25	-0.30	-0.36
7.00 8.00	-0.27	-0.36	-0.40
9.00 10.00	-0.30	-0.40	-0.43
11.00 12.00	-0.36	-0.50	-0.60

TABLE- 2a

MM

Width	Length
600	1500 2000
710	1410
800 1000	2000

TABLE - 3

MM

Thickness	Tolerances thickness wise of strip		
	Standard Accuracy	High Accuracy	
	From 40 to 600	From 40 to 300	From 300 to 600
0.40	-0.06	-0.04	-
0.50		-0.05	-
0.60	-0.07		
0.70 0.80	-0.08	-0.06	-
0.90 1.00	-0.09		-0.08
1.10 1.20 1.30 1.40 1.50	-0.10	-0.07	-0.09
1.60 1.80 2.00 2.20 2.50	-0.12	-0.09 -0.12	-0.10
3.00 3.50 4.00	-0.16		-0.12
4.50 5.00 5.50	-0.20	-0.14	-0.14
6.00 6.50 7.00 8.00	-0.25	-0.16	-0.16
9.00 10.00	-0.30	-0.18	-0.18
11.00 12.00	-0.36	-	-

MM

Width	Internal width wise	Tolerances for strip width at the thickness									
		Upto 1.0		From 1.0 to 2.0		From 2.0 to 4.0		From 4.0 to 6.0		From 6.0 to 12.0	
		Standard Accuracy	High Accuracy	Standard Accuracy	High Accuracy	Standard Accuracy	High Accuracy	Standard Accuracy	High Accuracy	Standard Accuracy	High Accuracy
40-100	10	-0.7	-0.5	-0.8	-0.8	-2.0	-	-	-	-	-
101-150	50	-1.5	-0.5	-1.5	-0.8	-3.0	-	-3.5	-	-7.0	-
151-300		-1.5	-1.0	-1.5	-1.3	-3.0	-	-3.5	-	-7.0	-
301-600		-2.0	-1.2	-3.0	-1.6	-3.0	-	-1.0	-	-7.0	-

WRITE CONVENTIONAL DESIGNATIONS AS PER DIAGRAM

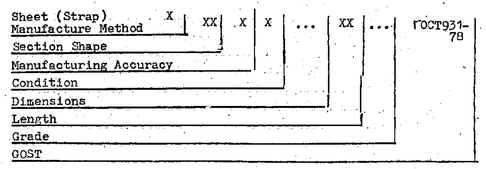

TABLE - 5

Manufacturing Method	Brass Grade	Condition of Material	Ultimate Tensile Strength МПа	Ultimate Tensile Strength (kгс/мм²)	Elongation, not less than	Brinnel hardness, (reference)
	Л 90	Soft	от 2.3x10² до 3.4x10²	(от 24 до 35)	36	60
		Half hard	от 2.9x10² до 3.9x10²	(от 30 до 40)	10	85
		Extra hard		(" 36)	3	110
			* 3.5x10²	(" 40) Not less		
	Л 85	Soft	от 2.5x10² до 3.6x10²	(от 26 до 37)	38	65
		Half hard	от 3.2x10² до 4.3x10²	(от 33 до 44)	12	95
		Extra hard		(" 40)	3	110
			* 3.9x10²			
	Л 80	Soft	от 2.6x10² до 3.7x10²	(от 27 до 38)	40	65
		half hard	от 3.3x10² до 4.3x10²	(от 34 до 44)	15	95
		Extra hard		(" 40)	3	120
			* 3.9x10²			
	Л 68	Soft	от 2.9x10² до 3.7x10²	(от 30 до 38)	42	70
		Half hard	от 3.4x10² до 4.7x10²	(от 35 до 48)	20	105
		Extra hard	от 4.3x10² до 5.4x10²	(от 44 до 55)	10	125
		Hot rolled	* 5.3x10²	(" 53)	-	155
	Л 63	Soft	от 2.9x10² до 4.0x10²	(от 30 до 41)	38	70
		half hard	от 3.4x10² до 4.7x10²	(от 35 до 48)	20	105
		Extra Hard	от 4.1x10² до 5.7x10²	(от 42 до 58)	8	135
		Hot Rolled	от 5.1x10² до 6.3x10²	(от 52 до 65)	4	150
		Hard Spring	* 6.1x10²	(" 62)	-	180
	Л 59-1	Half Hard	от 3.4x10² до 4.7x10²	(от 35 до 48)	25	100
		Extra hard	от 4.6x10² до 6.1x10²	(от 47 до 62)	5	200

Contd..

Table 5 Contd..

JM 58-2	Soft	σ_T 3.8x10^2 A_0 4.7x10^2	(σ_r 39 A_0 48)	30	85
	Half hard	σ_T 4.2x10^2 A_0 5.9x10^2	(σ_r 43 A_0 60)	15	100
	Extra Hard	* 5.9x10^2	* 60)	3	120
JO 62-1	Extra hard	3.9x10^2	* 40	5	145
63	-	σ_T 2.8x10^2 A_0 3.8x10^2	(σ_r 30 A_0 40)	30	-
62-1°	-	σ_r 3.4x10^2 A_0 4.4x10^2	(σ_r 35 A_0 45)	20	-
JC 59-1	-	σ_r 3.6x10^2 A_0 4.9x10^2	(σ_r 37 A_0 50)	18	-
AM $\bar{X}$		3.9x10^2	(* 40)	25	-

* not less than 10 from 11 upto