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GOST : 977-75

Title : STRUCTURAL STEEL AND
ALLOY STEEL CASTINGS

Translated and edited by

PVR Associates

Date : Sept.1984

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Name;

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USSR STATE STANDARD

Structural Steel and Alloy Steel Castings

Specifications

General Technical Conditions

GOST 977-75
This supersedes
GOST 977-65 and
GOST 7832-65

Reissued Jan. 1978. Valid from 01.01.1977.

1. Classification

1.1. Castings are divided into three groups as shown in Table 1 depending on the purpose and requirements of the cast parts.

Table 1

Group of castings	Purpose	Characteristic of castings	List of parameters to be checked
I	General purpose castings	Castings for parts the configration and dimensions of which are decided only by structural and technological considerations.	External view, dimensions, chemical composition.
II	Castings for critical parts	Castings for parts designed for strength and for working under static loads.	External view, dimensions, chemical composition, mechanical properties Yield point or ultimate strength and relative elongation.

Table 1 Contd.

Group of castings	Purpose	Characteristic of castings	List of parameters to be checked
III	Castings for very critical parts	Castings for parts, designed for strength and meant for working under cyclic and dynamic impact loads.	External view, dimensions, chemical composition, mechanical properties: Yield point or ultimate strength an relative elongation and impact strength.

Note:

1. (Deleted - "Standards information catalogue No. 8, 1977").

2. The following may be included additionally among the parameters to be checked: hardness, mechanical properties at reduced and elevated temperatures, hermetic sealing, microstructure, porosity etc. specified in the standards and technical documention for the castings.

(Revised edition - "Standards information catalogue No. 8, 1977")

1.2. The casting drawing must specify the group of the castings, the steel grade and the additional parameters and requirements to be inspected. Castings made by conveyerised production line are not classified into groups but the list of parameters to be inspected is specified in the drawing.

Examples of conventional designation:

For castings of group I made out of 25 Л grade steel:

Castings 25 Л -I GOST 977-75.

Castings of group-II, made out of 25 Л grade steel:

Castings 25 Л -II GOST 977-75.

Castings of group-III, made out of steel of grade 12ДХН1МФЛ;

Casting 12ДХН1МФЛ -III GOST 977-75.

Castings made by conveyerised production line out of 25 Л grade stee

Casting 25 Л GOST 977-75

-Fe- made out of steel of grade 12ДХН1МФЛ;

Casting 12ДХН1МФЛ GOST 977-75.

(Revised edition - "Standards information catalogue No.8, 1977").

2. Grades and Technical Requirements

2.1. Castings are made out of steel of grades:
15Л, 20Л, 25Л, 30Л, 35Л, 40Л, 45Л, 50Л, 55Л, 20ГЛ, 35ГЛ, 30ГСЛ, 20Г1ФЛ, 20ФЛ, 30ГСФЛ, 45ФЛ, 32Х06Л, 40ХЛ, 35ХМЛ, 30ХНМЛ, 35ХГМЛ, 35ХГСЛ, 20ДХЛ, 20ХГСНДМЛ, 08ГДНФЛ, 13ХНДФТЛ, 12ДН2ФЛ, 12ДХ1МФЛ, 23ХГС2МФЛ and 25Х2Г2ФЛ. 27

2.2. Basic or open-hearth acid steels or electrical steel are used for marking castings.

Note:

The standards and technical documentation should specify whether converter steel may be used.

(Revised edition - "Standards information catalogue No.8, 1977").

2.3. Chemical composition of steel used in castings should conform to the requirements given in Table 2.

2.4. Castings should be subjected to heat-treatment.

Recommended heat-treatment temperatures are given in the annexure

Note: Heat treatment may, by mutual consent, be omitted in the case of group I castings.

2.5. Mechanical properties of steel used in castings of wall thickness upto 100 mm after final heat-treatment should correspond to the norms specified in Table 4.

The main mechanical properties standardised for castings are: yield point or ultimate strength, relative elongation and impact strength.

The standards and technical documentation of each particular

product must specify the additional parameters to be inspected.

Note: 1. Norms for mechanical properties of castings having wall thickness more than 100 mm are specified in the standards and technical documentation.

2. The standards and technical documentation must specify whether relative reduction may be used as an additional parameter to be checked instead of relative elongation.

3. The need to increase the norms for ultimate strength with corresponding decrease in norms for plasticity and toughness should be specified in the standard and technical documentation.

4. Hardness may, by mutual consent, be taken as a standardised characteristic in the case of castings made by conveyerised production line.

(Revised edition - "Standards information catalogue"No.8, 1977").

2.6. Configuration and dimensions of castings should correspond to the drawings approved in the established manner.

Limit deviations on dimensions and weight of castings as also machining allowance should correspond to GOST 2009-55; pouring angles should conform to GOST 3212-57.

(Revised edition - "Standard information catalogue No. 8, 1977").

2.7. Castings should be cleaned to remove moulding mixture, scales, burnt sand, risers and runners.

Table 2

Table 2 Таблица 2

Марка стали Steel grade	Chemical composition, % Химический состав, % Chemical composition, %											
	C Углерод	Mn Марганец	Si Кремний	Phosphorus P Фосфор, not more than Не более	Sulphur S Сера, not more than Не более	Cr Хром	Ni Никель	Mo Молибден	V Ванадий	Cu Медь	Al Алюминий
15Л	0,12–0,20	0,30–0,90	0,20–0,52	По табл. 3 As per Table 3	По табл. 3 As per Table 3	Не более 0,30	Не более 0,30	—	—	Не более 0,30	Not more than Не более
20Л	0,17–0,25	0,35–0,10	0,20–0,52	То же	То же	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
25Л	0,22–0,30	0,35–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
30Л	0,27–0,35	0,40–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
35Л	0,32–0,40	0,40–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
40Л	0,37–0,45	0,40–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
45Л	0,42–0,50	0,40–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
50Л	0,47–0,55	0,40–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
55Л	0,52–0,60	0,40–0,90	0,20–0,52	"	"	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
20ГЛ	0,15–0,25	1,20–1,60	0,20–0,40	0,040	0,040	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
35ГЛ	0,30–0,10	1,20–1,60	0,20–0,40	0,040	0,040	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
30ГСЛ	0,25–0,35	1,10–1,40	0,60–0,80	0,040	0,040	Не более 0,30	Не более 0,30	—	—	Не более 0,30	
20ГЦФЛ	0,16–0,25	0,9–1,40	0,20–0,50	0,050	0,050	Не более 0,30	Не более 0,30	—	0,05–0,12	Не более 0,30	До 0,05 upto 0,05
20ФЛ	0,14–0,25	0,70–1,20	0,20–0,52	0,050	0,050	Не более 0,30	Не более 0,30	—	0,06–0,12	Не более 0,30	
36ХГСФЛ	0,25–0,35	1,00–1,50	0,40–0,60	0,050	0,050	0,30–0,50	Не более 0,30	—	0,05–0,12	Не более 0,30	
45ФЛ	0,42–0,50	0,40–0,90	0,20–0,52	По табл. 3 As per Table 3	По табл. 3 As per Table 3	Не более 0,30	Не более 0,30	—	0,05–0,15	Не более 0,30	
32Х06Л	0,25–0,35	0,40–0,90	0,20–0,40	0,050	0,050	0,50–0,80	Не более 0,30	—	—	Не более 0,30	
40ХЛ	0,35–0,45	0,40–0,90	0,20–0,40	0,040	0,040	0,80–1,10	Не более 0,30	—	—	Не более 0,30	
35ХМЛ	0,30–0,40	0,40–0,90	0,20–0,40	0,040	0,040	0,80–1,10	Не более 0,30	0,20–0,30	—	Не более 0,30	—
30ХНМЛ	0,25–0,35	0,40–0,90	0,20–0,40	0,040	0,040	1,30–1,60	1,30–1,60	0,20–0,30	—	Не более 0,30	—
35ХГСЛ	0,30–0,40	1,00–1,30	0,60–0,80	0,040	0,040	0,60–0,90	Не более 0,30	—	—	Не более 0,30	—
35ХГМЛ	0,32–0,42	0,80–1,20	0,20–0,40	0,040	0,040	Не более 0,30	0,80–1,20	0,15–0,25	—	Не более 0,30	—
20ГЛ	0,15–0,25	0,50–0,80	0,20–0,40	0,040	0,040	0,80–1,10	Не более 0,30	—	—	1,40–1,60	—
20ХГСНДМЛ	0,18–0,24	0,50–1,30	0,50–1,20	0,050	0,045	0,60–0,90	1,10–1,50	0,10–0,15	—	0,40–0,60	0,03–0,07

Steel grade	Chemical composition				
	Carbon	Manganese	Silicon	Phosphorus	Sulphur
				Not more than	
08ГДНФЛ	Not more than 0.10	0.60 to 1.00	0.15 to 0.40	0.035	0.035
13ХНДФТЛ	Not more than 0.16	0.40 to 0.90	0.20 to 0.40	0.030	0.030
12ДН2ФЛ	0.08 to 0.16	0.40 to 0.90	0.20 to 0.40	0.035	0.035
12ДХН1МФЛ	0.10 to 0.18	0.30 to 0.55	0.20 to 0.40	0.030	0.030
23ХГС2МФЛ	0.18 to 0.24	0.50 to 0.80	1.80 to 2.00	0.025	0.025
25Х2Г2ФЛ	0.22 to 0.27	1.60 to 1.80	0.70 to 0.90	0.025	0.025

Note:

1. Numerals and letters in the Russian steel grade designation denote the following:

First two numerals - average carbon content by weight, expressed in hundredths of one percent;

Numerals following the alphabetic designation - the average proportion of the element by weight as a percentage.

С - silicon, Г - manganese, Х - chromium;
Н - nickel, Д - copper, М - molybdenum;
В - tungsten, Т - titanium; Ф - vanadium; Л - lithium.

2. In the case of alloy steel melted in acidlined furnaces, the permissible sulphur and phosphoms content by weight may be increased by 0.010 % each. In Bessemer steel they may be increased by upto 0.06 %, other conditions of the this standard remaining unaltered.

3. Deviation in carbon content by ± 0.02 % is allowed. Deviation in silicon content by + 0.10 %, is allowed and in manganese, chromium, and nickel contents by ± 0.10 %, each, in molybdenum content by ± 0.05 % and in vanadium content by + 0.03 %, in steel of those grades in which they are the alloying elements, provided the mechanical properties and the remaining requirements of this standard are met. Deviation in silicon, manganese, chromium nickel and copper content by weight fror the specified norms is permitted in steels of those grades in which they are not the alloying elements provided mechanical properties and other requirements of this standard and also the requirements,

Chemical composition

Steel grade	Cr	Ni	Mo	V	Cu	Ti
08ГДНФЛ	≯ 0.30	1.15 to 1.55	-	0.06 to 0.15	0.80 to 1.20	-
15ГХНДФТЛ	0.15 to 0.40	1.2[illegible] to 1.60	-	0.06 to 0.12	0.65 to 0.90	0.04 to 0.10
12ДН2ФЛ	≯0.30	1.80 to 2.20	-	0.08 to 0.15	1.20 to 1.50	-
12ДХН1МФЛ	1.20 to 1.70	1.40 to 1.80	0.20 to 0.30	0.08 to 0.15	0.40 to 0.65	-
23ХГС2МФЛ	0.60 to 0.90	-	0.25 to 0.30	0.10 to 0.15	≯0.30	-
25Х2Г2ФЛ	1.80 to 2.20	0.20	-	0.15 to 0.20	≯0.30	-

specified in standards and technical documentation are met.

4. Titanium content less than the lower limit specified in Table 2 does not constitute reason for rejection provided the other requirement of this standard are met.

5. In steels of grades 35ХМЛ, 30ХНМЛ, and 35НГМЛ, molybdenum may be replaced with tungsten (depending upon the presence of one or the other element) on the following basis: one percent of molybdenum is replaced by three percent of tungsten, provided all the requirements of this standard are met. Such replacement may be carried out without any additional documentation.

6. Castings are made out of steels of grades 35ХМЛ and 30ХНМЛ only for special products.

7. Steels of grades 25Х2Г2ФЛ and 23ХГС2МФЛ are further modified with ferrocerium - magnesium hardener ФЦМ-5 added at the rate of 0.01 % of melt weight.

8. Sulphur and phosphorus content may be increased by 0.01 % each provided the mechanical properties are maintained in accordance with Table 4 and provided instructions to this effect are available in the standards and technical documentation for steels of grades 20ГЛ, 35ГЛ, 30ГСЛ and 40ХЛ.

Table 3

Group of castings	Impurities content in steel, % not more than					
	Basic steel	Acid steel	Bessemer steel	Basic steel	Acid steel	Bessemer steel
	Sulphur			Phosphorus		
I	0.050	0.06	0.06	0.05	0.06	0.08
II	0.045	0.06	0.05	0.04	0.06	0.07
III	0.045	0.05	-	0.04	0.05	-

Places of parting of feeders and risers, fillings and burrs should be cleaned or trimmed within the limits of tolerances specified in the drawing.

Presence of burnt-on sand in inaccessible places is allowed, if so specified in the standards and technical documentation.

(Revised edition - "Standards information catalogue No.8, 1977").

2.8. Feeders and risers may be removed by any method.

Removal of feeders and risers by gas-cutting should be carried out before the final heat-treatment operation in the case of castings made out of steel of grade 15Л, 20Л, 25Л, 08ГДНФЛ, 12ДН2ФЛ, risers and residues of risers removed earlier may be cut after the final heat-treatment operation.

(Revised edition - "Standards information catalogue No.8, 1977").

2.9. Surface defects in the form of blowholes, welds, shrinkage cavities, scabs, etc. not exceeding the machining allowance are permitted on the surfaces of castings which are proposed to be machined.

Blowholes which do not affect the serviceability and strength of the part as per standards and technical documentation of the castings are allowed on machined surfaces of castings.

(Revised edition - "Standards information catalogue No.8, 1977").

Steel grade	Yield point σ_T, N/mm² (kgf/mm²)	Ultimate strength σ_B, N/mm² (kgf/mm²)	Relative elongation δ_5, %	Relative reduction ψ, %	Impact strength a_H, kgfm/cm²
	Not less than				
Normalising or Нормализация или нормализация с отпуском Normalising followed by tempering					
15Л	200 (20)	400 (40)	24	35	5,0
20Л	220 (22)	420 (42)	22	33	5,0
25Л	240 (24)	450 (45)	19	30	4,0
30Л	2.0 (25)	480 (48)	17	28	3,5
35Л	280 (28)	500 (50)	15	25	3,5
40Л	300 (30)	530 (53)	14	23	3,0
45Л	320 (32)	550 (55)	12	21	3,0
50Л	340 (34)	580 (58)	11	20	2,5
55Л	350 (35)	600 (60)	10	18	2,5
20ГЛ	280 (28)	550 (55)	18	25	5,0
20ФЛ	300 (30)	500 (50)	18	35	5,0
35ГЛ	300 (30)	550 (55)	12	20	3,0
20ГТФЛ	320 (32)	520 (52)	17	35	5,0
08ГДНФЛ	350 (35)	450 (45)	18	30	5,0
30ХГСФЛ	400 (40)	600 (60)	16	25	3,5
30ГСЛ	350 (35)	600 (60)	14	25	3,0
35ХГСЛ	350 (35)	600 (60)	14	25	3,0
18ХНТФТЛ	400 (40)	500 (50)	18	30	5,0
20ХЛ	400 (40)	500 (50)	12	30	3,0
35ХМЛ	400 (40)	600 (60)	12	20	3,0
45ФЛ	400 (40)	600 (60)	12	20	3,0
12ДНФЛ	550 (55)	650 (65)	12	20	3,0
30ХНМЛ	550 (55)	700 (70)	12	20	3,0
12ХАНМФЛ	650 (65)	850 (85)	12	20	3,0
Hardening and Закалка и отпуск tempering					
25Л	200 (20)	500 (50)	22	33	3,5
30Л	300 (30)	500 (50)	17	30	3,5
35Л	350 (35)	550 (55)	16	20	3,0
40Л	350 (35)	550 (55)	14	20	3,0
45Л	400 (40)	600 (60)	10	20	2,5
50Л	400 (40)	750 (75)	14	20	3,0
55Л	470 (47)	850 (85)	15	20	2,5
35ГЛ	320 (35)	600 (60)	14	30	5,0
30ГСЛ	400 (40)	650 (65)	14	30	5,0
32ХМЛ	450 (45)	650 (65)	10	20	5,0
40ХЛ	500 (50)	650 (65)	12	25	4,0
20ХГСНМЛ	500 (50)	650 (65)	12	20	4,0
45ФЛ	500 (50)	700 (70)	12	20	3,0
20ХМЛ	550 (55)	650 (65)	12	30	4,0
25ХМЛ	550 (55)	700 (70)	12	25	4,0
35НГМЛ	600 (60)	750 (75)	12	25	4,0
35ХГСЛ	600 (60)	800 (80)	10	20	4,0

2.10. Blowholes and other defects conforming to standard and technical documentation as to size, number and location may be left unrectified on the surfaces of castings which are not proposed to be machined.

(Revised edition - "Standards information catalogue No.8, 1977").

Table 4 Contd.

Grade of steel	Yield point σ_T, H/mm^2 (kgf/mm^2)	Ultimate streigth σ_B, H/mm^2 (kgf/mm^2)	Relative elongation δ_5, 10 %.	Relative reduction ψ, %.	Impact strength a_H kgcm/cm^2
	Not more than				
30ХГСФЛ	600 (60)	800 (80)	14	25	4.5
30ХНМЛ	650 (65)	800 (80)	10	20	4.0
12МН2ФЛ	650 (65)	800 (80)	12	25	4.0
12ГХН1М2ФЛ	750 (75)	1000 (100)	10	20	3.0
23ХГС2М2ФЛ	1100 (110)	1300 (130)	6	25	4.0
25Х2Г2ФЛ	1200 (120)	1400 (140)	5	25	4.0

2.11. Rectification of defects in castings which reduce the strength and serviceability of the castings is allowed if it is so specified in the standards and technical documentation.

(Revised edition - "Standards information catalogue No.8, 1977").

2.12. Rectification of defects by welding should be carried out before final heat-treatment.

2.13. If defects are detected after final heat-treatment or machining they must be rectified. Subsequent heat-treatment of the castings is decided upon as per standards and technical documentation.

2.14. Internal defects (shrinkage, sandy and gas cavities, contaminatic and axial swellings) are allowed in castings, if they do not reduce

serviceability and strength of the parts. Sizes, numbers and location of the defects are specified in the standards and technical documentation for the particular product or determined by comparison with specimens approved in the established manner.

2.15. Straightening (rectification of warpage) of the castings may be carried out in the hot or cold condition.

Permissible extent of straightening and the need for tempering for removal of stresses after straightening are specified in the technical documentation approved in the established manner.

2.16. The need for checking for the presence and depth of decarbonized layer of metal in castings is specified in the standards and technical documentation relating to the casting.

Machining allowance on the machined friction surfaces of castings and at the places of checking the hardness should ensure complete removal of decarbonized layer.

3. Acceptance Rules

3.1. Castings are accepted in batches. A batch is made up of castings from a single melt. When furnaces of capacity not more than 500 kg are used, the batch consists of castings of the same grade of steel from a single melt or several melts of renewable charge, which have undergone heat-treatment in one batch and are covered by a single quality certificate.

If heat-treatment is not carried out in the factory producing the castings, a batch must consist of castings from a single melt.

A batch may consist of castings from the same melt, which have undergone heat-treatment in different furnaces or in several batches but to the same schedule (with mandatory recording of the actual schedule by means of automatic instruments).

Note: 1. In the case of small batch production with stabilised

technological process, a batch may, by mutual consent, be made up of castings of the same grade of steel but from several melts.

2. In the case of mass production of castings by the continuous casting method, a batch for heat-treatment may be made up of castings from several melts but of the same grade of steel, which have undergone heat-treatment to a common schedule recorded by automatic instruments.

3. (Deleted - "Standards information catalogue No.8, 1977").

Castings mass produced in conveyerised lines are not formed into batches.

(Revised edition - "Standards information catalogue No.8, 1977").

3.2. The manufacturer checks for conformity of chemical composition of steel of the castings with the requirements specified in Table 2 for each melt.

Sampling scale is as per GOST 7565-73.

Chemical composition of steel may be checked on a single melt per shift, provided the technological process has stablized the charge is constant and a single grade of steel is being melted. The furnace capacity must be not more than 3 t for castings of group I and not more than 500 kg for castings of groups II and III.

Chemical composition so determined is applicable to all the castings produced in that shift.

3.3. Every casting of a batch is subjected to external inspection.

3.4. The standards and technical documentation for the castings must specify the dimensions of the castings which are to be inspected and the scope of inspection.

3.5. The manufacturer carries out check for conformity of mechanical properties of steel of the castings with the norms specified in Table 4, for each batch of castings.

Test bars are cast in order to check the mechanical properties of steel. The standards or technical documentation for the casting must specify the number of test bars to be cast.

Note: In the case of conveyerized mass production, the manufacturer carries out the test for mechanical properties of the steel periodically as per technical documentation.

(Revised edition - "Standards information catalogue No.8, 1977").

3.6. If unsatisfactory test results are obtained in respect of even a single parameter of mechanical properties, the particular test is repeated on twice the number of specimens taken from the test bars of the same batch and melt.

If unsatisfactory results are obtained at the repeated tests, the castings of the given batch and test bars (or the part of test bars remaining after the first test) are subjected to repeated heat-treatment and the test for mechanical properties is carried out in accordance with the requirements of clauses 4.5 to 4.8.

The number of permissible complete heat-treatment operations should not be more than three.

All the castings of the given batch are rejected if the test results do not conform to the requirements of clause 2.5 even after the third heat-treatment.

Note: The number of tempering operations on castings and test bars after hardening or normalization for obtaining the required mechanical properties or after rectifying defects by welding is not limited.

(Revised edition - "Standards information catalogue No.8, 1977").

3.7. The scope and periodicity of tests for parameters to be additionally tested are established by the standards and technical documentation for the particular castings.

(Revised edition - "Standards information catalogue No.8, 1977".)

4. Test Methods

4.1. Chemical composition of steel is checked as per GOST 2331-63, GOST 12344-66 to GOST 12356-66 or by other methods which ensure the accuracy of determination envisaged by these standards.

(Revised edition - "Standards information catalogue No.8, 1977").

4.2. Samples for determining chemical composition of steel of the castings are selected in accordance with GOST 7565-75. 49

Samples for determining the chemical composition of steel melted in furnaces of capacity less than 500 kg must be drawn when the pouring is half way through. The sample may weigh 200 g or more.

When all the metal from a melt is poured into a single casting the sample may be drawn after filling the mould.

Chips taken from the test bar for mechanical testing or from the casting may be used for determing chemical composition.

The melt number is marked on the samples.

(Revised edition - "Standards information catalogue No.8, 1977").

4.3. Mechanical properties of the metal of the castings are determined on testpieces made from the test bars.

4.4. The required number of test bars is cast half way through the pouring of each melt.

When steel is melted in furnaces of capacity not more than 500 kg, test bars are cast from one or several melts of the particular shift.

Configuration and dimensions of the test bars and the arrangement of the cut for testpieces are shown in the drawings 1 - 6.

Position of testpieces for elongation and impact strength test in test bars is not regulated and it is shown conventionally in the drawings. 191

Type of the test bars in determined by the manufacturer.

In the case of large castings which require individual checking of mechanical properties, testbars may be cast as ribs of the casting.

The dimensions and location of such ribs must established in the standards and technical documentation.

Conditions of manufacturing of the test bars and castings should be identical. Test bars or blanks cut from them for determining mechanical properties should be heat-treated together with the castings of the given batch.

Test bars may be cast by sand moulding (dry or green) irrespective of the method of making the castings.

Note: If there are no test bars or if the customer so stipulates, testpieces may be cut from the castings at a distance of 30 mm from the outer surface.

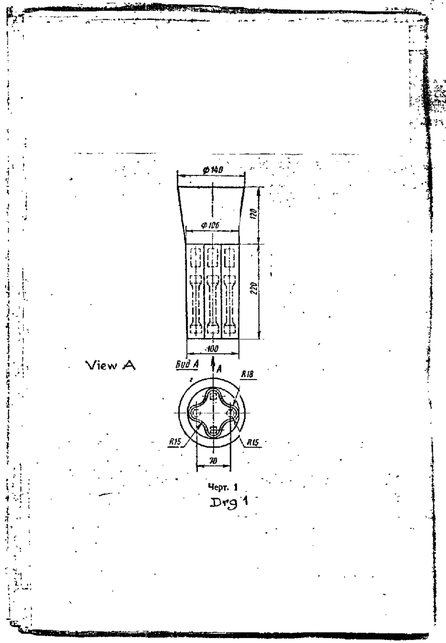
(Revised edition - "Standards information catalogue No.8, 1977").

4.5. Elongation test is carried out as per GOST 1495-73 on cylindrical samples of diameter 10 mm and design length 50 mm.

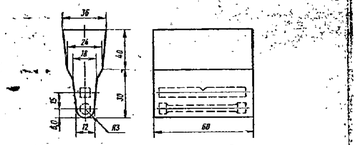
Testpieces of 5 mm diameter and 25 mm design length may also be used.

4.6. Impact strength is determined in accordance with GOST 9454-60 on type I testpieces at normal temperature and in accordance with GOST 9455-60 at reduced temperatures.

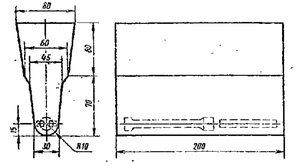
4.7. Mechanical properties of castings are checked on a single testpiece by tensile test and on two testpieces by impact strength.



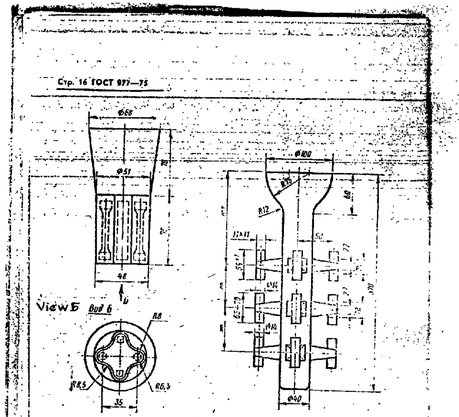
Черт. 1
Drg 1



Черт. 2 Фиг. 2



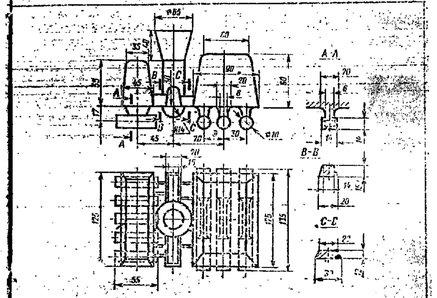
Черт. 3 Фиг. 3



Черт. 4
Dig 4.

Черт. 5
Dig 5.

4.8. Results of tests on testpieces having defects connected with casting conditions (blowholes, foreign inclusions, hot cracks etc). or with machining conditions or testing conditions are not taken into account. Defective testpieces are replaced with new ones taken from the testbars or castings.



Черт. 6
Dwg. 6.

4.9. The standards and technical documentation must specify the methods and scope of testing chemical composition and mechanical properties in the case of castings produced in conveyerised mass production lines.

4.10. Brinell hardness test is carried out in accordance with GOST 9012-59.

4.11. Decarbonised layer is determined in accordance with GOST 1763-68.

4.12. Internal flaws in castings are detected by X-ray, gamma-ray radiation, kerosene test, magnetic defectoscopy and other methods specified in the standard and technical documentation.

(Revised edition - "Standards information catalogue No.8, 1977").

5. Marking, Packing, Transport and Storage

5.1. The castings should have the seal of the quality control department of the manufacturing concern and also additional markings in accordance with the requirements of technical documentation, on the unmachined surface. Marking symbols may be made by casting or printing or applied with indelible paint.

If it is not possible to mark and seal the castings because of the configuration and dimensions, the batch of castings should have a tag containing the marking, quality control seal and an indication of the number of castings. Castings mass produced in conveyerised lines must be marked and sealed in accordance with the instructions in the standards and technical documentation.

5.2. Every batch of castings should be accompanied by a quality certificate containing the following:

a) Manufacturer's trade mark;
b) Drawing or casting number;
c) Conventional designation of the casting;
d) Number and weight of castings;
e) Melt number;
f) Grade of steel;
g) Results of final chemical analysis;
h) Type of heat-treatment;
i) Results of final mechanical tests;
j) Results of special tests and
k) Number of the present standard.

5.3. Rules for packing, transport and storage of castings are decided upon as per standards and technical documentation for the particular castings.

Recommended Annexure

Steel grade	Heat-treatment Schedules			
	Normalising and Tempering		Hardening and tempering	
	Normalising Temperature, °C	Tempering Temperature, °C	Hardening Temperature, °C	Tempering Temperature, °C
15Л	910—930	—	—	—
	910—950	670—690		
20Л	890—900	—	—	—
	890—900	630—650		
25Л	880—900	610—630	870—890	610—630
30Л	880—900	610—630	850—880	610—630
35Л	860—880	600—630	850—880	600—630
40Л	860—880	600—630	800—880	600—630
45Л	850—880	600—630	860—880	550—600
50Л	850—880	600—630	860—880	600—630
55Л	840—860	600—630	790—810	580—600
20ГЛ	880—900	600—650	—	—
35ГЛ	880—900	600—650	850—860	600—650
30ГСЛ	870—900	570—600	920—950	570—650
20ГТФЛ	900—920	600—650	—	—
20ФЛ	920—940	600—650	—	—
30ХГСФЛ	900—920	600—650	900—920	630—670
45ФЛ	880—900	600—650	880—900	600—650
32Х06Л	—	—	890—910	620—660
40ХЛ	—	—	850—860	600—650
35ХМЛ	850—880	600—650	860—870	600—650
30ХНМЛ	850—880	600—650	860—870	600—650
35ХГСЛ	870—890	570—600	870—880	630—670

Table Contd.

Steel grade	Heat-treatment Schedules			
	Normalising and Tempering		Hardening and Tempering	
	Normalising Temperature, °C	Tempering Temperature, °C	Hardening Temperature, °C	Tempering Temperature, °C
35НГМЛ	-	-	860 to 870	600 to 650
20ДХЛ	880 to 890	560 to 600	880 to 890	560 to 600
20ХГСНДМЛ	-	-	910 to 930	640 to 660
08ГДНФЛ	930 to 970	-	-	-
	920 to 950	590 to 650	-	-
13ХНДФТЛ	950 to 970	-	-	-
	900 to 920	530 to 560	-	-
12ДН2ФЛ	910 to 930	530 to 580	-	-
12ДХН1МФЛ	Preliminary heat treatment before hardening 940 to 950	-	910 to 920	560 to 600
	940 to 960	-	-	-
	890 to 910	52[illegible] to 630	890 to 910	520 to 630
23ХГС2МФЛ	Preliminary heat treatment before hardening 940 to 950	60[illegible] to 650	980 to 1000	200 to 230
25Х2Г2ФЛ	Preliminary heat treatment before hardening 900 to 920	600 to 680	910 to 930	280 to 300