

# ORDNANCE FACTORY PROJECT, HYDERABAD.

## FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : 172      GOST 977-75 G.4

Drawing No. : \_\_\_\_\_ Date Typed : 172

Sheet No. : 1/27 \_\_\_\_\_ Date Verified : GOST

Castings of unalloyed structural and alloyed steel. General technical specifications

GOST \_\_\_\_\_  
977-75 ✓  
 Replacing plates standard GOST 977-65 and GOST 7832-65.

Note: - Do not scribble on the specification.

### Classification.

- 1.1. Depending on the purpose and requirements prescribed for cast parts, castings are divided into three groups in compliance with table 1.
- 1.2. Casting group grade of steel and additional tests are specified in the drawing approved in a set order

Table No. 1.

Casting group	Purpose	Characteristics of castings	List of tests
1	2	3	4
I	General purpose castings	Castings for parts whose shape and dimensions are determined in terms of design and manufacturing development.	Visual appearance, dimensions, chemical composition
II	Special purpose castings	Castings for parts to be specified for strength properties and working under static and cyclic loads.	Visual appearance, dimensions, chemical composition, mechanical properties yield point, or strength and relative

33 sheets

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1	2	3	4
III	Highly special purpose castings.	Castings for parts to be specified for strength properties and working under dynamic and impact loads.	Visual appearance, dimensions, chemical composition, mechanical properties, yield point or variable resistance, relative elongation and impact strength.

**Remarks :**

- 1) The castings are not divided in groups during continuous mass conveyor production.
- 2) The list of tests may include hardness, mechanical properties at low and high temperature, air-tightness, microstructure, porosity and etc. specified in standard documents for production.

Examples of conventional designations:

Casting, group II, grade of steel 25 steel 25A-11.  
 GOST 977-75.

also group II, grade of steel 25 steel 25-11 GOST-

*cp. - III GOST 977-75.*

The same for continuous mass conveyor production, from steel as grade 25 ;

steel 25A GOST 977-75 same for steel of grade 12A xH1M steel 12A xH1M GOST 977-75.

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**2. Grades and technical requirements.**

2.1. Castings are made of steel, grade; 15 $\Lambda$ , 20 $\Lambda$ , 25 $\Lambda$ , 30 $\Lambda$ , 35 $\Lambda$ , 40 $\Lambda$ , 45 $\Lambda$ , 50 $\Lambda$ , 55 $\Lambda$ , 20 $\Gamma$ , 35 $\Gamma$ , 30 $\Gamma$ , 20 $\Gamma$ , 20 $\Gamma$ , 30x $\Gamma$ , 45 $\Gamma$ , 32x06 $\Gamma$ , 40x $\Lambda$ , 35xM $\Lambda$ , 30xHM $\Lambda$ , 35x $\Gamma$ , 35HM $\Lambda$ , 20 $\Lambda$ x $\Lambda$ , 20x $\Gamma$ HA M, 08 $\Gamma$ HA M, 13xHA M, 12 $\Gamma$ HA M, 12 $\Lambda$ x HM $\Lambda$ , 23x $\Gamma$ 2M $\Gamma$ , 25x2 $\Gamma$ 2 $\Gamma$ .

2.2. To make castings, basic steel or open-hearth acial steel or electrical steel is used.

Remarks : By the agreement between manufacturer and consumer, conventer stel may be used.

2.3. Chemical composition as the casting steel should correspond with the requirements specified in table 2.

The contents of sulphur and phesphorus in unalloyed steel castings should correspond with the requirements specified in table 3.

2.4. The castings should be subjected to heat treatment..

Recomended temperatures for heat treatment are specified in the appendix.

Remark: upon the agreement between manufacturer and consumer, heat-treatment of castings, group I may not be carried out.

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2.5. After heat treatment the mechanical properties of casting steel with wall thickness upto 100 mm should correspond with standards specified in table 4.

Basic standardized characteristics mechanical properties casting are yield point or ultimate strength, relative elongation impact strength.

Standards for the remaining testing properties are set by standard documents for concrete production.

Remarks :

1. For castings with thickness of wall exceeding 100mm, standards of mechanical properties are set the agreement made between manufacturer and consumer.
2. Up on the agreement made between manufacturer and consumer it is permitted to take reduction <sup>of</sup> area in the place of relative elongation as standard characteristic.
3. Upon the agreement made between manufacturer and consumer, ultimate strength may be increased proportionately decreasing in plasticity and viscosity standards.
4. During continues mass conveyer production, hardness may be taken as standard characteristic upon the agreement between manufacturer and consumer.

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2.6. Shape and dimensions of castings should correspond with the drawings approved in a set order limit deviations of dimensions and casting mass, also machining allowance should correspond with GOST 2009-55, pattern drafts with GOST 3212-57, tolerance for angular dimensions with GOST 9808-58.

2.7. Castings should be cleaned of sand scales, metal penetration and sand fusion, riser and gate should be removed.

Riser and gate cutting places, flashes and burrs should be cleaned or chipped with the limits of tolerance as per the drawing.

Upon the agreement between manufacturer and consumer, presence of metal penetration and sand fusion is permitted in inaccessible places and in places where cleaning is not possible.

2.8. To remove riser and gate any applicable method may be used.

The riser and gate should be removed by flame cutting before the final heat treatment,

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2.8. Heads and runners may be removed by any applicable method.

Removal of heads and runners by flame-cutting is to be carried out before the final heat-treatment.

In case of castings of steel Grade 15<sup>1</sup>, 20<sup>1</sup>, 08<sup>1</sup>AlH<sup>2</sup>, 12<sup>1</sup>AlH<sup>2</sup> cutting of runners as well as remnants of runners, removed earlier, may be carried out only after conducting the final heat-treatment.

2.9. Surface defects in the form of cavities cold laps, shrinkage cavities and scales etc; which do not exceed the machining allowance on depth, may be allowed on the casting surface, undergoing machining.

Cavities, not affecting the service-ability and strength of a part may be permitted on the machined surfaces of castings as per the standard- production documents.

1.10. Cavities and other similar defects is guarantity and location as per the standard production documents are permissiable on the unmachined casting surfaces.

2.11. Defects of castings, not reducing the strength and serviceability and affecting the appearance of castings may be repaired upon agreement between the user and supplier.

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- 2.12. The casting defects should be repaired by welding-up before the final heat-treatment.
- 2.13. If the defects are revealed after the final heat-treatment or machining, the need for their repair and subsequent heat-treatment of the castings is determined on agreement between the user and supplier.
- 2.14. Internal defects on castings are ( pipes, sand holes, blow holes, impurities, axial porosity) acceptable, if they do not affect the serviceability and strength of parts. Dimensions, quantity and location of the defects are to be stated in the standard-production documents or determined by comparing with the samples approved in the established order.
- 2.15. Castings may be dressed hot or cold (repair of working). Permissible dimensions for dressing in the need of tempering for removal of stress after the dressing are set by the technical documents, approved in the established order.
- 2.16. The need for checking presence of layer in the castings and its depth are stated in the standard technical documents.

Machining allowance should ensure complete elimination of decarbenized layer on the machined friction surfaces

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of castings and at the places, where the hardness is to be checked.

### 3. Acceptance Rules.

- 3.1. The castings are submitted for acceptance in batches. Each batch should consist of castings of one grade of steel or several meltings, melted in one burden as per one and the same technology in furnaces of volume not exceeding 500 kg. These furnaces should have undergone heat-treatment in one charge and their quality certified by one document.

Batch of castings, which is not subjected to heat-treatment in the manufacturing plant, consists of castings of one melting. A batch may also consist of castings of one melting, heat-treated in different furnaces or in several charges as per one and the same regime (the actual regime be recorded cumulatively through the automatic instrumentation).

Note: Upon agreement between the manufacturer and customer,

1. It is permitted to make a batch of castings of the same grade of steel of different meltings in batch production as per the established production process.

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2. In mass production of castings with the use of continuous furnaces for heat-treatment, it is permitted to make a batch of castings from several meltings of the same grade of steel which have undergone heat-treatment in the same conditions recorded by automatic instrument

3. In line production and the set production process, it is permitted to make a batch of same melts the casting as one grade as steel.

3.2. The manufacturer should carry out checking for conformity of chemical composition of steel castings on each melting.

Selection should be as per GOST 7565-73.

It is permitted to check chemical composition of steel on one melting in a given shift in the conditions of a steady production process, constant burden and melting of steel of one and the same grade in furnaces of group I and of volume not exceeding 500 kg-for castings of groups II and III.

Results of determination of chemical composition apply to all the castings of melting in a given shift.

Results of determination of chemical composition apply to all the casting of melting in given shift.

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- 3.3. Each casting of the batch is to be checked for external condition.
- 3.4. The dimensions of castings subject to check as well as scope of checking are set by the standard technical documents of the product.
- 3.5. The manufacturer is to carry out the check for conformity of mechanical properties of the casting steel to the normal, specified in Table 4 for each batch of castings.
- For checking the mechanical properties of steel, test vane are cast in quantity set by the standard technical documents.
- 3.6. In case of obtaining unsatisfactory test results even with regard to one of the indices of mechanical properties, the test pertains to that particular index is repeated on the doubled quantity of lumps, taken from the test vane for the same batch.
- When the obtained results of the repeated tests are unsatisfactory, the test bends ( or in gasikkex portions, leftover after the first test) are subjected to repeated treatment and tests of mechanical properties are conducted on the doubled quantity of samples.
- When the obtained test results are unsatisfactory Item after the repeated heat-treatment, heat-treatment can be repeated for the third time.
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Results of the third tests are final and apply to the entire batch.

Note : Number of tempering operations of castings along with the test bars is unrestricted after hardening or normalizing for obtaining the required mechanical properties after removal of defects by welding-up.

3.7. The scope of additional types of check for castings is determined by the standard technical documents.

4. Testing methods.

4.1. Chemical analysis of the steel is conducted as per GOST 2331-63, GOST 12344-66-GOST 12365-66.

4.2. Samples for determining the chemical composition of the steel castings are taken in the middle of process of casting of a given melting in compliance with GOST 7565-73.

When melting the steel in furnaces of volume not exceeding 500 kg, test sample in weight 200g and above may be used.

When casting one casting from the melting, the test samples are taken after the casting.

For determination of chemical composition, a chip taken from the test bar may be used for mechanical tests on from the casting.

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The test samples are to be marked with number of the melting.

4.3. tests for determination of mechanical properties of the casting metal are conducted on samples, taken from the test bars.

4.4. The test bars are cast in the required quantity in the middle of the process of casting of each melting and when melting in furnaces of volume not exceeding 500 kg - from one or several meltings of a given shift.

The shape and dimensions of the test bars and the procedure of cutting the samples are given in drawings 1 to 6.

The position (condition) of the samples for tensile test and determination of impact strength (elasticity) in test bars is not specified and is given in the drawings provisionally.

The type of test bar is specified by the manufacturing plant.

Fixed-tide test bar of thickness, equal or close to the predominant wall thickness of castings may be used for manufacture of large-size (big-pip) castings, requiring individual checking of mechanical properties.

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The manufacturing conditions of test bars and castings should be similar.

Heat-treatment of test bars or the blanks, cut from them for determination of mechanical properties is to be conducted in one charge with castings of a given batch.

Test bars may be cast in sand moulds (wet or dry) regardless of the method of manufacture of castings.

Note: It is permitted to cut samples from the castings at a distance not exceeding 30 mm from the external surface for determining the mechanical properties if test bar is not available or as per the requirement of the customer.

4.5. ✓ The tensile test is conducted on cylindrical-shape samples of diameter 10mm with calibrated length 50 mm as per GOST 1497-73.

The test may be carried out on samples of diameter 5 mm and calculated length 25 mm.

4.6. ✓ Impact strength (elasticity) is carried out as per GOST 9454-60 on samples of type \_\_\_\_\_ at normal temperature and as per GOST 9455-60 at lower temperatures-

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- ✓ 4.7. The mechanical properties of castings are checked on one sample for tensile strength and one sample for determination of impact strength ( elasticity )
- 4.8. Test results of samples, having defects, concerned with conditions of their casting ( cavities, foreign inclusions, net cracks etc ), conditions of machining or test conditions, are not taken into consideration. The defective samples are replaced with new ones, taken from the bars or casting.
- 4.9. In mass line production, the methods and scope of check of the chemical composition and mechanical properties are specified as per the standard technical documents.
- 4.10. Determination of Brinell hardness is carried out as per GOST 9012-68.
- 4.11. Determination of decarbonized layer is to be carried out as per GOST 22 1763-68.
- 4.12. Detection of casting defects is carried out by exposure to gamma-rays or X-rays test, Repasin test, magnetic flaw detection and other relevant methods.
- Upon agreement between the manufacturer and user.

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5. Marking, packing, Transportation  
and storage.

1.1. The castings should have a stamp of the manufacturing plant as well as additional marking in compliance with requirements of the technical documents on unmachined surfaces. Symbols of the marking may be cast, embossed or applied with unerasable paint.

In case, it is difficult to apply marking and stamp on castings due to the shape and dimensions, the batch of castings should have a label with marking, stamp of technical inspection and number of castings in a given batch indicated on it.

In small line production of castings, marked stamp them in compliance with the standard technical documents.

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5.2. Each batch of castings should be accompanied by a document on quality (certificate), in which the following should be stated.

- a. Trade-mark of the manufacturer.
- b. Number of the drawing or casting.
- c. Conventional designation of the casting.
- d. quantity and weight of castings.
- e. Melting No.
- f. Grade of steel
- g. Results of the final chemical analysis.
- h. Type of heat-treatment.
- i. Results of the spool-mechanical tests.
- j. Results of the special tests.
- k. Designation of the present standard.

5.3. Rules for packing, transportation and storage of castings are laid down as per the standard technical documents for a particular product.

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Table 2

Таблица 2

Grade of Steels Марки сталей	ХИМИЧЕСКИЙ СОСТАВ CHEMICAL COMPOSITION					Хром Chromium	Никель Nickel	Молибден Molybde num.	Ванадий Vanadium	Медь Copper	Титан Titanium
	Carbon Углерод	Manganese Марганец	Phosphorus Фосфор	Sulfur Сера	Silicon Кремний						
	not more than										
15Л	0.12-0.20	0.30-0.90	0.20-0.52	По табл. 3	По табл. 3	Не более 0.30	Не более 0.30	—	—	Не более 0.30	* not more than
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	-до-	-до-	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	0.010	Не более 0.30	Не более 0.30	—	—	Не более 0.30	
35ГЛ	0.30-0.40	1.20-1.60	0.20-0.40	0.040	0.010	Не более 0.30	Не более 0.30	—	—	Не более 0.30	
30ГСЛ	0.25-0.35	1.10-1.40	0.10-0.10	0.040	0.010	Не более 0.30	Не более 0.30	—	—	Не более 0.30	Upto
20Г1ФЛ	0.16-0.25	0.9-1.40	0.20-0.50	0.050	0.050	Не более 0.30	Не более 0.30	—	0.06-0.15	Не более 0.30	До 0.05
20ФЛ	0.11-0.25	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	
30ГСФЛ	0.25-0.35	1.00-1.50	0.10-0.60	0.050	0.050	0.30-0.50	Не более 0.30	—	0.03-0.12	Не более 0.30	
45ФЛ	0.42-0.50	0.40-0.90	0.20-0.52	По табл. 3	По табл. 3	Не более 0.30	Не более 0.30	—	0.05-0.15	Не более 0.30	
32ХФЛ	0.25-0.33	0.40-0.90	0.10-0.40	0.050	0.050	0.50-0.60	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	0.60-1.10	Не более 0.30	0.20-0.20	—	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	
35НГМЛ	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	
20ЛХЛ	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	
20ХГСНДАЛ	0.18-0.24	0.50-1.30	0.10-1.20	0.050	0.045	0.60-0.90	1.10-1.50	0.10-0.15	—	0.40-0.60	0.03-0.07

CHEMICAL COMPOSITION

Continuation of Table 2  
Продолжение табл. 2

Grade of Steels Марки сталей	CHEMICAL COMPOSITION				
	Carbon Углерод	Manganese Марганец	Silicon Кремний	Phosphorus Фосфор	Sulphur Сера
08ГДНФЛ	Не более 0,10	0,50—1,00	0,15—0,40	Not more than 0,035	
13ХНДФЛ	Не более 0,16	0,40—0,50	0,20—0,40	0,030	0,030
12ДН2ФЛ	0,03—0,16	0,40—0,50	0,20—0,40	0,035	0,035
12ДХН13ФЛ	0,10—0,18	0,30—0,55	0,20—0,40	0,030	0,030
23ХГС2МФЛ	0,18—0,24	0,50—0,80	1,80—2,00	0,025	0,025
25Х2Г2ФЛ	0,22—0,27	1,60—1,80	0,70—0,50	0,025	0,025

\* not more than

Chromium Хром	Nickel Никель	Molybdenum Молибден	Vanadium Ванадий	Copper Медь	Titanium Титан
Не более 0,30	1,15—1,55	—	0,06—0,15	0,80—1,20	—
0,15—0,40	1,30—1,60	—	0,05—0,12	0,65—0,90	0,01—0,10
Не более 0,30	1,30—2,20	—	0,08—0,15	1,20—1,50	—
1,20—1,70	1,40—1,80	0,20—0,30	0,08—0,15	0,40—0,65	—
0,60—0,50	—	0,25—0,30	0,10—0,15	Не более 0,30	—
1,80—2,20	Не более 0,20	—	0,15—0,20	Не более 0,30	—

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NOTE:

- The numerals and letter symbols designating the grades denote the first two numerals - average carbon content in 1/100 fraction of percent; numerals following the letter symbol - average content of element in percents; C - silicon;  
Г - Manganese; X - Chromium; Н - Nickel; Д - Copper; М - molybdenum; В - Tungsten;  
Т - Titanium; В - Vanadium; Л - Cast.

ORDNANCE FACTORY PROJECT, HYDERABAD.  
FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_ Date Typed : \_\_\_\_\_

Sheet No. : ~~23~~ 19 Date Verified : \_\_\_\_\_

2. When melting alloyed steel in furnaces with acid lining, the permissible content of sulphur and phosphorus may be increased to 0.010% each and in case of converter steel upto 0.06% each, provided all the other requirements of the present standard are complied with

3. Deviations in carbon content in the range of  $\pm 0.02\%$  are permitted.

The deviations, specified below for content of various elements alloyed with steel are permitted, provided all the mechanical properties and the remaining requirements of the present standard are fully met :

Silicon  $\pm 0.10\%$  manganese, chromium and nickel  $\pm 0.10\%$  each; molybdenum  $\pm 0.05\%$  vanadium  $\pm 0.03\%$ .

Deviations with respect to content of silicon, manganese chromium, nickel and copper from the specified norms are permitted in steels of those grades, in which they are not used as alloying elements, on condition that all the mechanical properties and other requirements of the present standard are provided.

4. Content of titanium less than the lower limits, specified in table 2 is not a criterion for its rejection, provided all the remaining requirements of the present standard are complied with.

Contd...4/--

Name of Typist : \_\_\_\_\_ Name of Verifier \_\_\_\_\_

# ORDNANCE FACTORY PROJECT, HYDERABAD.

## FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_

Date Typed : \_\_\_\_\_

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Date Verified : \_\_\_\_\_

5. In steels of grades 35xM $\Lambda$ , 30xHM $\Lambda$  and 35H $\bar{M}$  $\Lambda$  molybdenum may be substituted with tungsten (depending upon presence of one or the other element) as per the calculation: one percent of molybdenum is replaced with three percents of tungsten, on condition that all the requirements of the present standard are complied with. Such replacement can be carried out with out any additional formalities.
6. Steel castings of grades 35xM $\Lambda$  and 30xHM $\Lambda$  are manufactured only for special purpose.
7. Steels of grades 25x2 $\bar{1}$  2 $\Lambda$  and 23x C2M $\Lambda$  are modified additionally with composition HM-5 in quantity 0.1% weight of the melting.

Table 3

Group of castings	Content of admixtures in steel, %, max.					
	Sulphur			Phosphorus		
	Basic	Acid	Converter	Basic	Acid	Convertor
I	0.050	0.05	0.05	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	-

Contd...5/--

Name of Typist : \_\_\_\_\_

Name of Verifier : \_\_\_\_\_

Grade of Steel	Yield strength H/mm <sup>2</sup> (kgf/mm)	Ultimate strength H/mm <sup>2</sup> (kgf/mm)	Elongation	Reduction	Impact strength, kg cm/CM <sup>2</sup> аН
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NORMALIZING OR NORMALIZING BY TEMPERING

15Л	200 (20)	400 (40)	24	35	5.0
20Л	220 (22)	420 (42)	22	35	5.0
25Л	240 (24)	450 (45)	19	30	4.0
30Л	260 (26)	480 (48)	17	30	3.5
35Л	280 (28)	500 (50)	15	25	3.5
40Л	300 (30)	530 (53)	14	25	3.0
45Л	320 (32)	550 (55)	12	20	3.0
50Л	340 (34)	580 (58)	11	20	2.5
55Л	350 (35)	600 (60)	10	18	2.5
20ГЛ	300 (30)	550 (55)	18	25	5.0
20ФЛ	300 (30)	550 (55)	18	35	5.0
55ГЛ	300 (30)	550 (55)	12	20	3.0
20Г1ФЛ	350 (35)	550 (55)	17	25	5.0
08ГДНФЛ	350 (35)	450 (45)	18	30	5.0
30ХГСФЛ	400 (40)	600 (60)	15	25	3.5
30ГСЛ	350 (35)	600 (60)	14	25	3.0
35ХГСЛ	350 (35)	600 (60)	14	25	3.0
13ХНДФТЛ	400 (40)	500 (50)	18	30	5.0
20ДХЛ	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
12ДН2ФЛ	550 (55)	650 (65)	12	20	3.0
30ХН1МФЛ	550 (55)	700 (70)	12	20	3.0
12ДХН1МФЛ	650 (65)	800 (80)	12	20	3.0

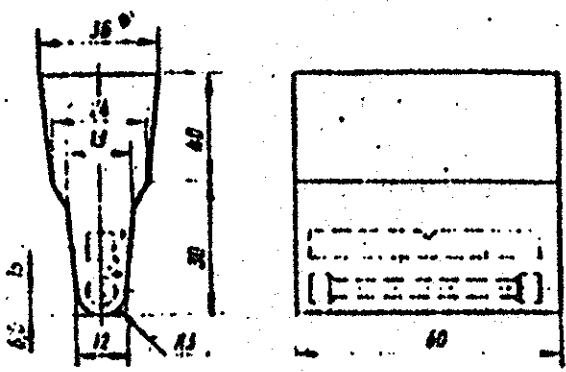
HARDENING AND TEMPERING

15Л	300 (30)	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)	860 (86)	15	20	2.5
35ГЛ	350 (35)	600 (60)	14	30	5.0
30ГСЛ	400 (40)	650 (65)	14	30	5.0
32Х06Л	450 (45)	650 (65)	10	20	5.0
40ХЛ	500 (50)	650 (65)	12	25	4.0
20ХГСНДМЛ	500 (50)	650 (65)	12	20	4.0
45ФЛ	500 (50)	700 (70)	12	20	3.5
20ДХЛ	550 (55)	650 (65)	12	30	4.0
35ХМЛ	550 (55)	700 (70)	12	25	4.0
33НМЛ	600 (60)	750 (75)	12	25	4.0
33ХГСЛ	600 (60)	800 (80)	10	20	4.0
30ХГСФЛ	600 (60)	800 (80)	14	25	4.5
30ХНМЛ	650 (65)	800 (80)	10	20	4.0
12ДН2ФЛ	650 (65)	800 (80)	12	25	4.0
12ДХН1МФЛ	750 (75)	1000 (100)	10	20	3.0
23ХГС2МФЛ	1100 (110)	1300 (130)	6	25	4.0
25Х2Г2ФЛ	1200 (120)	1400 (140)	5	25	4.0

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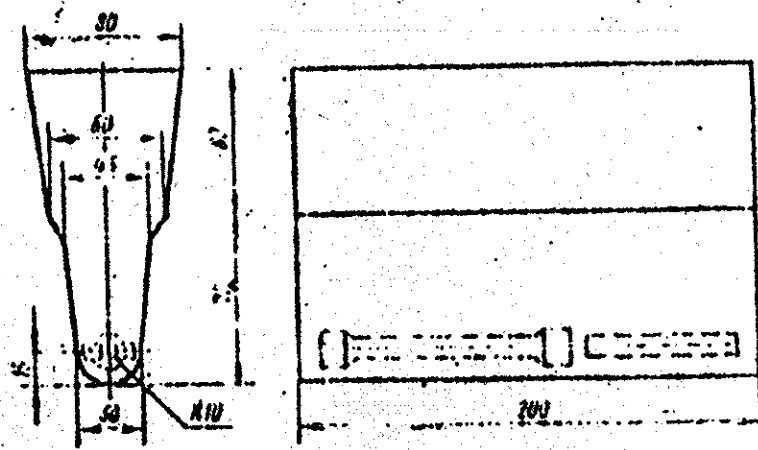
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Drig 2

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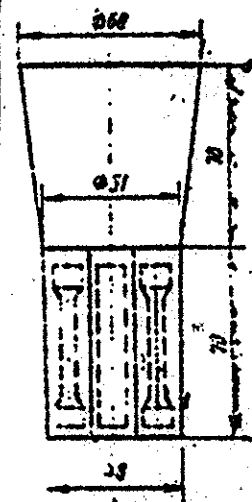


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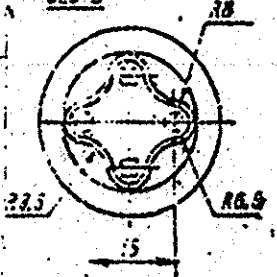
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FOCT 977-75

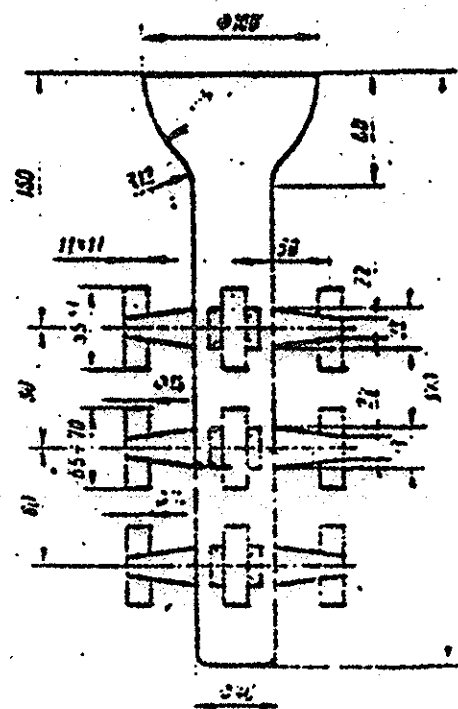


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Drig 4

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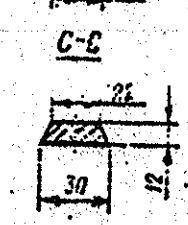
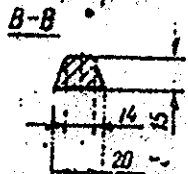
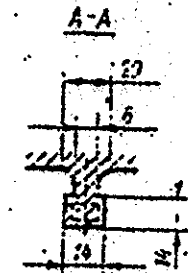
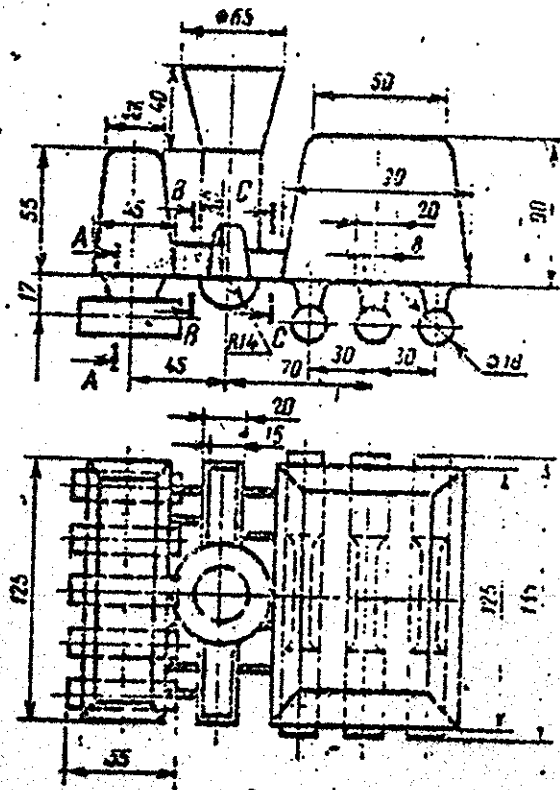
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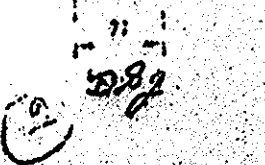
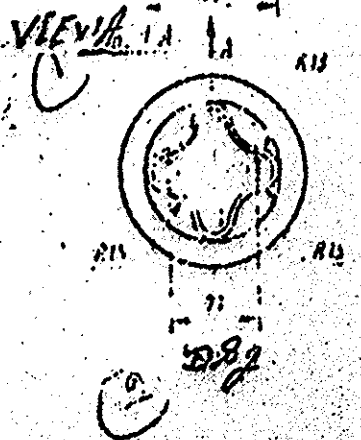
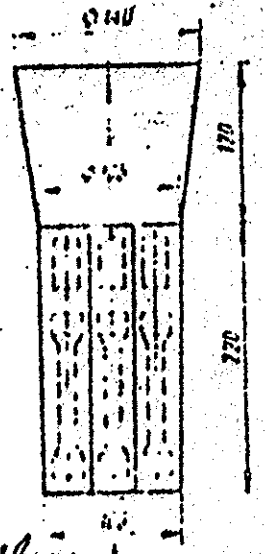
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DRG 16

ГОСТ 977-75



DRG 16



DRG 16

ПРИЛОЖЕНИЕ  
Рекомендуемое

Recommended  
Appendix

Condition of Heat-Treatment

Grade of Steel Марки стали	Режимы термической обработки			
	Нормализация и отпуск		Закалка и отпуск	
	Температура нормализации, °C	Температура отпуска, °C	Температура закалки, °C	Температура отпуска, °C
	Normalizing Temp.	Tempering Temp.	Hardening Temp.	Tempering Temp.
15Л	910-930	-	-	-
	910-980	670-690	-	-
20Л	880-900	-	-	-
	880-900	630-650	-	-
25Л	880-900	610-630	870-890	610-630
30Л	880-900	610-630	860-880	610-630
35Л ✓	860-880	600-630	850-850	600-630
40Л	860-880	600-630	860-880	600-630
45Л	860-880	600-630	860-880	550-600
50Л	860-880	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	870-890	570-600	920-950	570-650
20Г1ФЛ	930-970	600-650	-	-
20ФЛ	920-960	600-650	-	-
30ХГСФЛ	900-930	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	860-880	600-650	860-870	600-650
30ХНМЛ	860-880	600-650	860-870	600-650
35ХГСЛ	870-890	570-600	870-880	630-670



Condition of Heat-treatment Continuation  
Продолжение

Grade of Steel Марки стали	Режимы термической обработки			
	Нормализация и отпуск		Закалка и отпуск	
	Normalizing Temp	Tempering Temp.	Harden- ing Temp.	Tempering Temp.
35НГМЛ	—	—	860—870	600—650
20ДХЛ	850—890	560—600	880—890	560—600
20ХГСНДМЛ	—	—	910—930	640—660
68ГДНФЛ	930—970	—	—	—
	920—950	590—650	—	—
13ХНДФЛ	950—970	—	—	—
	900—920	530—560	—	—
12ДН2ФЛ	910—930	530—580	—	—
	Предварительная термическая обработка перед закалкой 940—950	—	910—920	560—600
12ДХН1МФЛ	940—960	—	—	—
	890—910	520—630	890—910	520—630
23ХГС2МФЛ	Предварительная термическая обработка перед закалкой 940—950	600—650	980—1000	200—230
25Х2Г2ФЛ	Предварительная термическая обработка перед закалкой 900—920	600—680	910—930	280—300

\* Preliminary heat treatment before hardening

Редактор  
Технический редактор  
Корректор

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**ORDNANCE FACTORY PROJECT, HYDERABAD.**  
**FINAL TRANSLATION SHEET FOR DRAWINGS**

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_ Date Typed : 24-11-83

Sheet No. : (A) Appendix Date Verified : \_\_\_\_\_

Group B 82

Cost 977-75 castings of structural unalloyed and alloyed steel. General specifications.

Emmendment No. 1

Item No. 1.1. Table 1. column " characteristics of castings"  
Group II. Omit words " and cyclic".

Group III. Replace words " in dynamic impact loads" with  
in cyclic and dynamic impact loads".

Item 1.1. Table 1. omit Note 1.

Item 1.1. Table 1. Note 2. Item Nos 2.9, 2.10, 2.16,  
3.4, 3.5, 5.3. Substitute word: production with " casting.

Item 1.2. Include in the revised edition.

Item 1.2. Group of the castings, grade of steel, additional  
standardized characteristics and requirements are to be  
specified in the drawing of the casting. During line  
production, the castings need not be divided into groups.

The list of standardized characteristics is to be  
specified in the drawing of casting".

Examples of conventional designations. Substitute word:  
"steel" with " casting " ( 4 times ).

Contd....

Name of Typist : M.S. JAYANTHI. Name of Verifier \_\_\_\_\_

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# ORDNANCE FACTORY PROJECT, HYDERABAD.

## FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_

Date Typed : \_\_\_\_\_

Sheet No. : B

Date Verified : \_\_\_\_\_

Supplement section 1 with an example of conventional designation:

" For castings from steel of grade 25<sup>A</sup> of group 1: casting 25<sup>A</sup>-1 GOST 977-78".

Item 2.2. State the note in the revised edition:

"Note. the feasibility of using converter steel should be stated in the standard technical documents".

Item 2.3. Table 2. change the content of carbon from 0.14 - 0.25 to 0.16-2.5 for steel of grade 20<sup>F</sup> 17<sup>2</sup>.

Item 2.3. Table 2. state Note 3 in the revised edition:

" 3. Deviations for fraction of total mass of carbon  
± 0.02%, silicon + 0.10%; manganese, chromium and nickel  
± 0.10% each, molybdenum ± 0.05 % , vanadium + 0.03%

are allowed in steels of those grades, in which they are used as alloying elements, on condition that all the mechanical properties and other requirements of the present standard are provided for.

Deviations for content of silicon, manganese chromium, nickel and copper from the specified norm are allowed in steels of those grades, in which they are not used as alloying elements, on condition that the mechanical properties and other requirements of the present standard including the requirements,

Contd...

Name of Typist : \_\_\_\_\_

Name of Verifier \_\_\_\_\_

Signature of Typist .

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# ORDNANCE FACTORY PROJECT, HYDERABAD.

## FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_ Date Typed : \_\_\_\_\_

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stated in the standard technical documents are complied with.

Note 6. Substitute words" of special purpose" with " of special product".

( Continuation of amendment for GDST 977-75 ).

Item 2.3. Supplement table 2 with note 8:

" 8. The fraction of total mass of sulphur and phosphorus may be increased to 0.01% each in steels of grades 20<sup>70</sup>, 35<sup>70</sup>, 30<sup>70</sup>, 40x<sup>2</sup>, on condition that all the mechanical properties are provided for in compliance with table 4.

Item 2.3. Table 9 Heading of the table. Substitute word: " Acid" with "Acid"

Item 2.5. Third para. Substitute words: ~~with~~ the remaining standardized properties" with " of additional standardized characteristics".

Item 2.5. Note 1. substitute words: "upon agreement between the manufacturer and user" with " in standard technical documents".

State notes 2 and 3 in the revised edition:

2. The possibility to ref contraction as the rated index instead of expansion has been specified in the standard technical documents.

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Name of Typist : \_\_\_\_\_ Name of Verifier \_\_\_\_\_



ORDNANCE FACTORY PROJECT, HYDERABAD.  
FINAL TRANSLATION SHEET FOR DRAWINGS

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Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_ Date Typed : \_\_\_\_\_

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Item 2.13. Amend words: " upon agreement between the manufacturer and user" to " as per standard technical documents".

Item 3.1. State the first para in revised edition:

"3.1. The castings are accepted in batches. of given batch consists of castings of one melting. when furnaces of volume 500 kg max are used, each batch is composed of castings of a one grade of steel one or several melts of melting of a given shift, which have undergone heat-treatment in one charge and certified with one document for quality".

Item 3.1. Supplement with a new para:

" In mass line production, batches of castings need kg-be formed".

Item 3.1. Omit note 3.

Item 3.5. supplement with note:

Note. In mass line production, checking of mechanical properties of the steel is carried out periodically as per the technical documents of manufacturing plant".

Item 3.5. Supplement the first para with words: " and meltings"

State the second third and fourth para in revised edition: " when the obtained results of the repeated tests are unsatisfactory, castings of a given batch and test bars (or sections of left after the first test

Contd....

Name of Typist : \_\_\_\_\_ Name of Verifier \_\_\_\_\_

Signature of Typist : \_\_\_\_\_ Signature of Verifier : \_\_\_\_\_

# ORDNANCE FACTORY PROJECT, HYDERABAD. FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_ Date Typed : \_\_\_\_\_

Sheet No. : F Date Verified : \_\_\_\_\_

are subjected to repeated heat-treatment and tests for mechanical properties in compliance with requirements of Item Nos 15 to 18.

Number of permissible complete heat-treatments should not exceed 3.

When the test results do not conform to the requirements of item 2.5 after the third heat-treatment all the castings of a given batch are rejected.

Item 3.7. State in the revised edition:

"3.7. Scope and periodicity of the tests of additional standard characteristics is set by the standard technical documents for each particular casting".

Item 4.1. Add the following or by other methods, which ensure accuracy of determination, envisaged by in the specified standards".

Item 4.2. First para. Omit the following: " in the middle of casting process of as a given melting".

State the second para in the revised edition as follows: when the steel is melted in furnaces of volume not exceeding 500 kg, it is permitted to take samples for analysis of chemical composition in the middle of the casting process of a melting. For this purpose test samples of mass 200g and more may be used.

Name of Typist : \_\_\_\_\_ Name of Verifier \_\_\_\_\_

Signature of Typist : \_\_\_\_\_

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# ORDNANCE FACTORY PROJECT, HYDERABAD

## FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_

Date Typed : \_\_\_\_\_

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Date Verified : \_\_\_\_\_

Item 4.4. Fifth para. Amend the following " of thickness, equal or close to the predominant wall thickness of the casting as per the drawing" with " dimensions and location of which are to be specified in the standard technical documents".

State the sixth para in the revised edition as follows:

" the manufacturing conditions of test bars and castings should be the same test bars on the blanks, cut from them for determining mechanical properties should undergo heat-treatment along with the castings of a given batch".

Item 4.12. Add " Internal " after the word detection".

Substitute: " upon agreement between the manufacturer and user" with " specified in the standard technical documents".

Appendix: column " Grades of steels". substitute grade: 08 HM with 08 H .

Appendix. State the heat-treatment made for steel of grade 30 x C<sub>1</sub> in the revised edition as follows:

1. Heat - treatment modes
2. Normalizing and tempering
3. Hardening and tempering
4. Grades of steel.

Name of Typist : \_\_\_\_\_

Name of Verifier \_\_\_\_\_

Signature of Typist

Signature of Verifier



# FINAL TRANSLATION SHEET FOR DRAWINGS

Description of Item : \_\_\_\_\_

Drawing No. : \_\_\_\_\_

Date Typed : \_\_\_\_\_

Sheet No. : H

Date Verified : \_\_\_\_\_

5. temperature of normalizing ,
6. temperature of tempering
7. Temperature of hardening
8. temperature of tempering
9. preliminary heat treatment before hardening 940-950.

Date of incorporation of amendment No. 1 01.12.77.

( Supplier No 1687 010777 USSR State standard appendix  
№ 8 year 1977)

1. Group B 52
2. Note for GOST 977-75. Castings of structural alloy steel and plain carbon steel. General specifications ( refer to amendment No. 1, yc No. 8 year 1977)
3. Place
4. Printed
5. amended
6. Line 63. Item 2.3. Note 3.
7. Carbon  $\pm$  0.02 silicon  $\pm$  0.10%
8. Carbon  $\pm$  0.02%. Deviations for fraction of total mass of silicon  $\pm$  0.10% are allowed.
9. Line 66. Appendix.
10. For steel of grade 30x c  $\emptyset$  .
11. For steel of grades 30x C  $\emptyset$  and 12 H2 $\emptyset$  .
12. (H yc No. 3 year 1978).

X.X.X.X.X

Name of Typist : M.B. JAYANTHI.

Name of Verifier \_\_\_\_\_

Signature of Typist :

Signature of Verifier :