	I-1214	NUMBER OCI 3-4365-79
		SHEET 1 OF 26
		SUPERSEDES

ALBUM No: 66

TECHNICAL DOCUMENT

INDEX: 84/084B711-01-40001

OCI 3-4365-79

TRANSLATED	Padmavath	V		Ordnance Factory Project Mailaram, Medak
AUTHENTICATED	Doigov/SS			
RETYPED	Sarodhi		27/1/87	
EDITED	Swamy		6/2/87	APPROVED 18.02.87
	NAME	SIGN	DATE	

1. BRANCH STANDARDS

Steel precision - investment castings.

TECHNICAL SPECIFICATIONS.

OCT 3-4365-79 Superseded 3-1182-73.

The present standard refers to steel precision investment castings used for the articles of this branch of industry.

The castings are classified as per GOST 977-75 and GOST 2176-77.

1. GRADES OF STEEL

1.1 The castings are manufactured from steel of grades 15Л, 20Л, 25Л, 30Л, 35Л, 40Л, 45Л, 50Л, 55Л, 40ХЛ, 35ХГСЛ, 35НГМЛ, 20ДХЛ, 08ГДНФЛ, 12Д,Н2ФЛ, 12ДХН1МФЛ, 23ХГС2М1ФЛ - as per GOST 977-75;

15Х13Л, 20Х13Л, 10Х18Н9ФЛ, 12Х18Н9ТЛ, 09Х17Н3СЛ, 09Х16Н4БЛ, 20х25Н19С2Л, 16х18Н12С4Т1ФЛ, - as per GOST 2176-77; 45ХЛ, 25ХГСЛ, 18ХН2Л, 15ХГН2СФЛ, 30ХГСЛ, 12Х2НВМЛ, 12Х2НВФЛ, 25Х2Г2ФЛ, 27ХГСНЛ, 10Х13Н2Л, 10Х32Н8Л, 32НКДЛ, 9 12Л, 7М, 513Л, 21-11-2.5, У7Л, У8Л, specified in Table 1.

REMARK: It is not permitted to use steel, grade 27ХГСНЛ for new production processes.

(*) Correct to Aluminium

TABLE-2

FRACTION OF TOTAL MASS OF ELEMENTS, %

GRADE OF STEEL	Carbon	Manganese	Silicon	Phosphorus (MAXIMUM)	Sulphur (MAXIMUM)	Chromium	Nickel	Copper	Vanadium	Molybdenum	Titanium	Niobium	Tungsten	Aluminium	Boron	Nitrogen	Cobalt	Cerium
45Х	0.40–0.50	0.50–0.80	0.17–0.37	0.040	0.040	0.80–1.10	–	–	–	–	–	–	–	–	–	–	–	–
25ХГСА	0.22–0.30	0.80–1.10	0.90–1.20	0.030	0.030	0.80–1.10	≤0.40	–	–	–	–	–	–	–	–	–	–	–
30ХГСА	0.25–0.35	0.80–1.10	0.90–1.20	0.030	0.040	0.80–1.10	≤0.40	–	–	–	–	–	–	–	–	–	–	–
18ХН2А	0.12–0.20	0.50–0.80	0.20–0.50	0.040	0.040	0.00–1.20	1.20–3.20	–	–	–	–	–	–	–	–	–	–	–
(*) [illegible]	0.14–0.19	1.20–1.40	0.20–0.42	0.030	0.030	≤0.30	1.80–2.20	1.20–1.50	0.10–0.20	–	–	–	–	–	–	–	–	–
12Х2Н4А	0.09–0.16	0.30–0.70	0.20–0.50	0.030	0.030	1.50–2.10	3.40–4.00 0.90–1.20	–	–	0.20–0.30	–	–	1.00–1.40	–	–	–	–	–
12Х2Н3ФА	0.09–0.15	0.30–0.70	0.17–0.37	0.030	0.030	1.30–2.40	2.80–3.20	–	0.10–0.20	–	–	–	1.00–1.40	–	–	–	–	–
25Х2ГСА	0.20–0.25	1.60–1.80	0.60–0.80	0.020	0.020	1.70–1.90	–	–	0.15–0.20	–	–	–	–	–	–	–	–	–
27ХГСНА	0.20–0.30	0.50–1.20	0.50–0.80	0.035	0.030	0.70–1.00	1.40–1.80	–	–	–	–	–	–	–	–	–	–	–
HIGH ALLOY STEEL																		
10Х13Н3А	0.07–0.18	≤0.60	≤0.60	0.030	0.030	12.00–14.00	1.50–2.00	–	–	–	–	0.10–0.25	–	–	–	–	–	–
10Х12Н9А 32НХА	≤0.10 ≤0.05	0.20–0.00 ≤0.40	0.40–0.80 0.02–0.15	0.035 0.020	0.025 0.020	30.00–34.00 –	7.00–9.00 32.00–33.50	– 0.60–0.80	– –	– –	– –	– –	– –	≤0.15 –	– –	– –	3.20–4.20	0.01–0.20
Э12А	≤0.04	≤0.20	≤0.20	0.030	0.040	–	–	–	–	–	–	–	–	–	–	–	–	–
ЭИ	0.16–0.22	1.00–2.00	≤1.00	0.030	0.030	19.00–21.00	24.00–26.00	–	–	0.90–1.10	–	0.00–1.10	4.50–5.00	–	As per Calculations 0.005	0.10–	–	As per Calculations 0.02
5Х3А	0.09–0.15	0.20–0.00	0.20–0.80	0.035	0.030	11.50–13.50	2.30–3.00	–	0.10–0.20	–	–	–	1.60–2.20	–	0.003–0.006	–	–	–
21–11–2.5	0.10–0.25	0.60–1.20	0.60–1.60	0.045	0.040	20.00–23.00	10.50–12.50	–	≤0.20	≤0.25	≤0.20	–	2.40–3.00	–	–	–	–	–
У7А	0.65–0.74	0.20–0.40	0.15–0.35	0.035	0.030	≤0.20	≤0.25	≤0.25	–	–	–	–	–	–	–	–	–	–
У8А	0.75–0.84	0.20–0.40	0.15–0.35	0.035	0.030	≤0.20	≤0.25	≤0.25	–	–	–	–	–	–	–	–	–	–

REMARKS: 1) Deviation of norms of chemical composition for steel, grade Э12А is not considered as [illegible] to be a defective symptom, if requirements of magnetic properties are observed properly.

2) While melting steel it is permitted to add for grade 5Х3А titanium upto 0.05% and for grade 21–11–25 upto 0.20%.

3) Deviation in contents (in %) is allowed for steel of grades У7А and У8А in the following way: For carbon +0.1; Silicon +0.15, and Manganese +0.1.

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REMARKS: 1. Deviation of norms of chemical composition for steel grade 912Л is not considered to be a defective symptom, if requirements of magnetic properties are observed properly.

2. While melting steel, it is permitted to add for grade 313Л titanium upto 0.05% and for grade 21-11-2.5 upto 0.20%.

3. Deviation in content (in %) is allowed for steel of grades Y7Л and Y8Л for carbon +0.1, Silicon +0.15, and Manganese +0.1.

2. TECHNICAL REQUIREMENTS.

2.1 The castings are to be made in compliance with the requirements of the present standard GOST 977-75, GOST 2176-77 and Technical papers approved in a set order.

2.2 Casting groups, grades of steel, strength, category for castings from alloyed and plain structural steel and additional requirements for cast part are specified in the drawing.

2.3 High-alloy steel for castings should be melted in induction furnaces with basic [illegible] lining. Alloyed and plain structural steel may be melted in furnaces with basic or acid lining.

2.4 The chemical compsotion of steel should meet the requirements of GOST 977-75, GOST 2176-77 and Table 1.

2.5 To provice required mechanical properties or to improve structure, castings are to be subjected to heat treatment under conditions set by the manufacturing factory.

Conditions for performing heat treatment of castings from alloyed and plain steel do obtain present strength. Categories are given in Table 2. Conditions for performing heat-treatment of castings from high-alloy steel are given in Table 3.

2.6 The main standardised characteristics of mechanical properties of steel are yielded strength or (ultimate breaking) strength, elongation and impact strength. After heat-treatment the norms of mechanical properties of steel for castings should meet the requirements specified in Tables 2 and 3.

REMARKS: The norms of mechanical properties of steel on samples cut from castings may be reduced within the limits specified in technical documents.

2.7 Shape, dimensions, mass, machining allowance, permissible deviations of dimensions as well as pattern drafts should meet the requirements of casting drawings.

Permissible deviations of dimensions are set in compliance with Tables 4 and 5.

(Standard-Technical, design and technological documents used for designing cast parts and making castings are considered to be technical documents).

Tolerances for casting radii should comply with those given below:

CASTING RADII, UPTO & Upto 3 Inclusive. (MM)	TOLERANCE, MM
Above 3 to 10 inclusive	1.0
Above 10 to 18 inclusive	1.5
Above 18 to 30 inclusive	1.8
Above 30 to 50 inclusive	2.5
Above 50 to 80 inclusive	3.0
Above 80	4.0

2.8 The castings are to be cleaned of sand buckle, scales and ceramics of moulds feeder heads and gates.

Procedures to eliminate gating system and to dress casting surfaces are specified by manufacturing factory. The gating system should be removed by flame cutting before final heat-treatment.

If there are no instructions in the drawing or approve

standard the remainders of gating system on the casting surface should not exceed 10mm after cutting.

REMARKS: Upon the agreement with customer representative, sand buckle may be present inaccessible and hard to reach places of casting.

2.9 Surface finish of cast surface should be ~~R3~~ R_z 80 μ maximum.

2.10 The total depth of decarbonized layer on unmachined surface should not exceed:-

THICKNESS OF WALL, MM	DEPTH, MM
Upto 3 inclusive	0.4
Above 3 to 6 inclusive	0.5
Above 6 to 10 inclusive	0.6
Above 10 to 15 inclusive	0.8
Above 15	1.1

The depth of decarbonised layer on surfaces to be machined as well as in places where hardness is checked should not exceed minimum machining allowence.

The necessity to check the depth of decarbonised layer of metal of castings set by Technical Specifications of the order.

REMARKS: Total depth of decarbonised layer is not standardized for casting, group I made of Steel grades 15Л, 20Л, 25Л.

2.11 On unmachined surfaces of castings the imprints of joints of moulds and pushers should not sink in the body of casting to a depth of maximum 0.5mm or project by more than 0.8mm.

TABLE -2

STRENGTH CATEGORY (1)	Yield limit $\sigma_{0.2}$ or σ_T (Kgs/mm²) (2)	Ultimate breaking strength σ_B HBs (Kgs/mm²) (3)	Elongation δ_5 % (4)	Impact Strength a_n, KJ/m² (Kgm/cm²) (5)	GRADE OF STEEL (6)	Standard Technical Document on grade of steel (7)	RECOMMENDED HEAT TREATMENT (8)
X20	195(20)	390(40)	24	490(5.0)	15 J	GOST 977-75	Normalization at 910 to 930 OR Normalization at 910 to 930°C and tempering at 670 to 690°C
	215(22)	410(42)	24	490(5.0)	10 J	GOST 977-75	Normalization at 880 to 900 OR normalization at 880 to 900°C and tempering at 630 to 650°C
	235(24)	440(45)	19	390(4.0)	25 J	GOST 977-75	Normalization at 880 to 900°C tempering at 610 to 630°C
X25	255(26)	470(48)	17	340(3.5)	30 J	GOST 977-75	Normalization at 880 to 900°C. tempering at 630 to 650°C
	275(28)	490(50)	15	340(3.5)	35 J	GOST 977-75	Normalization at 860 to 880°C tempering at 600 to 630°C
X30	295(30)	520(53)	14	290(3.0)	40 J	GOST 977-75	Normalization at 860 to 880°C tempering at 600 to 630°C.
	315(32)	540(55)	12	290(3.0)	45 J	GOST 977-75	Normalization at 860 to 880°C tempering at 600 to 630°C
	335(34)	570(58)	11	240(2.5)	50 J	GOST 977-75	Normalization at 860 to 880°C tempering at 600 to 630°C
X35	345(35)	589(60)	10	240(2.5)	55 J	GOST 977-75	Normalization at 840 to 860°C tempering at 600 to 630°C
	345(35)	440(45)	18	490(5.0)	60 J при -40°C	GOST 977-75	Double Two times normalization at 930 to 970 and at 920 to 950°C. tempering at 630 to 650°C.
X50	490(50)	589(60)	10	490(5.0)	1EX=2 J	OST 3-4365-79	Normalization.
X55	540(55)	637(65)	5	196(2.0)	25 J при -40°C	OST 3-4365-79	Normalization with high tempering
	540(55)	637(65)	12	290(3.0)	124 J при -40°C	GOST 977-75	Normalization at 910 to 930°C tempering at 630 to 650°C.

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
K65	637(65)	785(80)	12	290(3.0)	15Л/Н2ФЛ	OCT 3-4365-79	Double normalizing at 950 to 970°C and at 900 to 920°C, tempering at 520 to 550°C.
	637(65)	785(80)	12	250(2.5)	[illegible]	GOCT 977-75	Double normalizing at 940 to 960°C and at 890 to 910°C, tempering at 520 to 630°C.
	637(65)	–	5	390(4.0)	12Х2Н3ФЛ	OCT 3-4365-79	Normalizing at 890 to 910°C tempering at 510 to 540°C.
KT30	295(30)	490(50)	22	340(3.5)	25Л	GOCT 977-75	Hardening in water at 870 to 890°C tempering at 510 to 630°C
	295(30)	~~490(50)~~	17	340(3.5)	20Л	GOCT 977-75	Hardening in water at 860 to 880°C tempering at 610 to 650°C.
KT35	345(35)	–	16	390(4.0)	35Л	GOCT 977-75	Hardening in oil at 860 to 880°C tempering at 600 to 630°C.
	345(35)	–	14	290(3.0)	40Л	GOCT 977-75	Hardening in oil at 860 to 880°C tempering at 600 to 630°C
KT40	390(40)	735(75)	10	240(2.5)	45Л	GOCT 977-75	Hardening in oil at 860 to 880°C tempering at 550 to 600°C.
	390(40)	–	14	290(3.0)	50Л	GOCT 977-75	Hardening in oil at 860 to 880°C tempering 600 to 630°C
KT45	460(47)	840(86)	15	240(2.5)	55Л	GOCT 977-75	Hardening in oil at 790 to 810°C tempering at 580 to 600°C.
KT50	490(50)	637(65)	12	390(4.0)	40ХЛ	GOCT 977-75	Normalizing at 880 to 900°C Hardening in oil at 850 to 860°C Tempering at 600 to 650°C
KT55	540(55)	–	12	390(4.0)	20ДХЛ	GOCT 977-75	Hardening in oil at 800 to 830°C tempering at 560 to 600°C
	540(55)	735(75)	10	290(3.0)	30ХГСЛ	OCT 3-4365-79	Hardening in oil at 900 to 920°C tempering at 630 to 670°C

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
KT60	568(60)	785(80)	10	390(4.0)	35ХГЛ	ГОСТ 977-75	Normalization at 880 to 890°C, hardening in oil at 870 to 880°C, tempering at 630 to 670°C.
	588(60)	715(73)	12	390(4.0)	35ХМЛ	ГОСТ 977-75	Hardening in oil at 860 to 870°C tempering at 600 to 650°C
KT65	637(65)	835(85)	7	290(3.0)	45ХЛ	ОСТ 3-4365-79	Normalization at 880 to 900°C Hardening in oil at 850 to 860°C tempering at 600 to 630°C.
KT75	735(75)	980(100)	10	290(3.0)	12ДХН1ФЛ	ГОСТ 977-75	Hardening in oil at 890 to 910°C tempering at 520 to 640°C.
KT80	785(80)	-	10	290([illegible])	15ГВ2ФЛ	ОСТ 3-4365-79	Normalization at 950 to 970°C hardening in oil at 870 to 880°C tempering at 520 to 500°C
KT95	835(85)	980(100)	7	390(4.0)	35ХГСЛ	ГОСТ 977-75	Normalization at 880 to 900°C hardening in oil at 890 to 900°C tempering at 570 to 630°C
	835(85)	930(95)	8	250(3.0)	12ХГН2МЛ	ОСТ 3-4365-79	Hardening in oil at 890 to 910°C tempering at 540 to 560°C
KT100	980(100)	1274(130)	6	195(2.0)	27ХГСНЛ	ОСТ 3-4365-79	Normalization at 880 to 920°C hardening in oil at 880 to 900°C tempering at 300 to 400°C
KT110	1078(110)	1274(130)	6	390(4.0)	23ХГС2МФЛ	ГОСТ 977-75	Normalization at 940 to 950°C tempering at 600 to 650°C hardening in water at 980 to 1000°C tempering at 200 to 230°C
KT120	1176(120)	1372(140)	5	390(4.0)	25ХГС2НЛ	ОСТ 3-4365-79	Normalization at 900 to 920°C tempering at 650 to 670°C, hardening in oil at 910 to 930°C tempering at 180 to 200°C

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REMARKS: 1. Indices "K" and "KT" are conventional designations of strength category and the next two-figure number indicates the required yield strength. Index "K" is applied to annealed, normalised and tempered material and index "KT" is applied, only after hardening and tempering.

2. Given below are examples of conventional designations of casting made from structural steel depending upon strength category from steel, casting, group I.

Grade steel 35Л Casting $\frac{\text{I}}{35Л}$ $\frac{\text{OST 3-4365-79}}{\text{GOST 977-75}}$

Casting, group II, from steel grade 35Л with strength category K25*

Casting $\frac{\text{K25-II OST3-4365-79}}{35\ Л\ \text{GOST 977-75.}}$

Casting group III, from steel grade 12ДХН1МФЛ with strength category KT75*.

Casting $\frac{\text{KT75-III OST3-4365-79}}{12ДХН1МФЛ\ \text{GOST 977-75}}$

Casting, group III, from steel grade 12Х2НВМЛ with strength category KT85*

Casting 12Х2НВМЛ -KT85-III OST3-4365-79

*Strength category is contained in example of conventional designation of castings, groups II and III.

TABLE- 3

GRADE OF STEEL	Yield limit $\sigma_{0.2}$ MPa (Kgf/mm²)	Ultimate breaking strength σ_B, MPa, (Kgf/mm²)	Elongation δ, %	Impact strength a_H, kJ/m² (Kgf.m/Cm²)	Standard Technical Document on Grade of Steel	RECOMMENDED HEAT-TREATMENT
	MINIMUM					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15X1M1ФЛ	390(40)	540(55)	16	490(5.0)	GOST 2176-77	Annealing at 950°C, hardening in water, oil or air at 1050°C, tempering at 750°C.
20X13Л	440(45)	588(60)	16	390(4.0)	GOST 2176-77	Annealing at 950°C, hardening in oil or air at 1050°C, tempering at 750°C.
09X16H4БЛ	795(80)	930(95)	10	390(4.0)	GOST 2176-77	Normalization at 1050°C, tempering at 600 to 620°C, hardening in oil or air at 950 to 1050°C, tempering at 600 to 6[illegible]°C.
09X17H3СЛ	735(75)	980(100)	8	195(2.0)	GOST 2176-77	Annealing at 600 to 670°C, hardening in oil at 1040 to 1060°C tempering at 300 to 350°C.
16X18H12С4ТЮЛ	240(25)	588(60)	15	275(2.8)	GOST 2176-77	Hardening in water at 1150 to 1200°C
10X18H9Л	175(18)	440(45)	25	980(10.0)	GOST 2176-77	Hardening in water, oil or air at 1050 to 1100°C
12X18H9ТЛ	195(20)	440(45)	25	588(6.0)	GOST 2176-77	Annealing in water, oil or air at 1050 to 1100°C tempering at 660 to 820°C.
20X25H19С2Л	245(25)	490(50)	25	–	GOST 2176-77	Hardening in water, oil or air at 1100°C.
10X13H2Л	–	490(50)	10	195(2.0)	OST 3-4365-79	Hardening and tempering.
10X12H8Л	490(50)	637(65)	15	490(5.0)	OST 3-4365-79	Normalization at 1050 to 1100°C Hardening in water at 1070°C, tempering at 270°C
10X32H8Л	637(65)	835(85)	10	195(2.0)	OST 3-4365-79	Normalization at 1050 to 1100°C hardening in water at 1070°C, tempering at 650°C.
32ГСАЛ	215(22)	410(42)	23	1225(12.5)	OST 3-4365-79	Hardening in water, oil 833 to 850°C tempering at 310 to 320°C
912Л	–	265(27)	24	–	OST 3-4365-79	Normalization at 900 to 920°C, tempering at 670 to 690°C
7Л	390(40)	537(65)	7	98(1.0)	OST 3-4365-79	Hardening in water at 1050-1100°C

Contd....

TABLE-3

(1)	(2)	(3)	(4)	(5)	(6)	(7)
513Л	980(100)	1276(120)	7	147(1.5)	OCT 3.4365-79	Hardening in oil at 1030 to 1080°C, tempering ~~oil~~ or 540 to 620°C.
	735(75)	880(90)	9	195(2.0)	OCT 3.4365-79	Hardening in oil at 1030 to 1080°C tempering at 680 to 720°C.
21.11.2.5	-	490(50)	10	-	OCT 3.4365-79	Normalizing at 1050 to 1100°C, for 3 to 8 hours.
	-	470(48)	10	-	OCT 3.4365-79	Normalizing at 1040 to 1100°C, aging at 800 to 850°C for 5 to 10 hours, cooling in air.
УЗЛ	598(60)	-	7	-	OCT 3.4365-79	Isothermal annealing at 740 to 760°C (soaking depending upon the charge)), cooling in furnace upto 650 to 680°C. Maintain soaking at given temperature, and cooling in furnace.
У8Л	637(65)	-	5	-	OCT 3.4365-79	Isothermal annealing at 740 to 760°C, (soaking depending upon the size of charge). Cooling in furnace upto 650 to 680°C. Maintain soaking at given temperature and cooling in furnace.

REMARKS: 1. Hardness of steel, grade У7Л and У8Л, after annealing is HB ≥ 187; After hardening at temperature 790° to 860°C and cooling in oil, Hardness is HRC ≥ 55.

2. Given below are examples of conventionally designated castings, manufactured from high-alloy steel:

For Casting, Group I, from grade of Steel 20Х13Л : CASTING I OCT 3-4365-79 / 20Х13Л -GOST 2176-77

For Casting, Group II, from a grade of steel 10Х13Н2Л Casting 10Х13Н2Л - I OCT 3.4365-79.

For Casting, Group II, from a grade of Steel 20Х13Л : CASTING II OCT 3-4365-79 / 20Х13Л -GOST 2176-77

For casting, group II, from a grade of steel ТН; Casting ТН-II, OCT 3-4365-79.

For Casting, Group III, from a grade of steel 20Х13Л; CASTING III OCT 3-4365-79 / 20Х13Л -GOST 2176-77

For casting, group III, from a grade of Steel 10Х32Н8Л Casting 10Х32Н8Л - III OCT 3-4365-79.

3. Heat Coefficient of linear expansion of steel, grade 32Х6Л should be maximum 10^{6} K^{-1} within the range of temperature from 173 to 373 K.

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TABLE – 4

Maximum ~~LARGE~~ DIMENSIONS OF CASTING, MM

	PERMISSIBLE DEVIATIONS OF CASTING DIMENSIONS WITH NOMINAL DIMENSIONS, mm						
	UPTO 5	From 5 To 50	From 50 To 120	From 120 To 260	From 260 To 500	From 500 to 800	From 800 to 1200
Upto 260	± 0.4	± 0.5	± 0.6	± 1.0	–	–	–
From 260 to 500	± 0.5	± 0.8	± 1.0	± 1.2	± 1.5	–	–
From 500 to 800	± 0.6	± 1.0	± 1.2	± 1.5	± 2.0	± 2.2	
Above 800	–	± 1.2	± 1.5	± 2.2	± 3.0	± 4.0	± 5.0

q castings

Cont....d....

TABLE 5

DIMENSION OF CASTING, mm	Permissible Deviations in thickness unmachined walls and ribs with Nominal thickness, mm			
	upto 6	From 6 to 10	From 10 to 18	Above 18
UPTO 120	± 0.4	± 0.6	± 0.8	± 1.0
FROM 120 TO 260	± 0.6	± 0.8	± 1.0	± 1.2
ABOVE 260	± 0.7	± 0.9	± 1.2	± 1.5

Cont....d...

2.12 Shrinkage cavities whose depth exceeds the permissible deviations of casting dimensions specified in Table 4 are not to be permitted or unmachined surfaces of castings in places of increased thickness. (Bosses, lugs in corners, etc.,)

2.13 Cavities, slag impurities and other defects whose dimensions and amount exceed those specified in Table 6 or preset by approved standards are not permitted on unmachined surfaces of castings.

2.14 Cavities, expansion scabs, scabs and other defects exceeding allowance in depth are not permitted on castings whose surfaces are subjected to machining.

2.15 Significant defects detected after machining are permitted as the machined surfaces of cast parts.

Dimensions and number as insignificant defects are to be stipulated in technical specifications of the order or preset by approved test standards.

If there are no limits in technical specifications of the order or test standard, cavities exceeding those specified in Table 7 are not allowed on machined surfaces.

The depth of a cavity should not exceed 1/4 of wall thickness.

Single cavities with dimension of upto 1mm are not taken into account. Cavities located at a distance of atleast 20mm are considered to be single cavities.

TABLE 6

THICKNESS OF WALL mm	PERMISSIBLE DEFECTS IN CASTINGS GROUP I and II. Dimension of the Defect maximum, mm: Diameter or overall dimension	DEPTH maximum	Distance between defects minimum, mm	Number of defects in an area of 10 Cm², pc	Defects with dimensions not exceeding 1 mm: DEPTH mm	Defects with dimensions not exceeding 1 mm: Number of defects in area of 4 Cm², pc	PERMISSIBLE DEFECTS IN CASTINGS GROUP III. Dimension of defect maximum, mm: Diameter or overall dimension	DEPTH maximum	Distance between defects, minimum mm	Number of defects in an area of 10 Cm², pc	Defects with maximum dimension not exceeding 0.5 mm in dimension: Depth mm	Number of defects in an area of 4 Cm², pc.
				MAXIMUM							MAXIMUM	
Upto 2	1.5	0.5	10	6	0.3	12	1.5	0.5	10	3	0.3	1
From 2 to 8	2.0	1/3 of wall thickness	5	5	0.5	15	1.5	1/3 of wall thickness	6	4	0.3	5
					OR							
					0.3	20						
Above 8	3.0	1/3 of wall thickness max. ~~8 mm~~ but not more than 8 mm	3	5	1.0	15	1.5	1/3 of wall thickness	5	5	0.5	5
					OR							
	4.0	Also Same.	5	2	0.5	20	-	-				

REMARKS: Location of defects in one section on both sides of the wall of casting, is not allowed.

TABLE 7

THICKNESS OF WALL mm	DIMENSION OF THE CAVITY, MAXIMUM mm: I GROUP I	~~II to III~~ GROUP II and III	NUMBER OF CAVITIES ON CASTINGS, pc MAXIMUM: I GROUP I	~~II to III~~ GROUP II and III	Distance ~~DIMENSION~~ BETWEEN CAVITIES, mm, MINIMUM.
Upto 2	2.0	1.5	2	1	10
From 2 to 8	2.5	1.5	3	2	5
Above 8	3.5	1.5	5	3	5

~~REMARKS: It is not permitted to use steel, grade 2XX-XX for new production processes.~~

-x-x-x-x-

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The total area of a cavity should not exceed 1% of part surface. Cavities exceeding 1.5mm in dimension, and two pieces in amounts are not allowed in the threaded holes of upto M16. Cavities exceeding 2mm in dimension and three pieces, in amounts are not ~~to be~~ allowed in the threaded holes above M16. The distance between cavities should exceed the maximum size of the cavities by atleast two times. Deefcts are not permitted on the two extreme turns of the thread start.

2.16 In joints and casting rib --to-wall mating points, Porosity occupying more than 15% of given joint section area is not allowed if the drawing does not contain any other instructions.

2.17 Casting defects such as hot and cold cracks, cold laps, expansion scabs, non-metallic impurities and also defects whose number and dimension exceed those specified in items 2.11 to 2.15 are subjected to correction by welding up as per the technology of manufacturing factory.

2.18 Surface defects on machined surfaces of castings may be rectified by brazing, resin-epoxy compounds and other methods approved by customer representative.

2.19 The defects are to be corrected by welding before final heat treatment of castings. If defects are detected after final heat-treatment the possibility of welding up and necessity of further heat-treatment after welding up of defects are determined by technological documents of manufacturing factory.

2.20 In case of warpage the castings may be straightened in cold and hot conditions. Then castings are checked for absence of cracks.

Permissible warpage methods of correction and test as well as necessity of tempering to relieve stress after straightening are preset by manufacturing factory and specified in the drawing for casting of technological documents.

2.21 Norms of additional characteristics to be checked and special properties, not specified in this standard are to preset in design documents or technical specifications, for concrete castings.

3. ACCEPTANCE RULES

3.1 Castings are submitted for acceptance by batches. The batch of castings should consists of castings of one and the same grade of steel, one or some meltings conducted in furnaces having capacity of not more than 160Kg, performed with the use of one and the same mixture of raw materials, as per the same technological process which have been subjected to final heat treatment in one charge with test bars to determine mechanical properties.

It is permitted to form a batch of castings from one melting which have undergone heat-treatment in some charges under the same conditions. During this the actual conditions areto be registered by using automatic devices.

3.2 The list of characteristics to be checked for castings of all groups is compiled as per GOST 977-75(Section-I) and GOST 2176-77 (Section-1) Items 2.2 and 2.6 of the present standard.

3.3 Each melting of steel is subjected to check for compliance of chemical composition of metal of casting with the requirements of Item 2.4.

REMARKS: 1. It is permitted to check the contents of sulpur and phospherous from a shift melting when using steady technological process and the mixture of fixed composition.

2. If the results of chemical analysis are not satisfactory, repeated test is conducted for elements which fail to meet the Standard requirements in samples or castings.

3.4 Each batch is checked for compliance of mechanical properties of steel of castings with the requirements of Item 2.6 by manufacturing factory.

To check those characteristics of steel mechanical properties which should be tested, test bars cast or samples are cut from castings. The places from where the samples are cut, are specified by the manufacturing factory.

Rules for accepting castings as per mechanical properties are as per GOST 977-75 and GOST 2176.77.

3.5 Castings lagged behind the batch as well as castings rectified by welding up followed by heat treatment are accepted as per the results of test of main batch is, the conditions of heat-treatment are same in both ~~cases~~ Cases which may be checked by the readings of automatic devices or as per the satisfactory results of test of castings from other batches with same grade of steel which have undergone heat-treatment simultaneously with the castings lagged behind the batch.

3.6 Periodical tests are conducted to check the compliance of casting dimensions with the requirements of drawing (Item 2.7)

Checking intervals, sample size and rules for testing fixtures are specified by the manufacturing factory.

All dimensions given in drawing are checked on first casting made in new or reconditioned mould.

3.7 Appearance of castings is checked for compliance with reuirements of Items 2.8, 2.11 to 2.14 of the present standard by conducting complete test.

If castings are not made as per the above specified requirements, they should be rectified in compliance with th the requirements of items 2.17 to 2.20.

Surface defects correction methods which are not specified in Items 2.17 to 2.20, are preset in technical documents of manufacturing factory, approved by customer representative.

3.8 Castings are checked for compliance with requirements of Items 2.9 and 2.10 by conducting periodical or random tests.

Check intervals, sample size and rules for testing fitness of casting are set by the manufacturing factory as per technical specifications of order.

3.9 Random test is conducted to check compliance of castings with the requirements of Item 2.16, if other indications are not given in the drawing, for part.

Check intervals and scope of test are set by the manufacturing factory.

Type of test, and rules for testing fitness of castings or test standards are specified in the technical specifications of order. Castings are rejected if internal defects, whose number, dimension (size) and location exceed these specified in Item 2.16 and those set by test standards are detected.

3.10 Scope and intervals of check of the additional characteristics and special properties specified in Item 2.21 and

rules for testing fitness are indicated in technical specifications for concrete castings.

3.11 Each batch of castings is to be accompanied with standard quality certificates certifying acceptance. The certificate should contain:

a) Name or trade-mark and address of the manufacturer;

b) Name and address of consignee;

c) Description and conventional designation of castings;

d) Number of castings in batch;

e) Melting No;

f) Grade of steel;

g) Quantity or Mass of the castings;

h) Test results;

i) Designation of the present standard.

3.12 The unmachined surface of castings should have melting an No. and TID stamp certifying their acceptance.

4. TEST METHODS

4.1 Chemical analysis of steel is carried out as per GOST 22536.0-77 to 22536.6-77 and by procedures specified in GOST 977-75 and GOST 2176-77.

4.2 Procedure for selecting samples for chemical analysis is as per GOST 977-75 and GOST 2176.77.

4.3 Methods for testing mechanical properties and number of samples to be tested are specified in GOST 977-75 and GOST 2176.77.

The shape and dimensions of test bars should comply with those specified in drawings 1 to 4.

Depending upon the grade of steel the height of head section may be increased in comparison with that given in

drawings 1 to 4.

4.4 Dimensions are checked by marking out castings with measuring instruments, as templates and gauges which provide accuracy of measurement specified in the drawing.

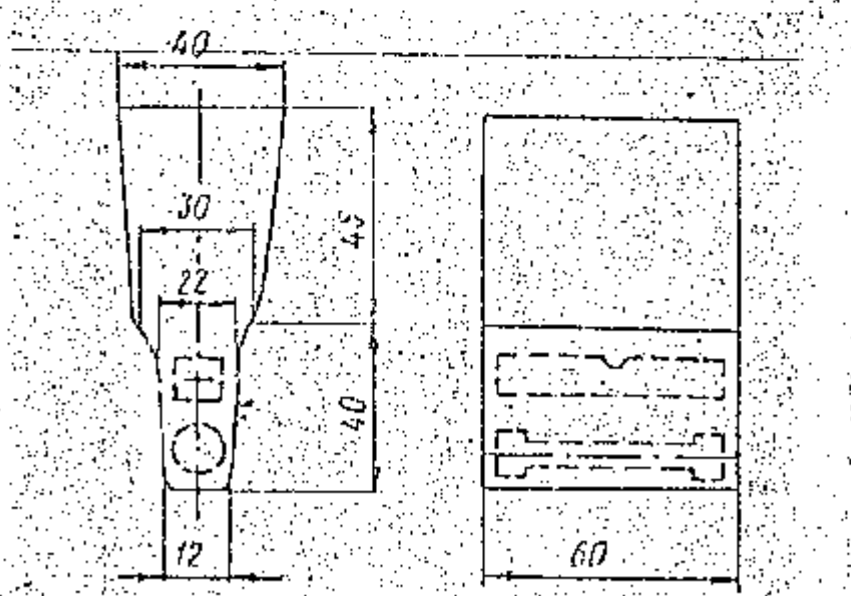
4.5 The absence of surface defects is checked by visual inspection without using magnifying instruments or X2.5 magnifying glass.

4.6 Surface finish of castings is checked by comparing the surface to be checked with surface finish of comparison specimen.

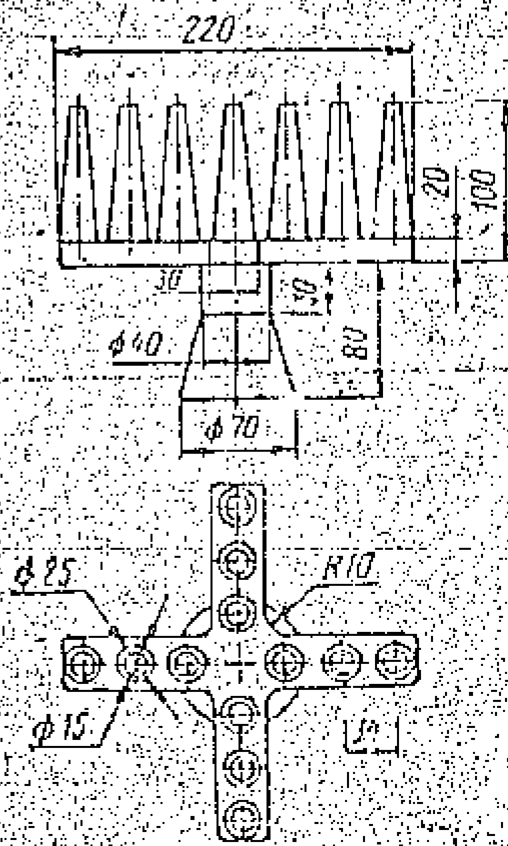
4.7 The depth of decarbonized layer of casting is checked as samples cut from thecastings.

4.8 Castings are checked for absence of internal defects as per item 2.16 by means of roentgenography, by cutting, breaking or by using other methods specified in technical documents of manufacturing factory. The defective section should be compared with test standard.

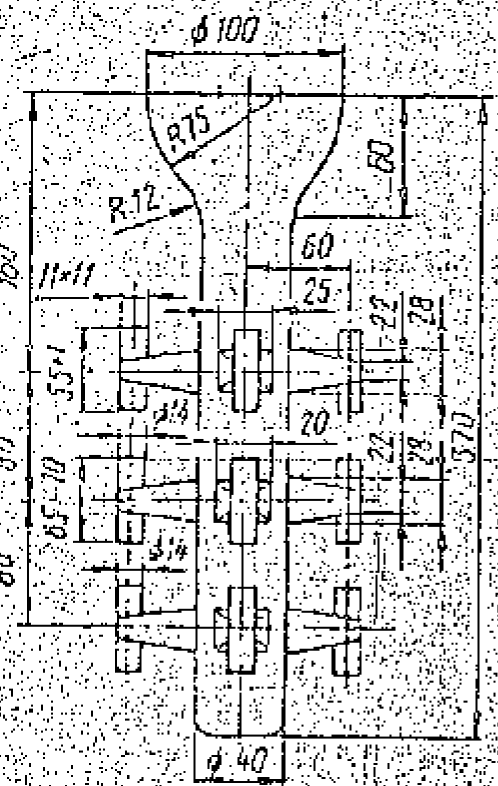
Test standard and method used for detecting defects must be approved by the customer representative.



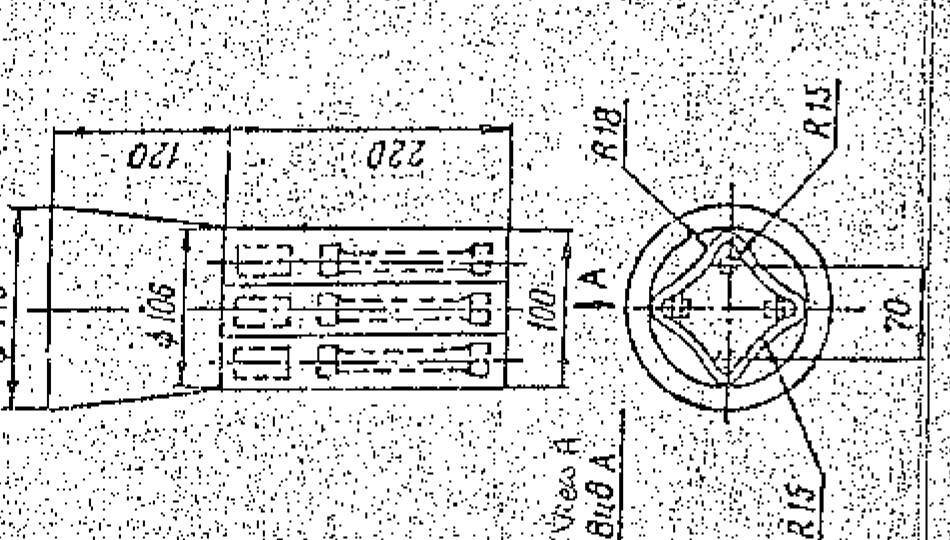
DRAWING 1
Черт. 1



DRAWING:2
Черт. 2



Черт. 3
DRAWING.3



Черт. 4 DRAWING. 4

4.9 Methods used for testing hardness, heat-resistance tests, intercrystalline corrosion resistance, tension tests and impact strength tests at increased and reduced temperature as well as long term strength test procedures are as per GOST 977-75 and GOST 2176-77.

4.10 Methods for testing special properties, not specified in section 4 are to be specified in technical documents for specific castings.

5. MARKING, PACKING, TRANSPORTATION AND STORAGE.

5.1 Marking should be applied on castings in compliance with requirements of section 5, GOST 977-75 and GOST 2176-77.

5.2 Packing, transportation and storage procedures should guarantee protection of castings from mechanical damages, warpage, and corrosion, and should be specified in the technical documents for castings.

6. MANUFACTURER'S GUARANTEE

6.1 The manufacturer should guarantee compliance of steel castings to be manufactured with the requirements of the present standard, GOST 977-75 and GOST 2176-77.

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Ordnance Factory Project Mallaram, Medak.	I-1214	NUMBER OST3-4365-79
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OBSERVED MISPRINTS IN OCT3-0365-79

in Russian original which have been taken into consideration during translation

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