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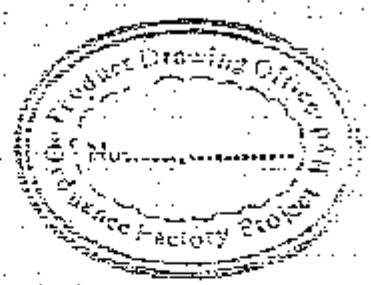

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TECHNICAL REQUIREMENTS
FOR CASTING AND ACCEPTANCE OF
CAST-IRON PANDS
TTMA-416
50(E) 755

TRANSLATED	G NIRMALA		19 12 85	Ordnance Factory Project, Hyderabad.
AUTHENTICATED	A.L.SUNDERRAY		20 12 85	
TYPED	P GIRI KUMAR		10 12 85	
EDITED				APPROVED
	NAME	SIGN	DATE	

Ordnance Factory Project Hyderabad.	2/12	NUMBER TTO/A-416
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INTRODUCTION:

1. The present technical requirements deal with the Cast parts made of grey and special grades of cast-iron.

Cast parts made of cast-iron of grades АЧС-1 are accepted in compliance with GOST 1585-79 .

Cast parts made of grey cast iron are accepted in compliance with GOST 1412-79. Parts made of cast-iron ХНБ and СЧМ-1 are accepted as per the present technical requirements.

2. Distribution of cast-parts which are specified in the present technical requirements according to grades of cast-iron is given in Table no.1.

Table:1

Sl.No.	Number of parts	Description of parts	Grade of cast-iron
1.	765-12-136	sealing ring	СЧМ-1
2.	765-12-175	bushing	АЧС-1
3.	765-12-226	sealing ring	ХНБ-
4.	765-17-1	bushing	АЧС-1
5.	765-17-4	bushing	АЧС-1
6.	765-17-5	bushing	АЧС-1
7.	765-17-6	bushing	АЧС-1
8.	765-17-7	swing arm	АЧС-1
9.	765-17-8	bushing	"
10.	765-17-9	bushing	"
11.	765-17-10	bushing	"
12.	765-17-218	"	"
13.	765-17-252	"	"
14.	765-17-300	"	"
15.	765-17-304	"	"
16.	765-32-84	ring	СЧМ-1 ХНБ
17.	765-34-152	bushing	АЧС-1

1	2	3	4
18	765-54-71	bushing	Aqc-1
19	765-64-545	roller	
20	765-17-407	bushing	Aqc-1
21	765-17-439	bushing	Aqc-1

3. The present technical requirements and drawings of castings and parts listed above are the only documents for their acceptance and are the guide lines for their manufacture.

II. GENERAL:

4. Parts are cast as provided by the approved production process.

Sealing rings of cast-iron СЧ and ХНВ are manufacture from ring-pots cast in rods, with metal smelled in electric furnace.

Other parts are cast from cast-iron smelted in cupola electric furnace or by duplexing process:

Cupola to electric furnace.

5. Chemical composition and mechanical properties of cast-iron should comply with the instructions of drawing and table no. 2

Table No. 2

Contents of Elements, Percent													Mechanical Properties	
Grade of cast iron	C (free)	C (fixed)	Si	C+Si	Mn	S max.	P	Cr	Ni	Cu	W	Bending strength kg/mm²	Sag mm	Brinnel Hardness BHN	Dia. of indentation
Cy 20	3.1 3.4	-	1.8 2.2	5.0 5.3	0.8 1.2	0.12	0.2	0.3	0.5	-	-	40	3	170 255	4.6 3.8
A4C-I	3.2 3.6	-	1.6 2.2	-	0.9 1.2	0.12	0.15 0.30	0.2 0.40	0.3	0.8 1.6	-	-	-	180 241	4.5 3.9
XHB	2.9 3.2	0.65 0.90	1.4 1.9 a	-	0.6 1.0	0.10	0.4 0.65	0.3 0.6	0.6 1.4	-	0.5 0.8	-	-	283 241	3.6 3.9
Special Cast Iron	3.0 3.4	-	1.8 2.2	-	1.8 2.2	upto 0.15	0.3 0.6	0.2	0.3	-	-	-	-	207 269	4.2 3.7
C4M-I	2.9 3.2	0.65 0.9	a 1.5 1.8	a 4.3 4.9	a 1.2 1.5	a 0.12	a 0.3 0.6	a 0.2 0.4	a 0.3 0.6	-	-	-	-	302 241	3.5 3.9

a - amended

NOTE: 1. Chemical composition of grey cast-iron is not a cause for rejection if hardness and mechanical properties comply with norms.

2. For cast iron of grade 440-1 specified content of chromium and copper is compulsory and its deviation is a cause for rejection. Despatch of parts with deviations in other elements is decided by the plant chief metallurgical engineer if the structure and hardness of the parts are normal.

3. For cast-iron of grades 417 and XH5 content of P, S free C is compulsory and deviations from the specified limits is a cause for rejection. If the structure and hardness are normal the deviations may be allowed for the remaining elements but only with the permission in writing by chief metallurgical engineer as per the table 3.

Table: 3

Grade of cast iron	2	3	4	5	6	
	±0.10	±0.2	+0.15 -0.10	+0.10	+0.30	
	+0.15 -0.10	+0.2	±0.15	+0.30	+0.30	+0.20

4. Despatch of meltings made of special cast-iron having deviations in 7

Within the limits of ±0.1 for production is decided by the plant chief metallurgical engineer in each individual case. Specified content of M_n S and P is compulsory and deviation from the specified limits is a cause for rejection.

5. Rockwell hardness for cast-iron of grades СЧП and ЖЧ6 should be HRB from 97 to 104. If the structure of metal of grade ЖЧ6 is normal, then hardness of ring pots and piston rings may be upto Rockwell 107 and upto 3.4 mm impression.

6. Chemical composition and mechanical properties of grades of grey cast-iron are determined on castings from every batch is compliance with GOST 1412-79.

7. Chemical composition of castings made of special cast-iron АЧС-1, СЧП and ЖЧ6 is determined on every melting by laboratory. One shift work of melting unit at the same modes is considered as one melting if working of the furnace has interrupted modes casting cast with cast-iron of one change are considered as one melting.

Chemical composition of grey cast-iron is determined as per the instructions for smelting the cast iron in cupola or electric furance.

8. Before forwarding to machine shop the castings should be cleaned from burns, forming sand, should be cut and fettled with every wheel the places of burrs, pourings, risers and air-gates.

9. The castings should be without hard spots cavities, cracks, cold laps and other defects and also without configuration and dimensions misalignment Variations from tolerances for them both on places to be machined and not to be machined according to the requirements for casting drawing and part drawings.

NOTE: The permissible castings defects on castings and parts after machining are specified in sheet number 13 of the present technical requirements.

10. Castings made of cast iron of grade 4Yc-/ should have macrostructure as per

11. Microstructure for 4Y7 and X#8 should consist of continuous pearlitic base of numbers P8, P9, P10, P11, P12, P13, P14, graphite precipitations of numbers P3, P4, P5, P6, P7 and P8 and inclusions of double phosphide eutectic of numbers #1, #2 and #3 against the standard scale of central plant laboratory (enclosed).

The following are not allowed:

a) structural free cementite (hard constituent) in perlite of numbers P15, P16, and P17.

b) Structural free ferrite given perlite of numbers P1, P2, P3, P4, P5, P6 and P7

c) Binary phosphide eutectic of numbers #4 and #5

d) Ternary phosphide eutectic at the rate of not more than 2 inclusions in the field of vision at 100 power magnifications.

e) Graphite of numbers. P1, P2, P9, P10, P11, P12, P13, P14, P15, and P16

The following are allowed;

a) Perlite of transition number P7 provided it occurs locally at the rate of not more than 3 localities with each specific area of not more than 10% and their total area is of not more than 20% of field of vision at 400 power magnification.

b) Binary phosphate eutectic of number #4 in the form of small localities uniformly distributed i.e without congregating in one place of micro-section metallographic specimen if their total area does not exceed 20% of the specimen area.

c) Ternary phosphidecarbide eutectic upto 25% of total number of phosphides for cast-iron of grades. X H B

1.2. Numbers of melt and wherever is possible numbers of parts should be cast on castings in compliance with the drawing instructions.

Checking norms of castings:

13. The casting intended for despatch should be checked for:

a) For mechanical properties against reference cast bars, It consists in bending for castings of the given melting max of cast iron.

b) The first check is carried out on 3 bars, If check results for bars are satisfactory then the melting is considered to be fit. In case of unsatisfactory check results for bars. Check is carried out on 3 more other bars.

If during duplicate taste one gives unsatisfactory results then all the castings of the melting under check are rejected.

NOTE: Check results for the specimens with defects are not considered and the specimens are replaced by spare ones from the same melting.

b) For casting defects which are not permitted by the casting drawing of the part and part technical requirements. check 100% of castings.

NOTE: Any defects which can be rectified by machining are allowed on castings surfaces to be machined.

c) For compliance of dimensions and shape with the casting drawing in external indications (cross-joint etc) by 100% check and in all dimensions by marking-out periodically as per the TID schedule.

d) For Brinell hardness (P=750g Ø= 5m) on surface to be machined casting at the rate of 10% of the batch are to be checked. In case of deviations 100% of castings of the given designation are checked.

Bushings of grade AЧС-1 may be checked as per rockwell method (scale B). Ring Pots of Sealing rings are to be subjected to 100% checking for hardness.

e) For absence of hard-spots by filing faces of casting with fire-cut file 5% of a batch should be subjected to this check. If hard-spots are found on atleast one casting, then all the castings are to be checked, casting with hard drop are rejected.

NOTE: Hard drop may be rectified by a special heat-treatment modes provided it results compliance with the technical requirements for hardness and micro-structure.

f) For microstructures of casting made of cast-iron of grade AЧС-1 check is carried out on 3 pieces fit as per hardness and taken from every melting as well as from every designation when cast from cupola or electric furnace. If the microstructures do not comply then it is rechecked on doubled number of casting. If the microstructure is unsatisfactory when rechecked then the batch castings under check is to be rejected.

g) For microstructure of special cast-iron parts

Check is carried out on 3 castings from a melting in sections which are most tend to formation of cementite (hard spots) at a distance of 5 to 10 mm from the face.

Microstructure should consist of slightly whirling lamellar graphite of medium as well as of small size, coarse lamellar graphite locations are allowed. Metallic base is thin lamellar or medium lamellar pearlite type. Ferrite is allowed upto 5% Phosphide eutectic in form of seperate inclusions is allowed as locations of ternary phosphide eutectic (as per according to the enclosed central plant laboratory scale).

14. The accepted castings are stamped with TID stamp and forwarded to machine shop and accompanied by invoice certified by TID.

Checking norms for ring plots:
(As per hardness, hardness, Micro structure)

15. Ring pots with cracks shore-run, cold lap, cavities and other defects beyond the allowance limits for machining are rejected during knock-out.

16. Complete melting is devided into batches and each ring pot is numbered:

The melting is devided into batches in the fowlling way:

a) first batch is ring pots number of 1 to 60
b) second batch is ring pots number of 61 to 120
c) third batch of the remaining badles in ring-pots of numbers 121 etc.

17. The last ring-pot of the last ladle from every batch should be partly broken from side of the bottom face and tested for hard spots.

18. If hard-spots are absent in the ring pots under test then their hardness is checked in three points: in the centre of lateral surface and on bottom face in two diametrically opposite points are a between the gates is fettled to a depth of 1.5 to 2.0m. Hardness in any of the three measuring points should be within the limits of HB .175 to 1.95m (P=750kg, D=5mm) and t = 10 sec. Rd. ... of HB ...

19. If the depth of hard spot in the ring-pots under the test is not more than 20m the hardness is checked at the same points. Hardness in the centre of lateral surface should be within the limits of HB 1.75 to 1.95m and at the measuring points on bottom face should be H_B = 1.6m (min) that makes up HB 263 max the part of ring pot with hard spots is removed during machining.

20. If hard spot of depth exceeding 20m is present in the ring pot under the test then the batch is rejected.

21. The last ring-pot of the last ladle from every batch or its remaining recognised as fit as per hardness and hard spot is forwarded to the laboratory for checking. Laboratory Ring pots check

22. Two longitudinal plates of width 15 to 20m are cut out from the checking ring-pots.

23. One area on the external surface of one plate and two area on the external surface of another are scraped with emery along the total length of ring-pot.

24. Number of melt and number of ring-pot are stamped on them.

25. One plate is ground on one-side. Brinell hardness is measured in four points and rockwell hardness (A-scale) in eight internal points along the length of plate leaving atleast 20m from its edges. Brinell hardness should be 1.75 to 1.95m and rockwell hardness should be 97.0 to 104.

26. On other plate two transverse cuts are made along the edges of one of the area with number of melt and ring pot and the area is broken out.

27. Microsection is made on one of cuts of the broken out area and it is tested within the range of 2m zone from the edges and also at a depth of 2m.

28. In case of satisfactory results of microstructure check the melting batch is accepted.

In case of unsatisfactory microstructure check results all the ring pots of the last ladle of the testing batch are rejected and last ring-pot of previous and next ladle are forwarded for rechecking. In case of unsatisfactory structure even in the case the batch of ring pots under check is rejected.

29. A chip is drilled from the remaining of the second plate and complete chemical analysis is carried out. The chemical composition should comply with the requirements specified in table No.I

30. The data on hardness microstructure and chemical analysis are entered in the laboratory book for ring pot checking and in certificate for melting. The certificate for melting should be forwarded to TID of foundry not latter than one day after receiving

the casting ring-pots.

31. After recieving the conclusions about fitness of castings all the ring pots are tapped with hammer. Ring pots with dull sound confirming the presence of cracks should be rejected.

3.2. Numbers of melt and ring-pots are stamped on protected area of the boss of upper face of ring-pots.

33. Personal bill (certificate) indicating number of melt and number of ring-pots in it is made up for melting.

34. The melting ring pots accepted according to melting are forwarded to machine shop accompanied by certificate

CASTING DEFECTS ARE ALLOWED AFTER MACHINING:

35. Casting defects are not allowed on working surfaces of bushes and sealing rings.

36. Two cavities with a maximum diameter upto 3mm an depth upto 1m are allowed on non-working surfaces of bushings if they are located not closer than 5m from the ~~edges~~ edges of holes and butt-ends. The distances between the cavities is not less than 10m.

Scale of ~~grey~~ grey cast-iron microstructures of a ring pot castings.

*or

stands for "at hunderd power magnifications etc