

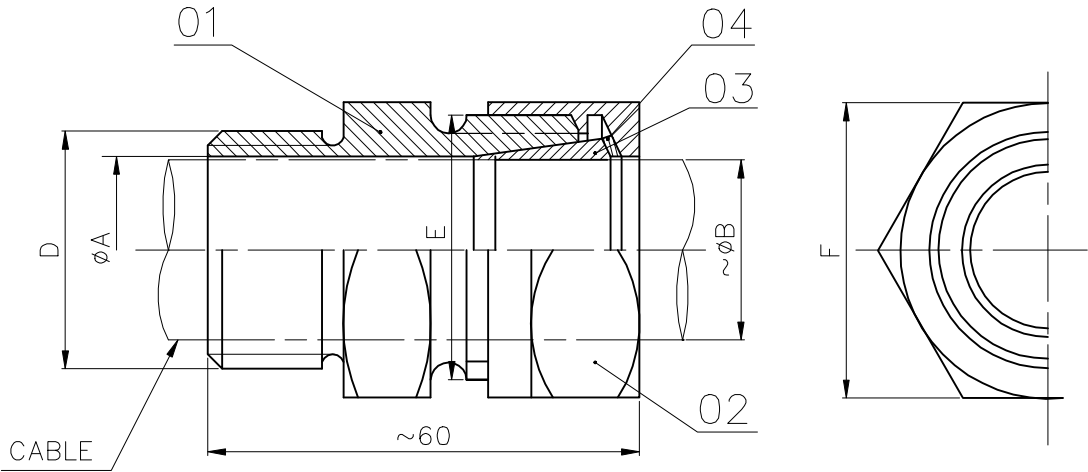
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ALL DIMENSIONS ARE IN MILLIMETRES.

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

REV	DATE	ALTERED	J.S
05	04.08.11	CHD & APPD	R.S. & K.S
VARIANT No. 03 CODE 96353115 REMOVED. DRAWING CONVERTED AS CAD.			
DCN:SB: 801133 / 5012916			

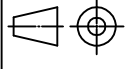
VARIANT No.	øA	øB	CABLE SIZE	'D'	'E'	'F'	MATERIAL CODE
01	25	24.5	12CORE 2.5mm ²	M33X2	M36X3	41	963532220000
02	20	~18.6	3CORE 6mm ²	M33X2	M36X3	41	963532230000



NOTE:—

FERRULE ID (øB) SHOULD BE SUITABLE FOR THE CABLE SIZE.

04	SEAL PLATE	M.S.GALVANISED	0.01	1
03	FERRULE	NITRILE MOULDED RUBBER	0.01	1
02	ADAPTER	M.S.GALVANISED	0.01	1
01	CONNECTOR	M.S.GALVANISED	0.02	1
ITEM	DESCRIPTION	MATERIAL	WEIGHT (kg)	QTY (Nos)

NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No	
 365-127 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.						DRN	NAME J.SANKAR	SIGN J.S	DATE 04.08.11	NO.OF VAR
						CHD	RAVINDER SINGH	R.S.	04.08.11	
						APPD	K.SRIDHARAN	K.S	04.08.11	
DEPT SB		SCALE	WEIGHT (KG).	REFERENCE INFORMATION					NO. OF ITEMS	
CODE 330		NTS	--							
TITLE				CARD CODE	DRAWING NO.					REV
CABLE GLAND				U 01	4-20-001-00781					05



365 - 148

**PRODUCT ENGINEERING / V&SB
PURCHASE SPECIFICATION FOR
CABLE GLANDS**

SPEC:SB:0012

PAGE 01 OF 01

REV:04

13.09.14

1.0 Component : Double compression cable glands

2.0 :

Type	Material codes	Material	Size
(i)	963535180000	Brass body nickel plated	Suitable for 3C X 2.5 mm ² armoured Cable of OD 14.5 mm with nipple entry Size of M20 x 1.5. Ferrule suitable for armoured wire diameter 0.8mm.
(ii)	963535180100		Suitable for 3C X 6 mm ² armoured Cable of OD 20 mm with nipple entry Size of M20 x 1.5. Ferrule suitable for armoured wire diameter 0.8mm.
(iii)	963535180200		Suitable for 3C X 2.5 mm ² unarmoured Cable 11 +0.65 /-0.40 mm with nipple entry Size of M20 x 1.5. Ferrule suitable for unarmoured wire diameter 0.8mm.

3.0 Area classification : Non flame proof

4.0 Document required for acceptance : Compliance certificate.

5.0 Packing : Suitably packed to avoid thread damages.

6.0 Critical check list :
1. Compliance certificate
2. Thread size
3. Cable entry size

REV: 04

For material Code 963531580200 cable OD included.

PREPARED
(J. SANKAR)

CHECKED
(S.K.GUPTA)

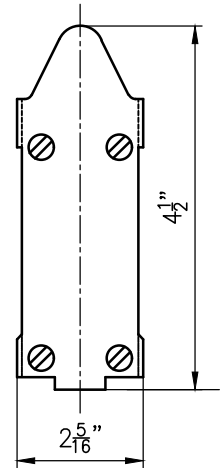
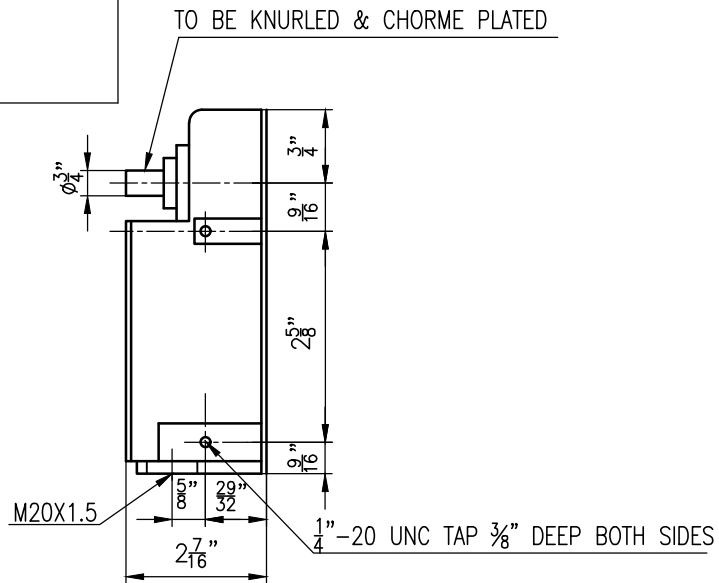
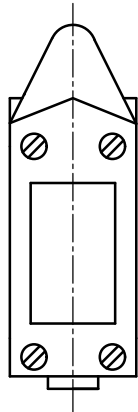
APPROVED
(HIRENDRA RAUT)

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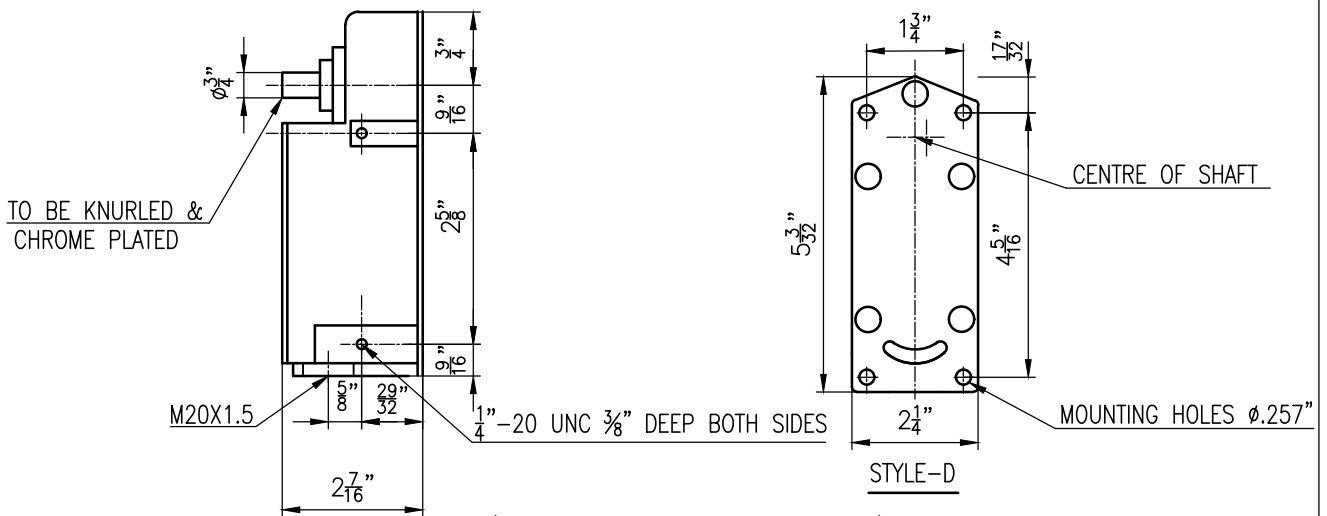
FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

REV	DATE	ALTERED	J.S
02	19.12.20	CHD & APPD	J.S & R.R
IN STYLE-D, DIMENSION $1\frac{3}{4}$ " WAS $1\frac{1}{4}$ " ONLY.			
DCN:SB: 802579/5026744			

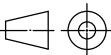


STYLE A BASEPLATE SHOWN (WALL BLOWER SUA 5)

OTHER BASE PLATE FOR SURFACE MOUNTING



(LONG RETRACTABLE SUD 1 & SYD 5)

-	-	-	-	-	-	-	-	-	-
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
 365-127 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI- 620014.					DRN	NAME J.SANKAR	SIGN J.S	DATE 02.02.17	NO.OF VAR
					CHD	J.SANKAR	J.S	02.02.17	
					APPD	HIRENDRA RAUT	H.R	02.02.17	
DEPT SB			SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS				NO. OF ITEMS
CODE 330			NTS	-	-				
TITLE					CARD CODE	DRAWING NO.			REV
SURFACE MOUNTING					U 01	4-20-001-00656			02

 365 - 148	PRODUCT ENGINEERING / V&SB PURCHASE SPECIFICATION OF HEAVY DUTY LIMIT SWITCH FOR SOOT BLOWERS (NON FLAME PROOF TYPE)			SPEC: SB : 0001 PAGE 01 OF 02	REV: 02 Dt. 18.07.11
1.0	COMPONENT	LIMIT SWITCH HEAVY DUTY TYPE			
1.1	NAME OF SWITCH	REVERSE LIMIT SWITCH	STOP LIMIT SWITCH	WALL BLOWER LIMIT SWITCH	COOLING AIR LIMIT SWITCH
1.2	MATERIAL CODE				
1.2.1	IMPORTED	973539000000	973530210000	973530400000	(I)973661820000 (II)973661820001
1.2.2	INDIGENOUS	963532840000	(I)963532830000 (II) 963532830001	963532820000	-----
1.3	SPECIFICATION				
1.3.1	CONTACT SPECIFICATION	1 NO + 1 NC SPDT, SPRING RETURN	(I)1NO + 1 NC 2 POINT DOUBLE THROW SPRING RETURN (II) 2NO+ 2NC 2 POINT DOUBLE THROW SPRING RETURN	1 NO + 1 NC SPOT, SPRING RETURN	(I)1 NO + 1 NC SPDT, MAINTAINED CONTACT (I)2 NO + 2 NC SPDT, MAINTAINED CONTACT
1.3.2	DIRECTION OF OPERATION	BOTH DIRECTIONS CLOCK WISE & COUNTER CLOCK WISE (CW & CCW)			
1.3.3	CONTACT RATING	MAKE 30 Amps, BREAK 5 Amps.			
1.3.4	EQUIVALENT Sq. D SWITCH TYPE No.	TUD-1	TYD-5	TUA-5	TUD-12
1.3.5	RATING	600V 30 Amps			
1.3.6	DIMENSIONAL DRAWING	4-20-001-00656 STYLE-D		4-20-001-00656 STYLE – A	4-20-001-00656 STYLE - D
1.3.7	APPROXIMATE WEIGHT (Kg)	1.5		1.14	1.5
1.3.8	ENCLOSURE	IP 65			
1.3.9	OPERATION	ROTARY LEVER OPERATION (LEVER WILL BE PROVIDED BY BHEL TRICHY)			
1.3.10	MOUNTING	SURFACE MOUNTING AS PER DRAWING			
1.3.11	CONDUIT ENTRY THREAD SIZE	M20 X 1.5 (FEMALE)			
1.3.12	ACTION	SNAP ACTION SPRING RETURN			SNAP ACTION MAINTAINED CONTACT
1.3.13	ACTUATION	PROVISION TO BE ENVISAGED TO OPERATE IN BOTH DIRECTIONS (CW & CCW)			
1.3.14	OPERATION/ RETURN TORQUE	11.52 Kg. Cm (10 lb. in.)			9.21 Kg-cm (8 lb.in.)
1.3.15	AMBIENT TEMP.	85°C			
1.4	SPECIAL FEATURES AND CONSTRUCTIONS	(i) BODY DIE CAST ZINC ALLOY (ii) EXTRA HEAVY DUTY CONTACT RATING (iii) HIGHER OPERATING AND RESET FORCES (iv) RUGGED MECHANICAL CONSTRUCTIONS (v) CONTACT TIPS SHOULD BE SILVER (vi) CONTACT BLOCK SHOULD BE PHENOLIC (vii) ALL INTERNALS SHOULD BE ENCLOSED IN NYLON LINER			
1.5	TESTING REQUIREMENTS	TESTING SCHEDULE GIVEN AS PER ANNEXURE – A (FOR INDIGENOUS SOURCE ONLY)			
1.6	CRITICAL CHECK POINTS				
1.6.1	CHECK POINTS FOS INSPECTION	(i) VISUAL CHECK (ii) DIMENSIONAL CHECK AND MOUNTING DETAILS AS PER DRAWING AND AS PER SPECIFICATION CLAUSE 1.3 (iii) INSPECTION OF THE ABOVE SPECIAL FEATURES AND CONSTRUCTIONS AS PER SPECIFICATION CLAUSE 1.4			
1.6.2	DOCUMENTS REQD. FOR ACCEPTANCE	(i) TYPE TEST CERTIFICATES FOR NEWLY DEVELOPED VENDOR			
1.7	PACKAGING	LIMIT SWITCHES ARE TO BE INDIVIDUALLY PACKED AND DESPATCHED IN THICK PAPER BOXES. (SERVIAL NO) SHALL BE KEPT IN EACH BOX) EACH LIMIT SWITCH SHALL HAVE AN IDENTIFIABLE NUMBER.			
1.8	STORAGE	IT SHALL BE STORED UNDER CLOSED AREA. EXPOSING TO ATMOSPHERIC CONDITION WILL DAMAGE THE EQUIPMENT.			
NOTE : THIS SUPERSEDES PREVIOUS SPEC: TSB : 017 & 74.					
REV 02.	CODE 973661820001 INCLUDED ON 18.07.2011				
Prepared (J.SANKAR)		Checked (RAVINDER SINGH)		Approved (K.SRIDHARAN)	

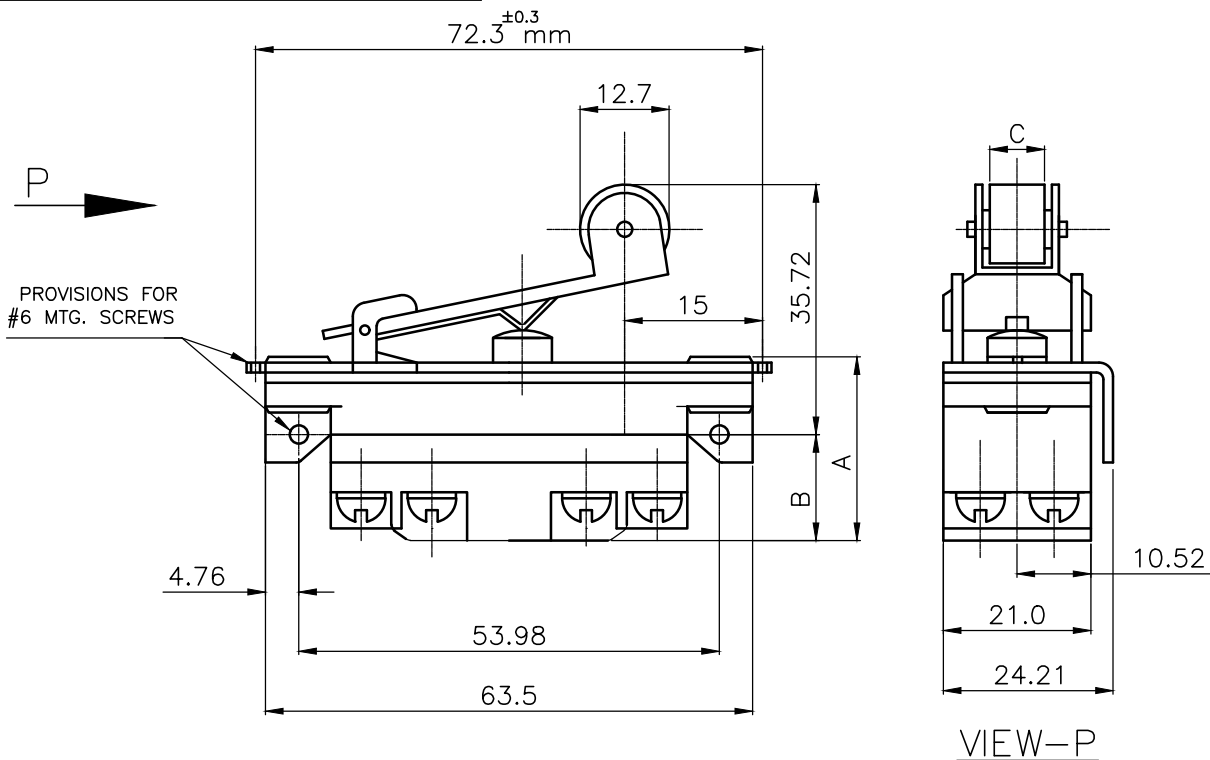
	PRODUCT ENGINEERING / V&SB PURCHASE SPECIFICATION OF HEAVY DUTY LIMIT SWITCH FOR SOOT BLOWERS (NON FLAME PROOF TYPE)	SPEC: SB: 0001 PAGE 02 OF 02	REV:02 Dt. 18.07.11
<u>ANNEXURE - A</u> <u>TEST SCHEDULE FOR HEAVY DUTY LIMIT SWITCHES</u> THE FOLLOWING TYPE TESTS SHOULD BE CARRIED ON EVERY ONE SWITCH IN 100 FROM THE LOT PRODUCED IN THE PRESENCE OF INSPECTING AGENCY . (a) WATER PROOF TEST, (b) TEMPERATURE TEST, (c) RATING TEST (a) <u>WATER PROOF TEST (AS PER NEMA Std. 4) :</u> IN ORDER TO ENSURE THAT THE SWITCH IS WATER PROOF, THE SWITCH WILL BE TESTED BY WATER JET APPLIED ON ALL THE SIDES OF THE SWITCH FOR 5 MINUTES. THE SWITCH IS THEN OPENED TO FIND OUT THE PRESENCE OF ANY INGRESS OF MOISTURE IN THE SWITCH OR ANY OF ITS WORKING PARTS. b) <u>TEMPERATURE TEST:</u> THE SWITCH IS KEPT IN A OVEN WHICH IS SET AT A TEMPERATURE OF 85°C UNDER HUMID CONDITIONS (WITH THE AVAILABLE FACILITY AT SUPPLIER'S WORKS) FOR ONE HOUR. THEN THE SWITCH IS REMOVED FROM THE OVEN AND TESTED FOR ITS FUNCTION GIVING 100 CYCLES UNDER LOADED CONDITIONS. c) <u>RATING TEST:</u> THE RATING TEST WILL CONSIST OF TEST WHEN THE SWITCH WILL BE SUBJECTED TO 6000 CYCLES OF OPERATION MAKING AND BREAKING A CIRCUIT AT RATED VOLTAGE AND LOAD. THE FIRST 1000 CYCLES SHALL BE AT THE RATE OF ONE CYCLE PER SECOND EXCEPT THAT THE FIRST 10 TO 12 OPERATION SHALL BE MADE AS RAPIDLY AS POSSIBLE. IN THE REMAINING 5000 CYCLES SHALL BE AT THE RATE OF 6 CYCLES PER MINUTE. MANUAL SLOW RELEASE AND SNAP ACTION TESTS SHALL BE CONDUCTED ON THIS TEST L. S. II. <u>ROUTINE TEST (100 %):</u> ALL THE LIMIT SWITCHES ARE TO BE TESTED FOR THE FOLLOWING IN THE PRESENCE OF INSPECTING AGENCY. (a). PRE TRAVEL (b). DIFFERENTIAL TRAVEL (c). RESET (d). TOTAL TRAVEL (e). OPERATING TORQUE (f). CONTINUITY (g). INSULATION RESISTANCE (SHOULD NOT BE LESS THAN 5 MEGA OHMS) (h). MANUAL SLOW RELEASE TEST. THE CONTACT SHOULD MAKE AND BREAK WITH SMOOTH OPERATION. IF THE CONTACT STOPS IN OPERATION THE L. S. SHOULD BE REJECTED. (i). SNAP ACTION TEST (j). HIGH VOLTAGE TEST AT 2 KV FOR 2 MINUTES. TO MEASURE THE ABOVE PRE TRAVEL, DIFFERENTIAL TRAVEL, RESET, TOTAL TRAVEL, THE ASSEMBLED SWITCH IS MOUNTED IN A FIXTURE. THE DETAILS OF 4 PARAMETERS (a TO d) MENTIONED ABOVE IS EASILY UNDERSTOOD WITH A REFERENCE TO DRAWING. NO. : 4-20-001-01130. WITH LATEST REVISION.			
REV 02.		CODE 973661820001 INCLUDED ON 18.07.2011	
Prepared (J.SANKAR)	Checked (RAVINDER SINGH)	Approved (K.SRIDHARAN)	

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ALL DIMENSIONS ARE IN INCHES

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

REV 03	DATE 17.02.18	ALTERED CHD & APPD	J.S J.S & H.R
DIMENSIONS CONVERTED TO MM & UPDATED. NOTES ALTERED.			
DCN:SB: 802330 / 5023714			



NOTES: –

1. INSULATION SHOULD BE PROVIDED BETWEEN MOUNTING PLATE AND LIMIT SWITCH BODY.

TYPE	A	B	C
AB-23	26.19	12.7	11.9
CB-33	28.58	15.08	11.9

NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.					DRN	NAME J.SANKAR	SIGN J.S	DATE 26.03.12	NO.OF VAR
					CHD	S.K.GUPTA	S.K.G	26.03.12	
					APPD	K.SRIDHARAN	K.S	26.03.12	
DEPT SB	CODE 330	SCALE N T S		WEIGHT (KG). 0.15	REFERENCE INFORMATIONS				NO. OF ITEMS
TITLE MICRO LIMIT SWITCH					CARD CODE U 01	DRAWING NO. 4-20-201-01344			REV 03



**PRODUCT ENGINEERING / V & SB
TECHNICAL DELIVERY CONDITIONS FOR
SUBDELIVERY COMPONENTS OF SOOT BLOWERS**

TSB : 018

Rev. 05

SHEET No. 01 of 02

LIMITS SWITCHES (MICRO)

1.0 Component : Limit Switches (Micro)

1.1. Material Code :

1.1.1. 963720640000 – Limit Switch (1NO+1NC): OTHER APPROVED MAKE

963720640001 – Limit Switch (1NO+1NC): B.C.H.

1.1.2. 963720630000 – Limit Switch (2NO+2NC): OTHER APPROVED MAKE

963720630001 – Limit Switch (2NO+2NC): B.C.H.

1.1.3. 973536800000 – Limit Switch (1NO+1NC):SQ-D Make, AB 23

1.1.4. 973530390000 – Limit Switch (2NO+2NC): SQ-D Make, CB 33

1.2. Application

1.2.1 Item 1.1.1 OR 1.1.3 is used for the control of wall deslaggers and rotary blowers.

1.2.2 Item 1.1.2 OR 1.1.4 is used for the control of wall deslaggers.

2.0 Specification

2.0.1. For item 1.1.1-Precision Switch with roller lever 600V, 15A, 1NO + 1NC Contacts, Break 5A, Make 8A PSRL of Cutler Hammer with improved features. (PSRL-R)

2.0.2. For item 1.1.2 Precision Switch roller lever 600V, 15A, 2NO+2NC Contacts, Break 0.8A, Make 6A PSRL-2 of Cutler Hammer with improved features. (PSRL-R2)

2.0.3. For item 1.1.4 Precision Snap Switch with rigid roller lever 600V, 10A, 2NO+2NC Contacts, Break 345VA, Make 3450VA. Type CB-33 of SQ-‘D’

2.0.4 For item 1.1.3 Precision Snap Switch with rigid roller lever 600V, 15A, 1NO+1NC Contacts, Break 5A, Make 8A. Type AB-23 OF SQ-‘D’

2.1 General specification

2.1.1. Operation : Roller lever (With 10mm Roller Width)

2.1.2. Operating force : Max. 0.595 Kg. Min. 0.387 Kg.

2.1.3 Terminal Capacity (Solid or stranded conductor) : 2.5 mm²

2.1.4 Action : Quick make and break.

2.1.5 Limit Switch dimensional detail for mounting, roller dimensions and operating data should accompany the offer.

2.1.6 LIMIT SWITCH Mounting Dimensions shall be as per Drg.No.4-20-201-01344

2.1.7 Frequency of operation : Should be suitable for 2500 operation/hr.

Rev:05 Dt.27/08/2004.

CONVERTED AS SOFT COPY.

Prepared (K.SRIDHARAN)

Date:
27/08/2004.

Approved (S.NATARAJAN)



**PRODUCT ENGINEERING / V & SB
TECHNICAL DELIVERY CONDITIONS FOR
SUBDELIVERY COMPONENTS OF SOOT BLOWERS**

TSB : 018

Rev. 05

SHEET No. 02 of 02

3.0 Inspection and Certificate

3.1 Inspection will be conducted by BHEL Inspector at supplier's work or at BHEL on receipt of the material (A)

3.2 Supplier to give guarantee certificate for 12/18 months trouble free operation.

4.0 Packaging : To be packed in weather proof card board boxes and dispatched.

5.0 Quantity : Item 1.1.1 or 1.1.3 – 1 No. / Wall deslagger and 1 No. / Rotary blower
Item 1.1.2 or 1.1.4 – 1 No. / Wall blower.

6.0 Approximate weight : 0.2 kg/ piece

7.0 Spares requirement : Spares vary respect to No of blowers.

8.0 Storage : To be protected from sun & rain. Exposing to atmosphere
damage the material.

For internal use only (A)

- i. The type numbers are to be checked as specified.
- ii. Visual inspection to check for damages, operation and also to ensure whether the switches are supplied in accordance with the specification shown in the purchase order like dimensional details and number of contacts.

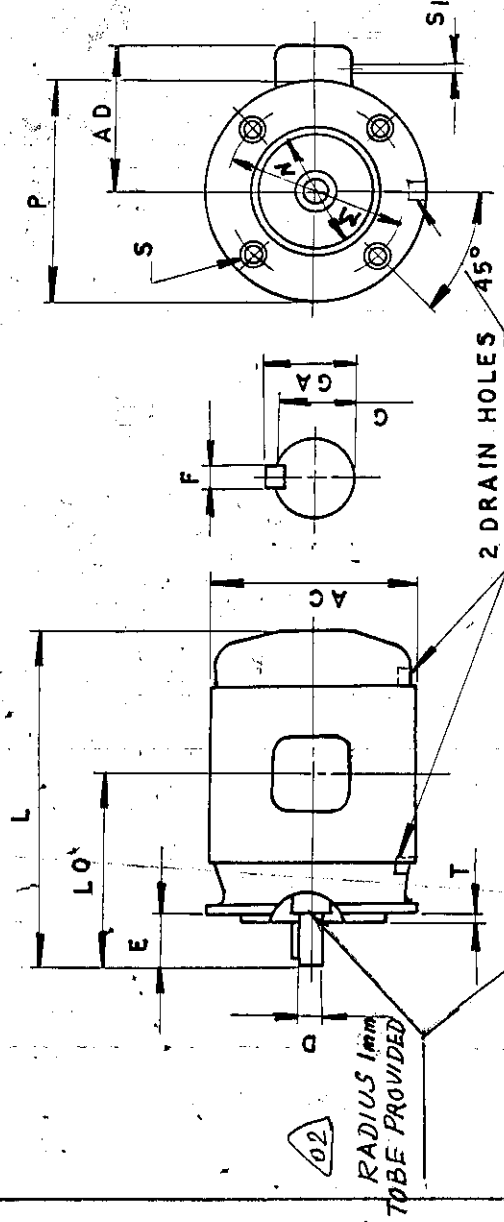
Rev:05 Dt.27/08/2004.

CONVERTED AS SOFT COPY.

Prepared (K.SRIDHARAN)

Date:
27/08/2004.

Approved (S.NATARAJAN)



DIMENSIONS IN M.M.

FIG. 1

FIG. 2

THE FACE OF THE FLANGE IS IN LINE WITH THE SHOULDER OF THE SHAFT EXTENSION
TERMINAL BOX SHOULD BE TURNED IN STEPS OF 90°

TYPE OF PROTECTION IP55 AS PER IS: 4691 DE. SIDE WITH OIL SEAL

FRAME SIZE	APPLICA-TION	M	N	P	S	T	L	LO	AD	AC	SI
71	WB ROTARY	85±0.3	70J6	105	M6X8	2.5	204	121.5	135	140	M20X1.5
80	LRSB TRAV & ROT.	100±0.3	80J6	120	M6X8	3	242.5	148.5	140	156	M20X1.5
90	WB TRAV.	115±0.3	95J6	140	M8X10	3	239	141	151	176	M20X1.5
71	ROTARY BLOWER	85±0.3	70J6	105	M6X8	2.5	204	121.5	135	140	M20X1.5

WB WALL BLOWER

LRSB LONG RETRACTABLE SOOT BLOWER

ROTARY

TRAV - TRAVERSE

FRAME SIZE	D	E	F	G	GA	FIG	KEY	REMARKS
AGW71 K4	14J S6	31.5	-	-	-	1	-	SHAFT DRIVE END TO BE PROVIDED WITH OIL SEAL
AGW80 N4	16J S6	40 48.5-05	5	13	18	2	5X5X40	-
AGW90 S4	16J S6	35-05	5	13	18	2	5X5X30	-
OI	14J S6	31.5	5	11	16	2	5X5X28	-

00389

0.99

REV RADIUS 1mm TO BE

02 PROVIDED 27-03-09-92 SB 0561

DRAWN 00, 22/03/09

CHECKED N. Farooq

V. Arumugam

TITLE SOOT BLOWER MOTOR

DRG. NO. 4 - 20 - 201 - 00303 / 02



365-148

**PRODUCT ENGINEERING / VALVES ENGINEERING AND R&D
TECHNICAL DELIVERY CONDITIONS FOR
SUBDELIVERY COMPONENTS OF SOOT BLOWERS**

TSB:019

Rev. 22

SHEET NO. 1 of 6

MOTORS

1.0 Component : Motors

1.1 Material Code # :

1.1.1 0.45 KW Motors (0.6 HP Motors):

96 272 005 0000 - Std. / 96 272 005 0100 - CL.F / 96 272 005 0200 - 440V
962720050400 - 380V, CI 'F' / 96 272 005 0300 - TEFC, CI 'F' - Temp raise limited to Cl. B,
S1 Duty, Continuous / 962720050301-KEC/ 96 272 005 0500 - 400 V Cl. F.
96 272 005 0501 - 400V, 50HZ, Spl START 85% RUN 80% / 96 272 005 0502 - 400V 60HZ
96 272 005 06 00 - 460 V CL.F, 60HZ. / 96 272 005 0201 - 440V, 60HZ, CGL.
96 272 005 0202 - 440V, 60HZ / 96 272 005 01 01 - 415V, Cl. F., CGL
96 272 005 0700 - 480V, 60Hz

1.1.2 0.37 KW Motors (0.5 HP Motors):

96 272 004 0000 - Std. / 96 272 004 0100 - Cl. F. / 96 272 004 0200 - 440 V
96 272 004 0300 - 400 V / 96 272 004 0400 - 380 V / 96 272 004 0500 - 460V/60Hz/3Ø

1.1.3 0.56 KW Motors (0.75 HP Motors):

96 272 002 0000 - STD / 96 272 002 0100 - Cl. F. / 96 272 002 0200-380V/50Hz/3Ø
96 272 002 0300- 415V/50HZ/3Ø/TEFC
96 272 002 0400-415V-50HZ-0.56KW-IE2-S1-TEFC
96 272 002 0500-415V-50HZ-0.56KW-S1
96 272 002 0600-400V-50HZ-0.56KW-IE2

1.1.4 0.05 KW Motors (0.066 HP Motors):

96 272 003 0000 - STD. / 96 272 003 0100 Cl. F.

1.1.5 0.09 KW Motors (0.125 HP Motors):

96 272 071 0000 - STD / 96 272 071 0100 - BBL / 96 272 071 0200 - KEC
96 272 072 0300 - CGL / 96 272 071 0400 - 400V / 96 272 071 0500 - 460V, 60Hz.
96 272 071 0600 - 380V / 96 272 071 0700- 440V, 60HZ, CGL.
96 272 071 0800 - 400V, 60Hz. /96 272 071 0001- 415V/50HZ/3Ø/TEFC
96 272 071 0900 - 480V/60HZ/3Ø/ 96 272 071 1000- 440V/60Hz/3Ø
96 272 071 1100 - 415V/50HZ/3Ø/IE3
96 272 071 1200 - 415V-50HZ-0.09KW-IE2-TEFC

1.1.6 0.18 KW Motors (0.25 HP Motors):

96 272 073 0300 - 415V/50Hz/3Ø- Ex'n'/NON SPARKING/ZONE 2 GAS GROUP II B, T3

1.1.7 LRNR Motor 0.18 KW(0.25HP) with Frame size 63:

96 272 401 0100- 415V-50HZ-0.18KW-Frame Size 63

2.0 Application

- 2.0.1 Item 1.1.1 : To impart rotation to long retractable soot blower lance.
2.0.2 Item 1.1.2 : To impart traverse motion to long retractable soot blower lance
and temp. probe lance tube.
2.0.3 Item 1.1.3 : To impart traverse motion to wall deslagger swivel tube.
2.0.4 Item 1.1.4 : To impart rotary motion to wall deslagger swivel tube.

Rev:22 Dt.18/01/2020

Material code 962720020600 added.

Prepared By(J SANKAR)

Approved By (GURPREET SINGH)



365-148

PRODUCT ENGINEERING / VALVES ENGINEERING AND R&D
TECHNICAL DELIVERY CONDITIONS FOR
SUBDELIVERY COMPONENTS OF SOOT BLOWERS

TSB:019

Rev. 22

SHEET NO. 2 of 6

- 2.0.5 Item 1.1.5 : To impart rotary motion to rotary blowing element and wall deslagger swivel tube.
- 2.0.6 Item 1.1.6 : To impart rotary motion to rotary blowing element.
- 2.0.7 Item 1.1.7 : To impart Traverse motion to Long Retractable Non-rotating type Soot blower(LRNR)

SPECIFICATION FOR LT MOTORS (SOOT BLOWER MOTORS)

2.1 General:

2.1.1 This standard specification applies to all LT Motors below 5 KW. The deviation if any to this specification should be specifically brought out for our approval prior to manufacture.

2.1.2 Standard

The construction, performance, materials and other matters of motor, if not specified in this specification shall conform to the requirement in the latest edition of IS-325/ IEC 60034 specification for 3 phase induction motor. Dimensions should be as per approved IEC frame size, wherever not specified.

Other than the specific requirements mentioned against the material codes, are as per the TSB requirements.

2.1.3 Priority:

In cases where there are any differences between applicable motor standard (IS Specification) and this motor specification, the later has priority.

2.2 Design conditions

2.2.1 Normally, motors shall be suitable for operation for 415 volts, 50 cycles, 3 phase, 3 wire ungrounded supply system. However, frequency and Voltage changes for some codes mentioned in part number itself shall be followed.

2.2.2 All LT motors except servomotors shall be designed to operate continuously at full load. But all motors shall operate without any trouble under each of the following conditions.

- i. If the terminal voltage varies within 10% above and below the rated value at the rated frequency.
- ii. If the frequency of the source varies within five per cent above and below.
- iii. If the voltage and frequency of the source vary simultaneously and the sum of absolute percentage values in variation does not exceed 10%.

2.2.3 Motors shall have class F insulation with tropicalisation suitable for polluted dust and corrosive atmosphere with a relative humidity of 100%. The motors are to be designed for an ambient temperature of 65°C.

Rev:22 Dt.18/01/2020

Material code 962720020600 added.

Prepared By(J SANKAR)

Approved By (GURPREET SINGH)



PRODUCT ENGINEERING / VALVES ENGINEERING AND R&D
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2.2.4 Motors shall be suitable for continuous winding heating with 24 Volts AC when the motors are not operating.

2.3 Construction :

2.3.1 Normally all motors shall be IP 55 weather proof enclosure TENV motors, unless Stated otherwise in specific part codes. All motors shall be provided with weather proof enclosures. This should be proved through testing.

2.3.2 All motors are to be provided with two earthing terminals of suitable size, one on either side of the machine for connecting the earth conductors. 3 terminals are to be brought out from the motor.

2.3.3 The terminal box cable entry shall be capable of being turned through 360° in steps of 180°. Terminal boxes shall be weather-proof. Spacing between the terminals and volume available inside the terminals box should be adequately designed so that no difficulty during the connecting of 3 core 2.5 sq. mm. PVC insulated Aluminium conductor cable or 3 core 2.5 sq. mm silicone rubber insulated copper/Aluminium conductor cable. The terminal box shall be provided with removal gland plates. The terminal box dimensional drawing should be sent for our approval. Detailed arrangement for the cable box weather-proofing should be indicated.

2.3.4 All motors shall be painted with corrosion proof Epoxy paint.

2.3.5 Mechanical Construction:

- i. The frames and all external parts of the motors shall be as per specification attached. Name plates shall be of stainless steel with letters embossed on them.
- ii. The motors shall be painted with one coat of rust preventing paint and two coats of suitable corrosion resisting and abrasion resisting paint. The type of paint shall be as per specification attached.
- iii. Drain plugs or drain webs shall be provided in the motor frames to permit drainage of any condensed water from the enclosure. Drain holes should be provided as per the enclosed drawing and should be plugged.
- iv. All motors shall be provided with pre lubricated ball bearings of suitable size. The bearings must be guaranteed to ensure a smooth operation and a life not shorter than 30,000 hours.
- v. The motors shall be dynamically balanced and shall rotate perfectly with no preferential stop points. The rotor shall be manufactured in such a way as to allow the removal or addition of material for balancing.
- vi. These motors are open to atmosphere. Special emphasis should be guaranteed for weather proofness. To achieve weather proofness the points Under 2.9 should be followed. The temperature rise calculation should be taken into account this point also.

2.3.6 Starting:

Rev:22 Dt.18/01/2020	Material code 962720020600 added.
Prepared By(J SANKAR)	Approved By (GURPREET SINGH)



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TECHNICAL DELIVERY CONDITIONS FOR
SUBDELIVERY COMPONENTS OF SOOT BLOWERS

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1. The motor shall be capable of being started direct online across full line voltage or reduced voltage starting.
2. Starting current will be limited 7 times full load current (Unless specified otherwise).
3. Medium voltage motors may be connected to electrical net-work where transient disturbance occur in the supply line. During transient voltage disturbances, voltage on the system may disappear completely and return back in a few cycles with the motors still running. Under the above conditions, the returning voltage may occur at such an instant that the induced emf in the motor is in phase with the applied voltage giving rise to currents surges which may reach a value equal to twice the starting current. The motor shall be suitably designed and the coils and end turns strongly brazed to provide adequate thermal and mechanical strength for with standing conditions stated above.

2.4 Accessories:

The following accessories are to be provided for all induction motors.
Two earth terminals outside of the enclosure on the main motor frame.
Name plate should be made of stainless steel. All motors should be supplied with cable gland.

2.5 Torque characteristics;

The motors should be capable of producing the torque as listed in the annexure.

2.6 Special Notes:

1. The weight of the motors offered should not be more than the weight indicated against each blower.
2. All motors should also be provided with an oil seal in the shaft outlet end.

2.7 Technical Data:

The supplier should furnish the details in the form enclosed.

2.8 Certificate and Drawings:

Detailed constructional drawings and Test Certificates as per relevant IS shall be supplied.

2.9 The following precautions are to be taken care of for achieving weather proofness.

1. The terminal box seating should be ground flat and smooth.
2. A gasket should be introduced between the terminal box cover and box as well between body and the box.
3. Copper gasket should be used if bolts are used in the Construction.
4. The windings should have extra dip and backing.
5. Drain holes should be provided as indicated in the drawing.
6. The dimensions should be as per the Drawing. 4-20-201-00303 for all applicable frame sizes except part code 962724010100. Motor to be supplied with key and oil seals.

3.0 Testing and Documents:

Rev:22 Dt.18/01/2020	Material code 962720020600 added.
Prepared By(J SANKAR)	Approved By (GURPREET SINGH)



PRODUCT ENGINEERING / VALVES ENGINEERING AND R&D
TECHNICAL DELIVERY CONDITIONS FOR
SUBDELIVERY COMPONENTS OF SOOT BLOWERS

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SHEET NO. **5** of **6**

- 3.1 BHEL will witness the type and routine tests as per the test procedures laid out in IS-325 on a prototype motor at supplier's works. On satisfaction of the prototype BHEL will give clearance for manufacture. All routine tests as per IS-325 are to be carried out in all motors by the supplier. Guide lines for testing to be taken from IS-4029.
- 3.2 Test Certificate and Drawings: 6 sets of detailed constructional drawings, test certificates and technical data shall be supplied.
- 3.3 Guarantee Certificate: To be given by the supplier for a period of 12 months from the date of commissioning or 18 months from dispatch whichever is later.
- 4.0 Quantity(For information)
- Item 1.1.1 One No. per Long Retract
 - Item 1.1.2 One No. per Long Retract and One No. per Temperature Probe.
 - Item 1.1.3 One No. per Wall Deslagger.
 - Item 1.1.4 One No. per Wall Deslagger
 - Item 1.1.5 One No. per Rotary Blower.
 - Item 1.1.6 One No. per Rotary Blower.
 - Item 1.1.7 One No. per Long Retractable Non-Rotating type Soot Blower(LRNR)
- 5.0 Packing : Motors to be packed and despatched in weather proof boxes.

Rev:22 Dt.18/01/2020

Material code 962720020600 added.

Prepared By(J SANKAR)

Approved By (GURPREET SINGH)

DATA SHEET FOR SOOT BLOWER MOTORS							
Sl. No.	Description						
1	Application	WB IE - Rotary	WBIE - Rot. Motor RB IE Motor	RB IE Motor	LR & FTP - Traverse	LR - Rotary	WB IE - Traverse
2	Frame size	71	71	71	80	80	90
3	Flange Type	IS2223TypeC	IS2223TypeC	IS2223TypeC	IS2223TypeC	IS2223TypeC	IS2223TypeC
4	Dimensions	4-20-201-00303	4-20-201-00303	4-20-201-00303	4-20-201-00303	4-20-201-00303	4-20-201-00303
5	Power in KW	0.05	0.09	0.18	0.37	0.45	0.56
6	Rated Voltage	415 V	415 V	415 V	415 V	415 V	415 V
7	No. of phases & frequency	3 Phase & 50 Hz.	3 Phase & 50 Hz.	3 Phase & 50 Hz.	3 Phase & 50 Hz.	3 Phase & 50 Hz.	3 Phase & 50 Hz.
8	RPM (Approx.)	As applicable to 4 Pole motor					
9	Duty	S1- Continuous	S1- Continuous	S1- Continuous	S2-15 Min.	S2-30 Min.	S2-30 Min.
10	Ambient Temp. in °C	65	65	65	65	65	65
11	Enclosure & Protection	TENV- IP55 protection	TENV/TEFC* - IP55 protection	TEFC- IP55 protection	TENV/TEFC* - IP55 protection		
12	Class of insulation	F (Temp. Raise limited to Cl. B)					
13	Voltage variation %	± 10%					
14	Frequency variation %	± 5%					
15	Combined Voltage & Frequency Variation %	± 10%					
16	Starting Torque in Kgm. (Min.)	0.245	0.29	0.254	0.32	1.1	1.14
17	No. of Leads.	6	6	6	6	6	6
18	Name plate	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
19	Paint	Epoxy Grey	Epoxy Grey	Epoxy Grey	Epoxy Grey	Epoxy Grey	Epoxy Grey
20	Conduit size in the terminal box.	M20 x 1.5	M20 x 1.5	M20 x 1.5	M20 x 1.5	M20 x 1.5	M20 x 1.5
21	Max. stalling time (Approx.)- sec.	Hot 35 / Cold 65	Hot 35 / Cold 65	Hot 40 / Cold 75	Hot 40 / Cold 75	Hot 20 / Cold 35	Hot 30 / Cold 55
22	Direction of rotation	Reversible	Reversible	Reversible	Reversible	Reversible	Reversible
23	Other Constructional features.	Shaft end with oil seal					
24	Weight of Motor kg. (Approx.)	8	8	8	13.5	13.5	17
25	Gd ² of Motor kgm ² (Max)	0.0027	0.0027	0.0034	0.0073	0.0073	0.0112
26	No. of Poles	4					

TEFC - TOTALLY ENCLOSED FAN COOLED; TENV- TOTALLY ENCLOSED NON-VENTILATED;
 *- MOTOR PART CODE TO BE CHECKED

SHEET NO. **6** of **6**

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:0:404 Rev: 19 Effective Date: 05/12/2018 Page: 1 of 3
Product: Carbon, Alloy & Stainless Steel Forgings (Boilers And Valves)		

Revisions Record:

Rev 09: New materials F23, F91 & F92 requirements added in Cl.1.0, Cl.2.0, and Cl.4.0 to Cl.6.0. CE marking certification clarity included in Cl.10.

Rev 10: Cl 1:F6a Class 2 added, Code case corrected. Cl 2: Steel makers names removed and requirement for creep testing added as per IBR Reg 4, Cl 4: Tempering temperature and soaking time modified for SA 182 F91, F92 & F23. Cl 4 & 10: Photomicrograph requirement added for F91 & F92 forgings, Cl 2, 6 & 10: modified for SS, Cl 5: Bend test Clarified, Cl 6: Wet MPI added.

Rev 11: Cl 2 Pt 3, 4, 5 modified. Cl 6 – Wet MPI for CS, AS added, Cl 10.1 – IBR Forms indicated

Rev 12: Cl 1, 2, 4, 6 and 7 – requirements for grades SA 182 F1, SA 336 F1, F12, F22 Cl 3 and F91 added (for Neyveli Project). Creep test criteria in-line with BHEL R&D included. Cl 2 Pt 8 modified. Cl 6 Pt 1 – SA388 changed to ASTM A 388 based on ASME Sec II Ed 2013.

Rev 13: Dt: 17/11/2014: Cl 2 Cl 4 Cl 10 Cl 12 modified.

Rev 14: Dt: 06/10/2015: Cl.4.3, 5.2, 5.8, 10.1.b.9 added; Cl 1.0, 2.1, 2.2, 2.3, 4.1, 4.2, 5.3, 6.2, 9.0, 10 modified.

Rev 15: Dt: 23/12/2015: Cl 1, 2, 3, 5, 6, 7, 10, 11 & 12 modified.

Rev 16: Dt: 06/02/2017: Cl 1 changed to indicate the use of latest revisions of referred codes, standards, specifications, drawings, procedures, etc; Tempering temperature added for F12 material in Cl 4, Requirements of API 6D removed from Cl 1, 2, 4, 5, 10, 12 since the API 6D certificate license was not applied for; Definitions for relevant, linear and rounded indications provided in Cl 6; Type 3.2 certification changed as per BS EN 10204-2004 in Cl 10.2.

Rev 17: Dt: 27/11/2017: Cl 1, 4 modified to include SA 266 & SA 336 F92 materials; Cl 5 modified to include 100% hardness testing & Creep testing requirements; Cl 6 changed to include UT for forgings above 40 mm; Cl 10 modified suitably.

Rev 18: Dt: 21/02/2018 – Material SA182 F51 added in Cl 1 based on Engineering/Valves input and minor corrections made in Cl 4 & 5.

Rev 19: Dt: 05/12/2018 – Material SA182 F11 Class 3 & SA182 F60 added in Cl 1 based on Engineering/Valves input, Tolerance in Cl 3 modified based on guidance from corporate standard AA 102 08 Rev07, Cl 4 modified to include F11.

1. MATERIAL SPECIFICATIONS:

All the codes, standards, specifications, drawings & procedures, etc., referred in this TDC shall be of latest revision as on the date of Enquiry/Purchase Order, whichever is earlier, unless specified otherwise.

Carbon Steel (CS)	:	SA 105, SA 266, SA 350 LF 2
Alloy Steel (AS)	:	SA 182 F12 Class 2, F22 Class 3, SA 182 F23 (Code case: 2199), <i>SA182 F11 Class 3</i> SA 182 F91 & SA182 F92 (Code Case: 2179), SA 182 F1, SA 336 F1, SA 336 F12, SA 336 F22 Cl 3, SA 336 F91, SA 336 F92 (Code Case: 2179)
Stainless Steel (SS)	:	SA 182 F6a Class 2, F6a Class 3, SA 182 Gr. F 304, 304L, 316, 316L, 316H, 321, 321H, 347 & 347H; F51; <i>F60</i> AISI 410 for TOA Gland and bushings.
Additional Requirement	:	As listed below (Supplementary to above material specifications)
Size and Quantity	:	As per Purchase order & Drawing.

2. CHEMICAL COMPOSITION & PROCESS

- Melting: fully killed.
Product analysis per heat: CS: C ≤ 0.25% , AS: SA182 F23: Si: 0.25-0.50% & Cu: 0.25max
SA182 F92: Si: 0.10-0.50%, Ni: 0.30 max & Cu: 0.25% max
- Raw material Steel for IBR forging items to be inspected at Mill & test certificate countersigned by IBR approved inspecting authority, if the mill is not approved under IBR as well known steel maker.
- Forging: Hot working to ensure uniformity of structure & strength with reduction ratio in area 4:1 min from ingot to final forging, close to final size & shape. Flow lines to be parallel to axis of openings. Forged Items ordered to this TDC shall be forged to the nearest shape before machining to final dimensions as per respective drawing.
- Blooms / Billets used for forgings (Side Length or Dia ≥ 50mm) shall be UT tested. For Acceptance criteria refer Cl.6.0. For finished bars, this can be done at final stage.
- SS: All raw materials used in steel making including incoming scrap shall be checked by supplier to ensure freedom from radioactivity.
- Tolerance for chemistry shall be as per the applicable material specifications/standards specified in Cl 1.

3. DIMENSIONS AND TOLERANCES

Dimensions & their tolerances shall be as per drawing.

For untoleranced dimensions: **CS & AS:** as per SA 29 for diameters upto 114.3mm. For diameters above 114.3mm and upto 300mm, tolerances shall be minus 0 plus 8 mm; **SS:** as per SA 484

4. HEAT TREATMENT(HT)

- Heat treatment shall be as per applicable drawing. Unless otherwise specified, the following heat treatment shall be following:

CS: SA 105: Normalised; SA 266: As per material specification;

SA 350 LF 2: Normalised at 880-900°C & Tempered at 620-640°C.

AS: Normalised and Tempered. For *F11*, F12: Tempering at 650°C (min).

For SA 182 F91, F92 & F23, SA336 F91, SA 336 F92: Normalising at 1050-1080°C & Tempering at 750-780°C.

SS: As per applicable material specification & grade.

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:0:404 Rev: 19 Effective Date: 05/12/2018 Page: 2 of 3
Product: Carbon, Alloy & Stainless Steel Forgings (Boilers And Valves)		

AISI 410: Supply in Quenched & Tempered condition as below.

Quenching at 955-1010°C in air or water or oil or Polymer. Soaking 30 mts/inch maximum thk. Tempering at 663°C.min. Soaking :60 mts/inch maximum thickness and air cool.

- 2) Photomicrograph test for F91 & F92 forgings - one per heat treatment lot per size and shall be reported in test certificate. Acceptance – The material shall be free from any micro fissures. Microstructure shall show lathe tempered martensite and also to be examined for grain growth. Photomicrograph with 400x (Min) magnification along with Photomicrograph report to be provided. The actual magnification and result of actual microstructure shall be certified/indicated.

5. MECHANICAL TESTS

- 1) Extent of test: One Specimen for each size/heat/HT batch from sample product or identical test coupon.
- 2) **Tensile test:** The test specimens shall be removed from a test coupon (TC) after the final heat-treatment cycle. Perform tensile tests at room temperature in accordance with the procedures specified in ASTM A370. Perform a minimum of one tensile test. All yield strengths shall be determined using 0.2 % offset method of ASTM A370. The results of the tensile test(s) shall satisfy the applicable material specification requirements.

If the results of the tensile test(s) do not satisfy the applicable requirements, two additional tests on two additional test specimens (removed from the same TC with no additional heat treatment) may be performed in an effort to qualify the material. The results of each of these tests shall satisfy the applicable requirements.

- 3) **Additional requirements for SA182 F23, F91 & F92:**
F91: Yield: (0.2% offset): Min 450 MPa; Tensile: Min 630 MPa, Max 850 MPa; Hardness (HBW): Min 195, Max 248.
F92: Tensile: Min 630 MPa, Max 850 MPa; Hardness (HBW): Min 191, Max 269
F23: Tensile: Min 510 MPa, Max 730 MPa; Hardness (HBW): Min 150, Max 220
Hardness testing shall be **100%** as per ASTM E10 or E18.
- 4) AISI 410: Hardness (**100%** testing shall be as per ASTM E10 or E18): 197-235 HBW. No other mechanical test required.

Additional requirements of tests: (Other than AISI 410 Only)

- 5) **Bend test: Acceptance as per IBR**
CS: Sample 19mm.Thick(t) x 25.4mm width to be bent 180 deg. around mandrel of radius 6.35 mm.
AS, SS: Sample 19mm.Thick(t) x 25.4mm width to be bent 180 deg. Around mandrel of radius =1.5 x t.
- 6) **Impact test for QCNR Valves & CRHNR Valves:** CS, AS and SS: 1 / HT batch. As per ASTM A370, 2mm Charpy-U notch, at Room temperature. Acceptance: Avg of 3 specimens: 36 Joules, Min Single value: 24 Joules
- 7) **For PED 2014/68/EU (CE-marking) items:** Charpy- V impact test at 20°C as per ASTM A370, Acceptance: Avg of 3 specimens: 40 Joules, Min. single value: 27 Joules.
- 8) Creep testing & reporting shall be carried out as per SIP:RM:01 (latest revision) whenever indicated in the Enquiry/Purchase Order/Engineering Drawing.

6. NON DESTRUCTIVE TEST

- 1) Extent of test: for each product. Stage of test : After heat treatment.
- 2) **Volumetric NDE - UT:** As per ASTM A388. All finished forgings of dia/wall thickness **> 40 mm**; All Body & yoke of special class valves & all forgings of SA 182 F91, F92 & F23, SA 336 F91.
Acceptance: ASME Sec.VIII Div. 2 Cl.3.3.4.
- 3) **Surface NDT -**
 - a) **Relevant indication:** Surface-rupture NDE indication with major dimensions > 1.6 mm (1/16 in).
 - b) **Linear indication:** Surface NDE indication whose length is $\geq$ three times its width.
 - c) **Rounded indication:** Surface NDE indication whose length is < three times its width.
 - d) **MPI for CS & AS :** 100% : As per ASTM A275.
Dry MPI: CS, AS (other than SA 182 F91, F92, F23, SA 336 F91) : all sizes.
Wet MPI : SA 182 F91, F92, F23; SA 336 F91: all sizes.
Acceptance: ASME B16.34 Appendix II. Linear Indications like cracks, folds & other injurious defects are unacceptable.
 - e) **LPI for SS:** 100%: ASTM E165. **Acceptance:** No linear indications acceptable.
- 4) **SS:** Finished forgings shall be checked for radioactive contamination and reported. Survey meter shall be used to measure at 5 cm near the surface. Acceptance limits: Shall be less than 0.1 milli Rontgen (MR) per hr or 1 micro Sievert per hr.

7. WORKMANSHIP AND FINISH

Forged items to spec SA336 shall be machined in the inside surface as it is meant for steam application. Items to be proof machined as per drawing or shot blasted for CS/AS; Pickled & passivated as per ASTM A380 for SS, & be free from scales & defects like laps, seams, folds, cracks, etc. Machined items (except SS) to be coated with a layer of transparent rust preventive before despatch.



Product: Carbon, Alloy & Stainless Steel Forgings (Boilers And Valves)

8. REPAIR

Repairs by fusion welding are prohibited. Surface defects can be removed by mechanical means and defective areas smoothly dressed up with the adjacent surface. Minimum thickness after repair to meet drawing / Specification.

9. MARKING AND PACKING

Details of stamping on each item with low stress stamps: Heat/melt number; material specification, grade & class; Code case number (for Gr 92 & 23); Maker's emblem/code & Inspection Authority's seal. Forgings to be properly packed and dispatched to avoid damage during transit.

10. INSPECTION AND CERTIFICATION

10.1 For IBR Items:

- a) Products shall be inspected at supplier's works/mill and the applicable IBR Form must be countersigned by the Inspecting Authority as indicated below in case the supplier's works/mill is not recognised as a "Well known Forger/Steel maker" under IBR:
 - ☐ **Imported Items:** Inspecting Authority approved by IBR for the Country of origin.
 - ☐ **Indigenously Supplied items:** Director of Boilers/Chief Inspector of Boilers/Inspecting Authority approved by IBR, for the respective state in India.
- b) Certification in IBR Form III-G for IBR items from "IBR-Well Known Forger" or "Inspecting Authority", as applicable, to be submitted. IBR Form III-G and a separate **manufacturer** Test certificate in English language with following details, shall accompany the product (including proof machined):
 1. Purchase Order No.(BHEL), TDC No & its revision no, Test certificate no & date.
 2. Specification, Grade & Class with applicable year of code, Code case number (for Gr 92 & 23), Heat Number, Drawing No., Quantity & Size.
 3. Supplier of the steel used in making the finished product (well known and others in IBR Form IV).
 4. Melting & forging process, Chemistry with incidental elements-Heat wise, Product analysis, Carbon Equivalent (CE).
 5. Heat treatment details of the material and test bars. For F91, F92 supplies – Photomicrograph at 400x resolution.
 6. Mechanical test results- Tensile (UTS, YTS (0.2% offset), % elongation, % reduction in area), Bend, Impact, Hardness and NDE test results with reference & acceptance standards.
7. Repair details if any, Certified copy of TC for starting material.
8. **For SS:** Measured Radioactivity levels shall be reported in the Mill Test Certificate (not to be recorded in IBR Form).
9. Creep test report as per SIP:RM:01 (latest revision) whenever indicated in the Enquiry/Purchase Order/Engineering Drawing.

10.2 For PED 2014/68/EU (CE-marking) items, the test certificates with details specified in CI 10 (b) shall be submitted as per BS EN 10204.

1. **For pressure parts**, test certificates of type 3.1 or 3.2 are acceptable.
Type 3.1 – Suppliers shall have ISO 9001-2008/2015 certification certified by Notified Body recognized by European Community and test certificate certified by supplier's authorized inspection representative.
Type 3.2 – Components inspected and test certificates certified by both the supplier's authorized inspection representative and Notified Body recognized by European Community.
2. **For non-pressure parts**, test certificates of type 2.2 are acceptable.
Type 2.2 – suppliers test certificates signed by suppliers authorized inspection representative with test results as required by this TDC.

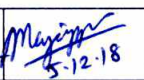
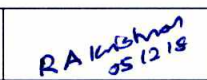
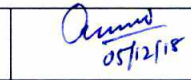
11. AUDIT CHECKS AT BHEL

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Supplies found defective during check or subsequent processing at BHEL will be rejected.

12. END USE

Valve bodies, bonnets, discs, socket ends, body guides, etc., Pressure part fittings in boilers & low, high temperature service like discs, socket weld tees, elbows, weld neck flanges & stubs (except drum nozzles) meeting IBR, ASME Section I, ASME B16.34 and PED 2014/68/EU.

Non pressure part items in boilers and valves: For these, requirements on starting material, bend test and inspection by IBR are not required.

 05/12/2018	 05/12/18	 5/12/18	 05/12/18	 5-12-18	 05/12/18	 05/12/18
Abdur Rahman	G. Panneer Selvam	S. Anand Kumar	K. Rajasekaran	R. Rajappan	R. Ananthakrishnan	Amit Roy
Sr.Engineer/ QA	DGM/QA	SDGM/PE/ FB	DGM/Valves/ Engg	SDGM/MM	AGM/Valves/ Purchase	AGM/QA& BE
Prepared By	Reviewed By					Approved By

BHEL, Tiruchirappalli – 620014.	Quality Assurance	Technical Delivery Conditions
Product: ALLOY STEEL FORGINGS TO SPEC. AISI 4140 FOR USE IN HIGH PRESSURE VALVES		
Document No.: TDC:0:417	Rev. No.: 00	Effective date: 01/08/1994 Page 1 of 2

1.0 SCOPE

This Technical Delivery Condition specifies the additional requirements for the delivery of alloy steel to specification AISI 4140 for use in high pressure valves components such as Gland flanges, Support ring, Split ring etc.

This TDC is supplementary to the mandatory requirements covered in the specification.

The size and quantity shall be as specified in the purchase order.

2.0 CHEMICAL COMPOSITION AND PROCESS

The steel shall be manufactured by electric furnace or any other approved process.

The chemical composition of the steel shall be tested for each melt and shall conform to the requirements given below in weight percentage:

Element	Percentage
C	0.38 - 0.43
Mn	0.75 - 1.00
Si	0.20 - 0.35
P	0.04 max.
S	0.04 max.
Cr	0.80 - 1.10
Mo	0.15 - 0.25

Forging practice: Open die forging.

The rough forgings must be as close as possible to the final shape and size.

Minimum forging reduction in area shall be 1:4 from ingot to finished forging.

The flow lines shall be parallel to the axial length of the part.

3.0 DIMENSIONAL TOLERANCES

The forgings shall conform to the dimensional tolerances as specified in the drawing.

4.0 HEAT TREATMENT

The forgings shall be supplied in quenched and tempered condition as given below to get the required mechanical properties:

Heat to 855 +/- 15 degC and quench in oil.

Temper at 540 degC minimum with a soaking of 1 hour per inch of thickness.

5.0 MECHANICAL TESTING

The testing for mechanical properties shall be conducted as per ASTM A370 at room temperature from finished heat treated material or identical specimen which has undergone the same amount of working, for each size/melt/Heat treatment batch. Test specimen shall be taken from a location which represents the midwall of the heaviest section. The test results shall meet the requirements as given below:

Tensile strength : 97 Kg/sq.mm min.

Yield strength : 85 Kg/sq.mm min.

% Elongation : 18 min.

Hardness : 285 - 320 BHN (minimum 3 values)

Charpy impact test } Average of 3 values 8 Kgm/sq.cm minimum
(on 2 mm "U" notch) } and single minimum value 6 Kgm/sq.cm.

6.0 NON DESTRUCTIVE TESTING

Ultrasonic test shall be conducted on all forgings according to SA 388 and the acceptance standard shall be as per AM 203.2 of ASME Section VIII Division 2.

7.0 WORKMANSHIP AND FINISH

BHEL, Tiruchirappalli – 620014.	Quality Assurance	Technical Delivery Conditions
Product: ALLOY STEEL FORGINGS TO SPEC.AISI 4140 FOR USE IN HIGH PRESSURE VALVES		
Document No.: TDC:0:417	Rev. No.: 00	Effective date: 01/08/1994 Page 2 of 2

The forgings shall be supplied in proof machined or shot blasted condition, if specified in the drawing/PO.

The forgings shall be examined visually and shall be free from scales, laps, seams, folds, cracks or other injurious defects and shall have a workman like finish.

All forgings shall be coated with a protective layer of transparent rust preventive before despatch.

8.0 **REPAIR**

Repairs involving fusion welding are prohibited.

Surface defects can be removed by mechanical means and the defective areas shall be smoothly dressed up with the adjacent surface. The minimum thickness after repair shall meet the drawing requirements.

9.0 **MARKING AND PACKING**

The following details shall be legibly marked on each forging by hard stamping with low stress stamps.

1. Specification and grade
2. Part identification
3. Melt number
4. Maker's emblem
5. Inspecting authority's seal

The forgings shall be properly packed and despatched to avoid any damage during transit.

10.0 **INSPECTION AND CERTIFICATION**

All the tests specified here shall be carried out at works and the test results shall be furnished in the test certificates.

The test certificate shall contain the following details in English language only.

1. Purchase Order Number.
2. Test Certificate Number.
3. TDC Number.
4. Quantity and Size.
5. Steel making process.
6. Specification, Grade and Melt Number.
7. Chemistry - Meltwise.
8. Heat treatment details like Temperature, soaking time, cooling medium etc.
9. Mechanical test results - Tensile, Hardness and Impact.
10. NDT results with reference and acceptance standards.

In addition, mill test certificate for raw material shall be enclosed.

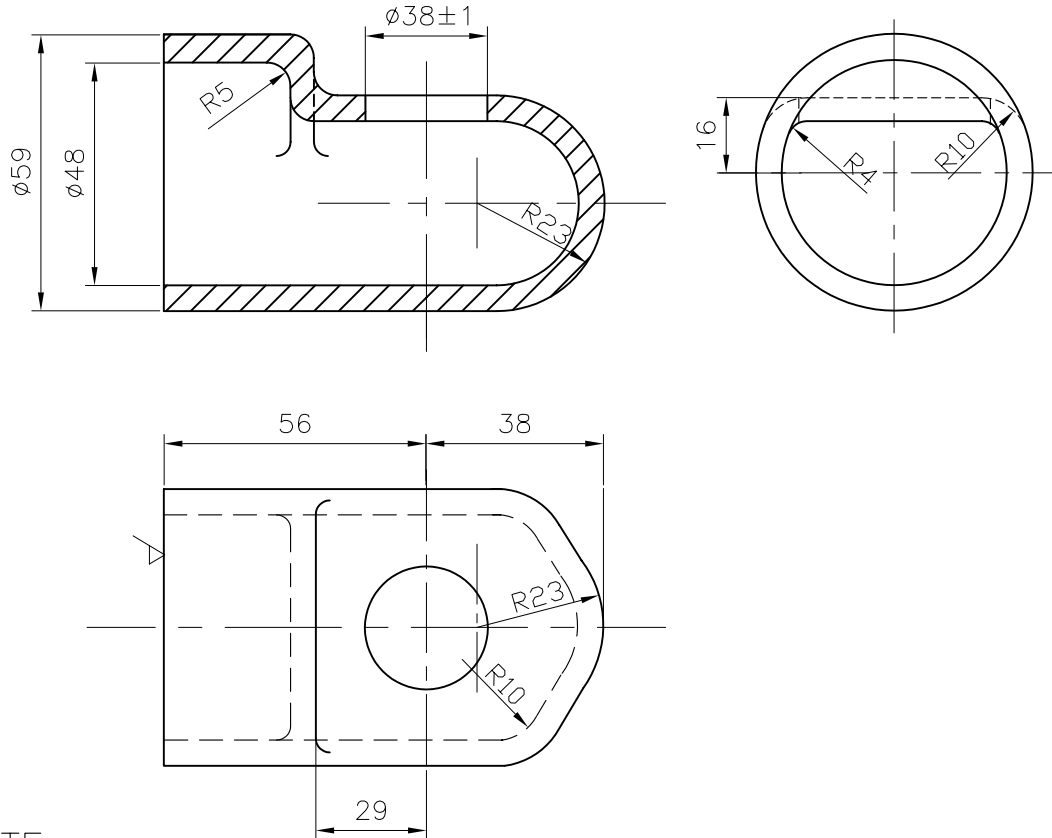
11.0 **END USE** These forgings are intended for use in high pressure valves for components like gland flanges.

S.Selvrajan Prepared	R.Sasikumar (QA) Reveiwed	M.Rajakumar (Engg)	K.Rengachari Approved
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ALL DIMENSIONS ARE IN MILLIMETRES.

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

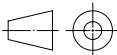
REV	DATE	ALTERED	K.S
02	9.11.04	CHD & APPD	S.N
DRAWING REDRAWN.			
DCN.NO: 800386			



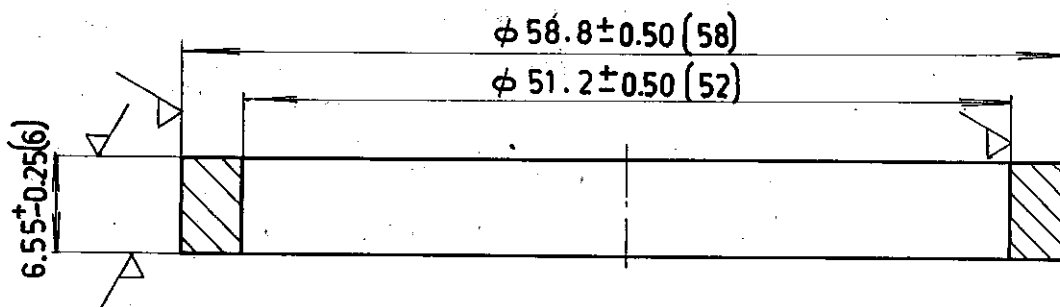
NOTE:—

- ✓ INDICATES THE SURFACES TO BE MACHINED.
- DIMENSIONAL DEVIATIONS FOR CASTING SHALL BE AS APPLICABLE TO STEEL CASTINGS.
- FOR MACHINING DRAWING REFER 4-20-201-00162.
- FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURES.

PART CODE: 920059630000

		920059630000	A297 Gr HH			0.8				
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No	
 365-122 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.					DRN	NAME S.NAPPI	SIGN S.N	DATE 9.11.04	NO.OF VAR	
					CHD	K.SRIDHARAN	K.S	9.11.04		
					APPD	S.NATARAJAN	S.N	9.11.04		
DEPT VL			SCALE NTS	WEIGHT (KG). 0.8	REFERENCE INFORMATIONS				NO. OF ITEMS	
CODE										
TITLE NOZZLE HEAD CASTING					CARD CODE U 01	DRAWING NO. 4-20-201-0068102				REV

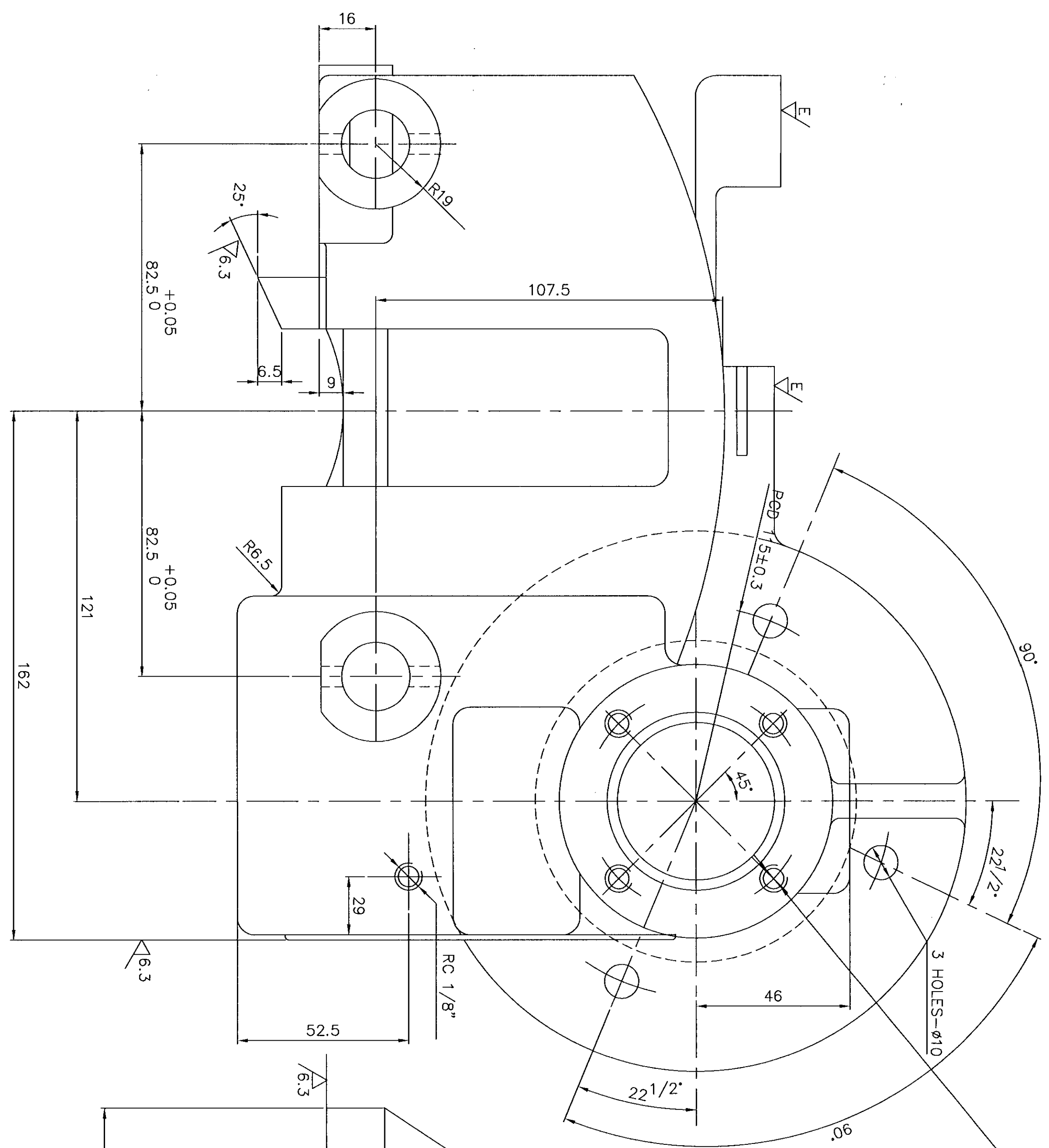
01	DATE	ALTERED
		CHECKED
ZONE		



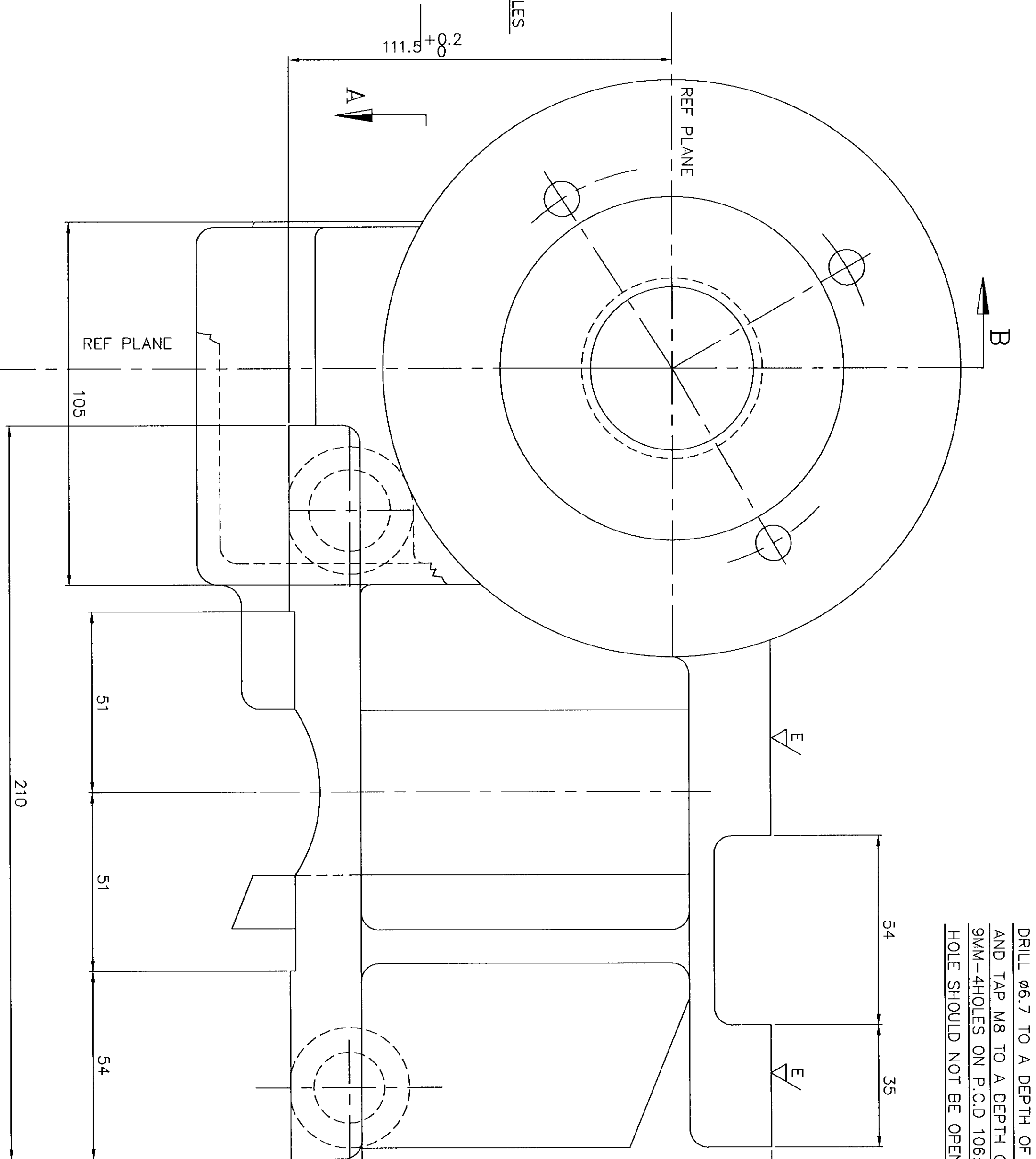
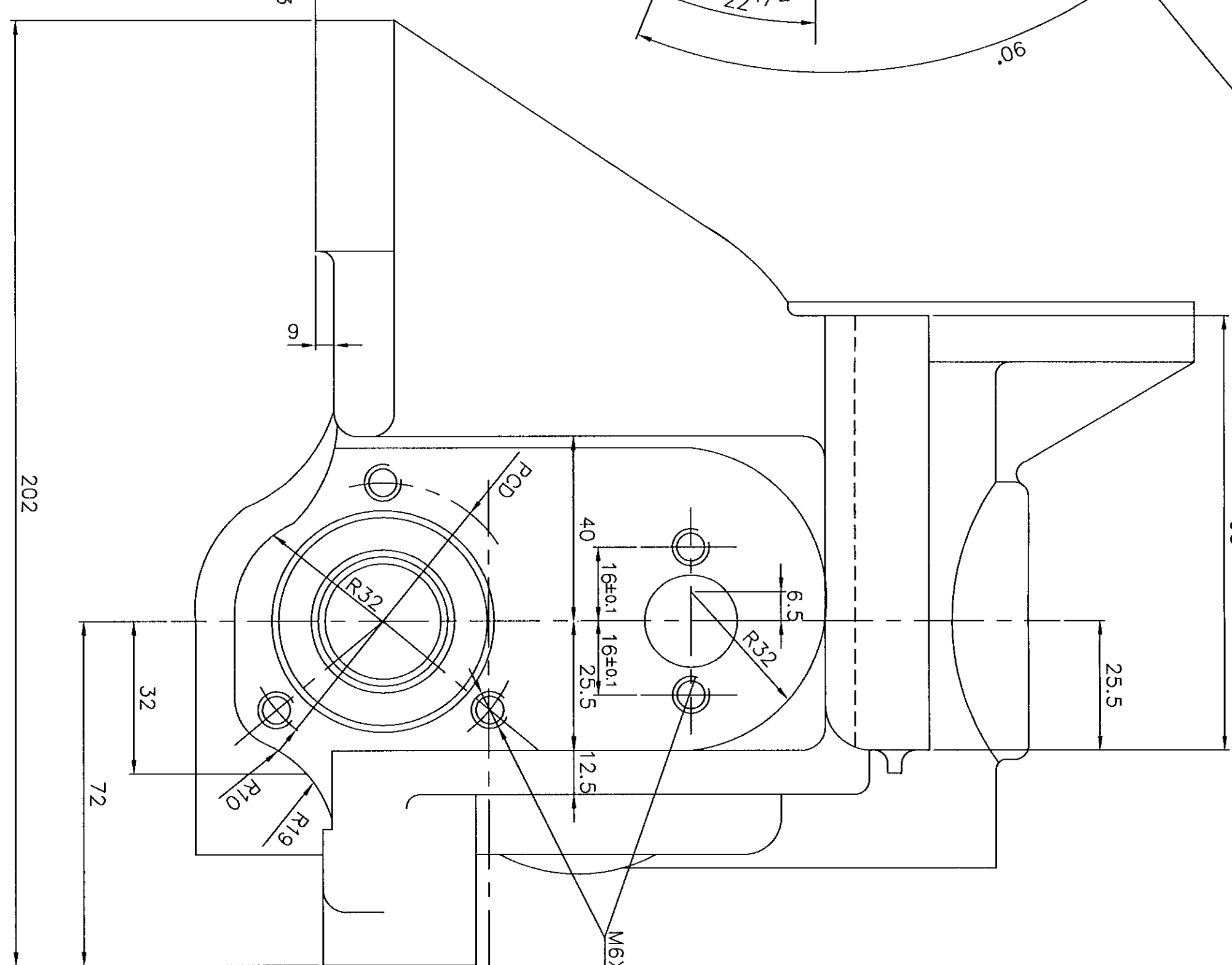
NOTE:

- ✓ MARK INDICATES THE SURFACES TO BE MACHINED FURTHER
- REFER DRG: 4-20-201-00565 FOR MACHINING
- HARDNESS: 41-44 HRC
- MATERIAL: Cr 29 ; W 9 ; C 1.8; REMAINING Co (STEELITE 12)
- PROCESS : INVESTMENT CASTING WITH SHELL INOCULATION
- DIMENSIONS SHOWN IN BRACKETS ARE FINAL DIMENSIONS
- REFER DRG. 4-20-001-01420 FOR CASTING REQUIREMENTS

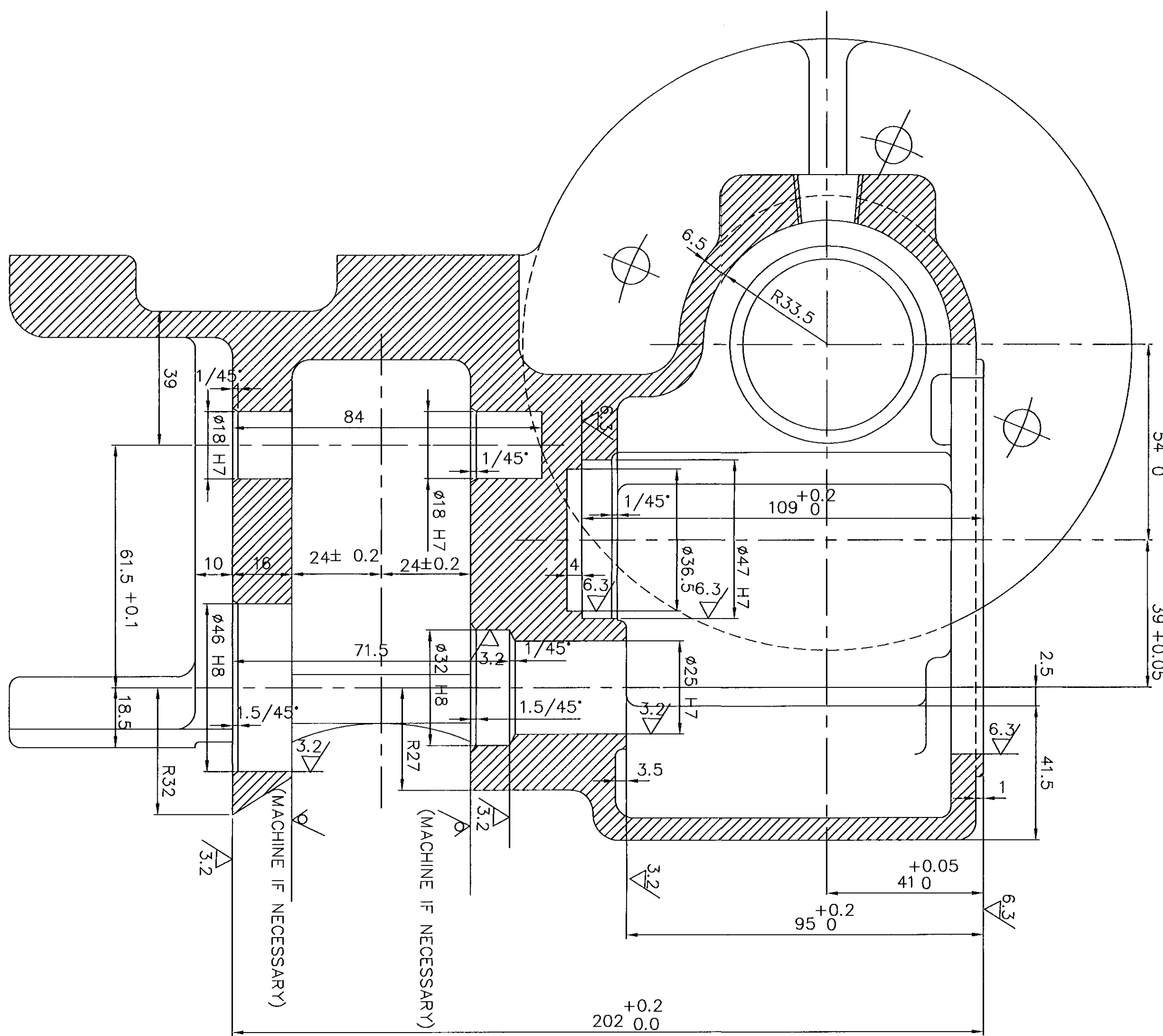
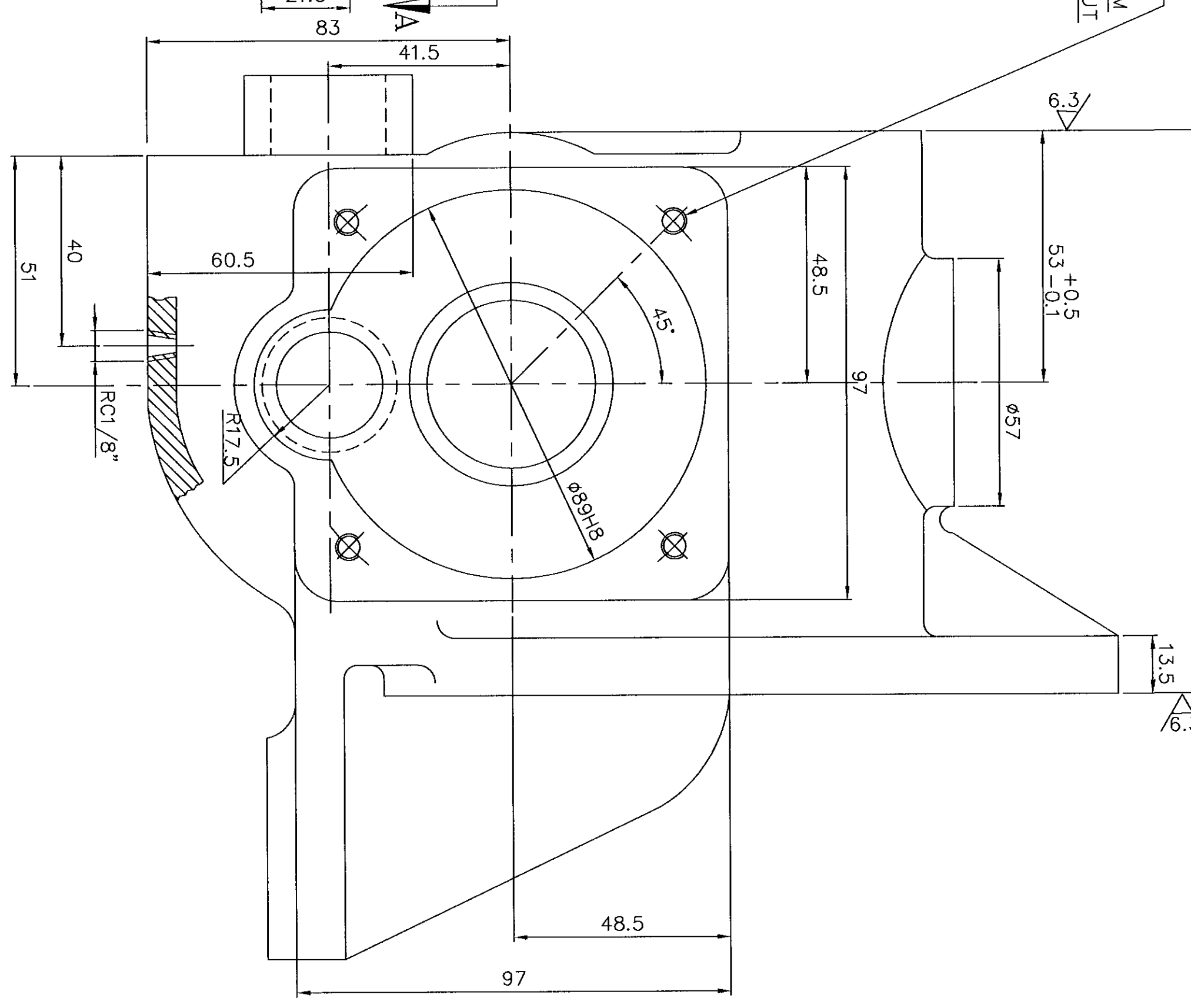
15		17		20		21		REF. DRG./BPS No.		RVN		34		56		57		63		68		75		76		20													
STYLE No.		ITEM No.		BPS						32		44		A		C		UNIT wt. (kg)		BNI		D																	
										STL								No. OFF																					
19										CARD TYPE 1										19										CARD TYPE 2									
BILL OF MATERIAL No.																																							
FIRST ANGLE				SCALE				DRAWN				CHECKED				APPROVED				TOTAL wt. (kg)				0.04															
				2:1																TYPE																			
ALL DIMENSIONS IN MILLIMETRES								DATE								NEW/OLD DRG. No.																							
CAUTION THE INFORMATION CONTAINED IN THIS DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED., BOILER PLANT UNIT, TIRUCHY-620 014. AND SHALL NOT BE USED WITHOUT THEIR EXPRESS WRITTEN PERMISSION IN ANY FORM OR PART THEREOF FOR ANY OTHER PURPOSE THAN FOR WHICH IT IS SENT TO YOU.													TITLE SEAT INSERT (CASTING)																										
CARD CODE UOI													DRAWING No. 4-20-001-01419													REVISION													



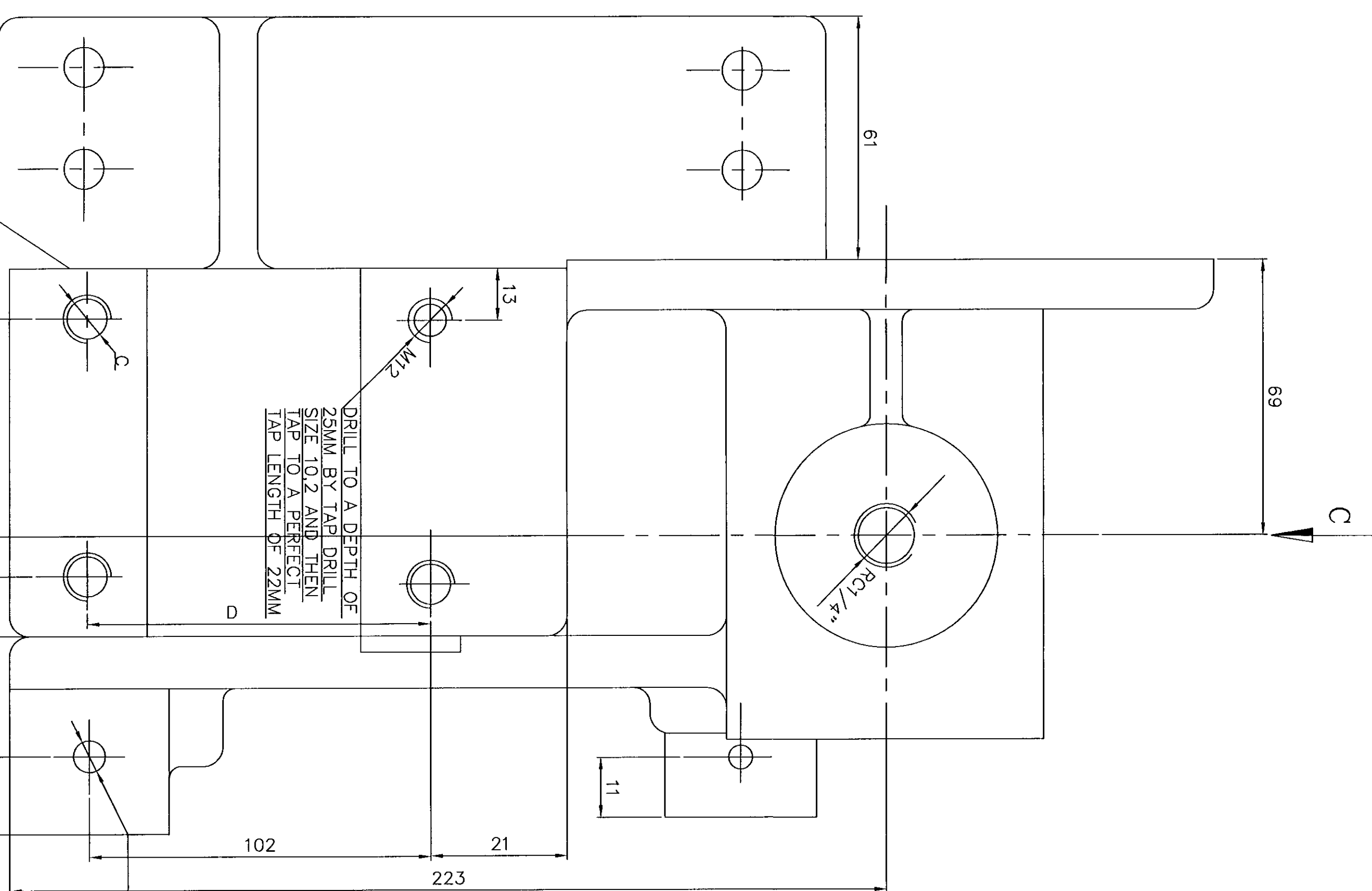
DRILL Ø6.7MM. TO A DEPTH OF 15MM
AND TAP M 8 TO A DEPTH OF 10 mm
DEEP 4 HOLES ON PCD 65MM



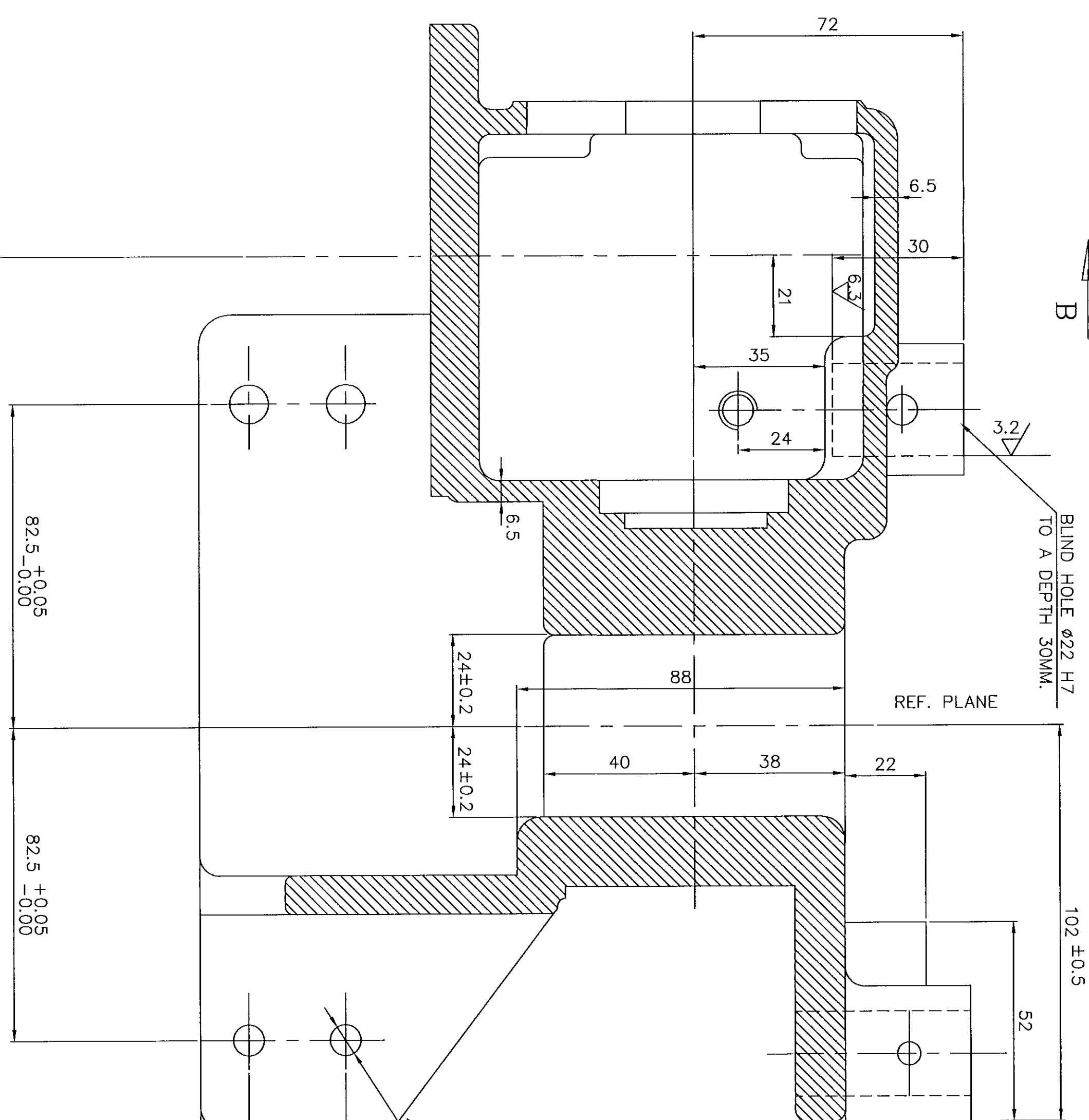
DRILL Ø6.7 TO A DEPTH OF 12MM
AND TAP M8 TO A DEPTH OF
9MM--4HOLES ON P.C.D 106±0.2MM
HOLE SHOULD NOT BE OPENED OUT



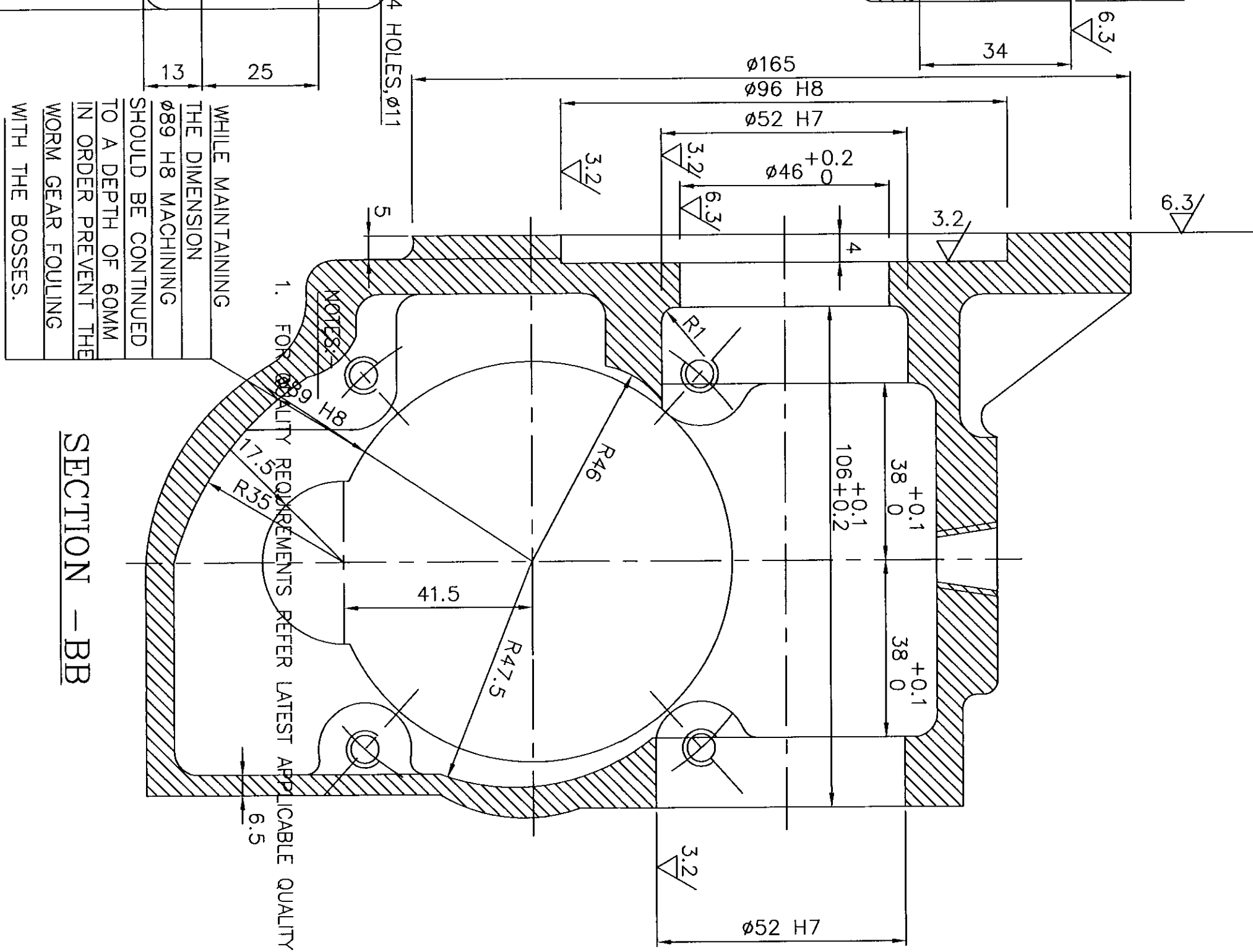
SECTION – CC.



DRILL TO A DEPTH OF
25MM BY TAP DRILL
SIZE 10.2 AND THEN
TAP TO A PERFECT
TAP LENGTH OF 22MM



BLIND HOLE Ø22 H/
TO A DEPTH 30MM.



SECTION - BB

WHILE MAINAINING
THE DIMENSION
Ø89 H8 MACHINING
SHOULD BE CONTINUED
TO A DEPTH OF 60MM
IN ORDER PREVENT THE
WORM GEAR FOULING
WITH THE BOSSES.

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURES.

VAR.02	842020111101
VAR 01	842020111100

TOLERANCE VALUES

SECTION - AA.

NOTE

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURE.
2. DIM A,B,D & E ARE APPLICABLE FOR VAR NO.2 ONLY (84 20 201 111 07).
(A=15; B=65; C=M12 3HOLES D=102; E=125

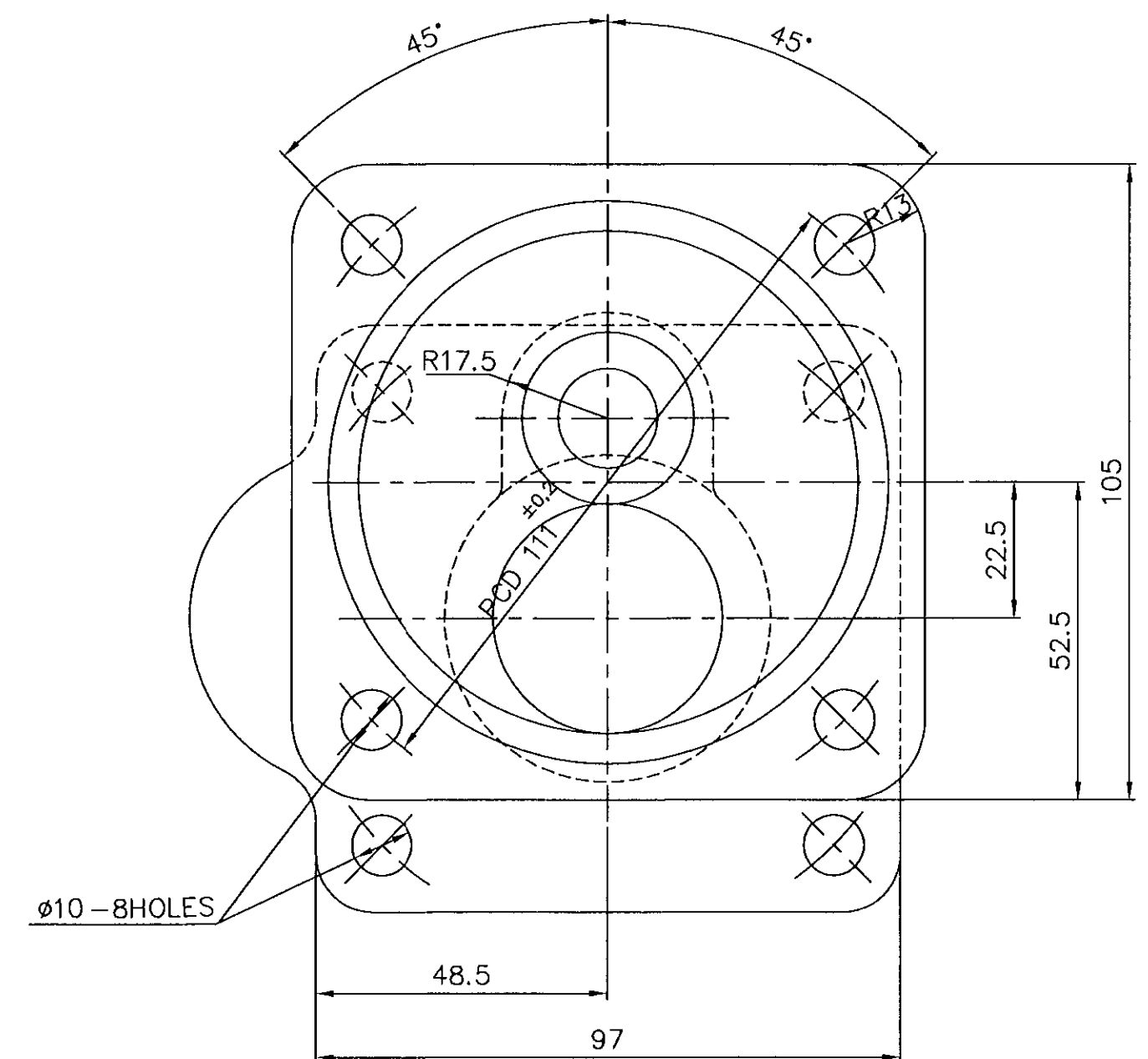
05	046 H8	+0.04
06	047 H7	+0.03
07	052 H7	+0.03
08	089 H8	+0.05
09	096 H8	+0.05

CAUTION: The information on this document is the property of ELI LILLY.

[illegible]

RACK GEAR HOUSING

0-20-201-00004 17



	CASTING	92/005/791	ALUMINIUM LM9			1.250			
No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI - 620014.					DRN CHD APPD	NAME <i>V. Arumugham.</i> <i>K. Fridharan.</i> <i>S. Natarajan.</i>	SIGN	DATE	NO.OF VAR.
DEPT SB			SCALE NTS	WEIGHT (KG).	REFERENCE INFORMATION				NO. OF ITEMS
CODE 330				~1,05	L 60378				
TITLE					CARD CODE	DRAWING NO.			REV
SWITCH MOUNT CONNECTOR					U 01	2-20-201-00061			03

SWITCH MOUNT CONNECTOR

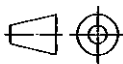
2-20-201-00061 0

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

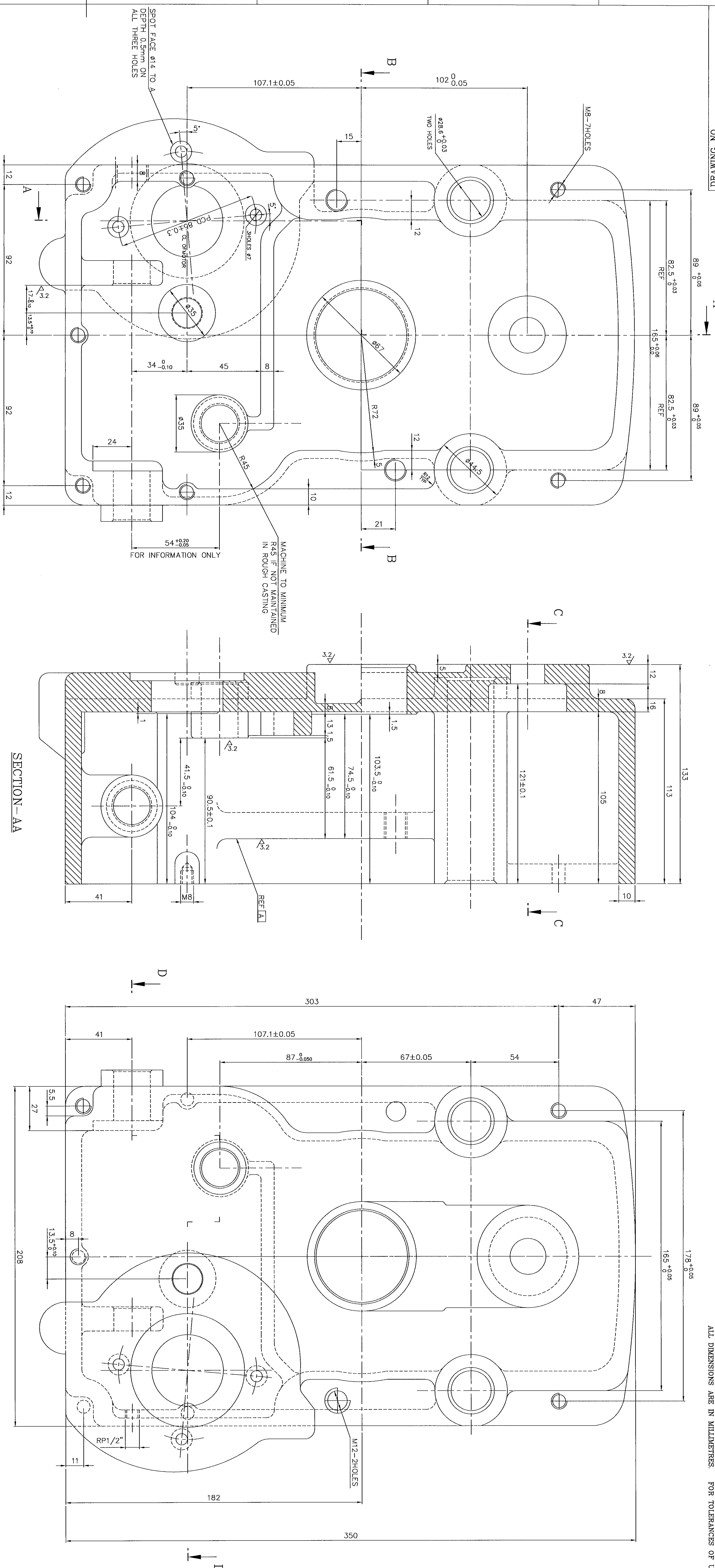
✓ (1.6 ✓ 3.2 ✓ 12.5 ✓)



FOR CASTING DRAWING REFER NO 4-20-201-00736
PART CODE :842020112600

02	D80X27	16/006/003	ALU. COMM			16			
01	CASTING	92/005/790	AL.LM9			16			01
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI 620014.					DRN	NAME		SIGN	DATE
					CHD	V.ARUMUGAM			
					APPD	K.SRIDHARAN			
						S.NATARAJAN			
DEPT SB			SCALE	WEIGHT (KG).	REFERENCE INFORMATION				NO. OF ITEMS
CODE 330			NTS	0.16					
TITLE					CARD CODE	DRAWING NO.			REV
BEARING CAP					U 01	4-20-201-00200			04

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.



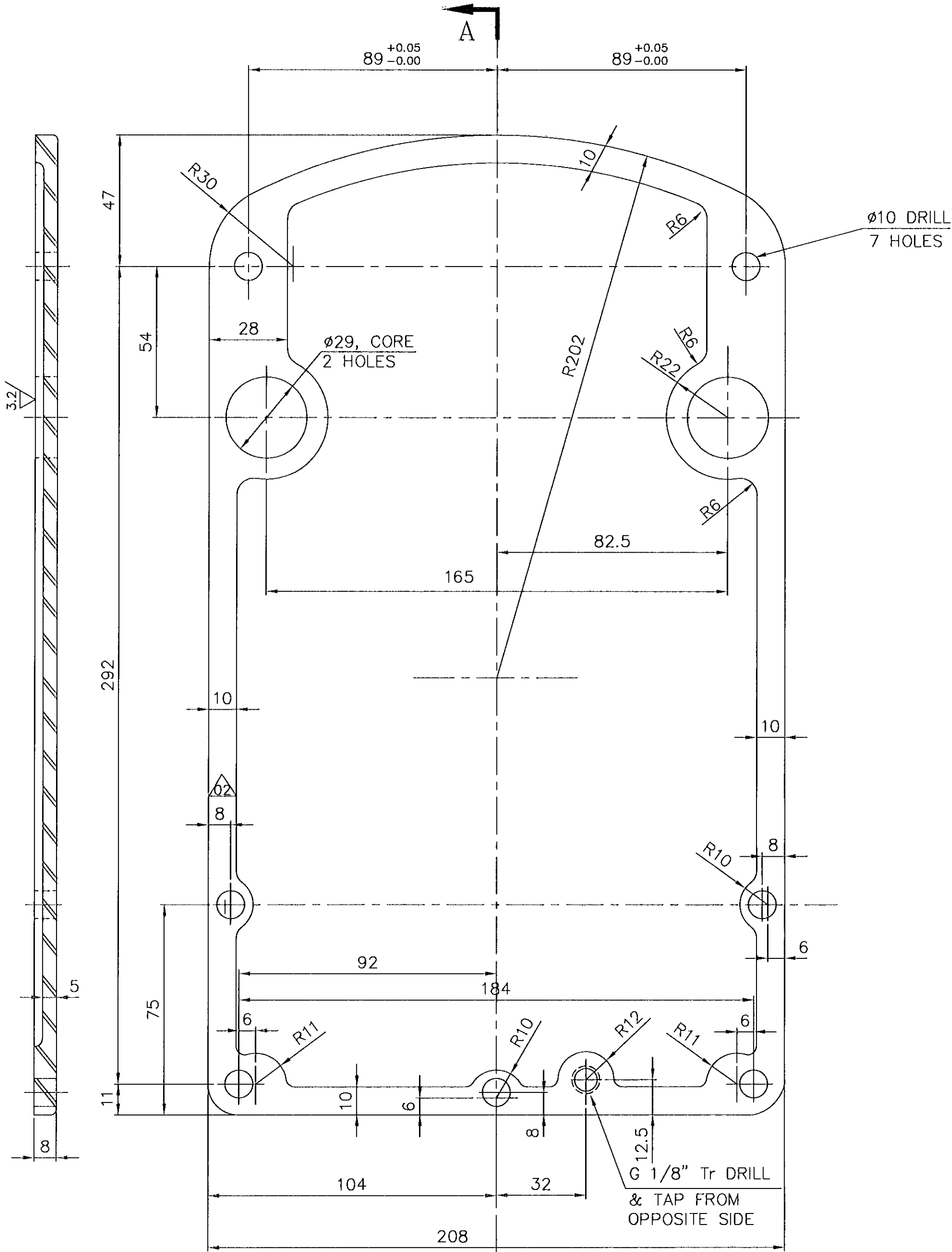
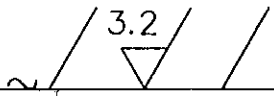
NOTE: -

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURES. DRAWING REVISED FROM DRG.NO. 0-20-201-00003

TOLERANCE VALUES			
$18\text{ }^{+0.03}_{-0}$	$19\text{ }^{+0.02}_{-0}$	$22\text{ }^{+0.03}_{-0.03}$	$56\text{ }^{+0.30}_{-0}$
$18\text{ }^{+0.03}_{-0}$	$19\text{ }^{+0.02}_{-0}$	$22\text{ }^{+0.03}_{-0.03}$	$56\text{ }^{+0.30}_{-0}$

PART CODE : 842020113200

NOTE: The information on this document is the property of BHARAT ELECTRO MECHANICALS. It must not be used directly or indirectly in any form without the consent to the interest of the company.									
TYPE OF PRODUCT				OR NAME OF CUSTOMER/PROJECT					
W/F	DESCRIPTION	W/F CODE	W/F SPEC	W/F PART	W/F DETAIL	W/F QTY	W/F UNIT	W/F PRICE	W/F TOTAL
CASTING	30-300-700	0001	40-000	0001	0001	4.000	PCS	0.0000000000	0.0000000000
ITEM NO.		ITEM CODE		ITEM NAME		ITEM QTY		ITEM PRICE	
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127		0127		30-300-700		4.000		0.0000000000	
128		0128		30-300-700		4.000		0.0000000000	
129		0129		30-300-700		4.000		0.0000000000	
130		0130		30-300-700		4.000		0.0000000000	
131		0131		30-300-700		4.000		0.0000000000	
132		0132		30-300-700		4.000		0.0000000000	
133		0133		30-300-700		4.000		0.0000000000	
134		0134		30-300-700		4.000		0.0000000000	
135		0135		30-300-700		4.000		0.0000000000	
136		0136		30-300-700		4.000		0.0000000000	
137		0137		30-300-700		4.000		0.0000000000	
138		0138		30-300-700		4.000		0.0000000000	
139		0139		30-300-700		4.000		0.0000000000	
140		0140		30-300-700		4.000		0.0000000000	
141		0141		30-300-700		4.000		0.0000000000	
142		0142		30-300-700		4.000		0.0000000000	
143		0143		30-300-700		4.000		0.0000000000	
144		0144		30-300-700		4.000		0.0000000000	
145		0145		30-300-700		4.000		0.0000000000	
146		0146		30-300-700		4.000		0.0000000000	
147		0147		30-300-700		4.000		0.0000000000	
148		0148		30-300-700		4.000		0.0000000000	
149		0149		30-300-700		4.000		0.0000000000	
150		0150		30-300-700		4.000		0.0000000000	
151		0151		30-300-700		4.000		0.0000000000	
152		0152		30-300-700		4.000		0.0000000000	
153		0153		30-300-700		4.000		0.0000000000	
154		0154		30-300-700		4.000		0.0000000000	
155		0155		30-300-700		4.000		0.0000000000	
156		0156		30-300-700		4.000		0.0	



SECTION A-A

NOTE: —

1. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURES.
M/CING ALLOWANCES TO BE MAX. OF 5MM WHEREVER NECESSARY.

PART CODE : 842020113300

		CASTING		92/005/792		ALUMINIUM LM9						1.000								
No OFF		DESCRIPTION		MATL CODE		MATL SPECN		HEAT TREATMENT		SCRAP SORT		NET WT (kg)		GROSS WT (kg)		DRAWING No		ITEM No		
TYPE OF PRODUCT																				
OR NAME OF																				
CUSTOMER/PROJECT																				
									DRN		NAME			SIGN			DATE		NO.OF VAR.	
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.									CHD		K. Pritharan.									
									APPD		P. Natarajan.									
365-120		DEPT		SB				SCALE		WEIGHT (KG).		REFERENCE INFORMATIONS							NO. OF ITEMS	
CODE		330		NTS																
TITLE									CARD CODE		DRAWING NO.							REV		
GEAR BOX COVER									U 01		2-20-201-00060							03		

REV	DATE	ALTERED
03	11.06.01	CHD & APPD
ZONE	DRG.UPDATED AND REDRAWN.	
	DCN: SB: 1298	

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69000-102-20-201-00059
DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

$\nabla/3.2/6.3$

SECTION - BB

SECTION - CC

SECTION - AA

NOTES:

1. CASTING RADII SHOULD BE 3MM WHEREVER NOT SPECIFIED.
2. REFER DRG.NO: 2-20-201-00117 FOR CASTING.
3. FOR QUALITY REQUIREMENTS REFER LATEST APPLICABLE QUALITY PROCEDURES.

PART CODE :842020113400

	BEARING FRAME	92-026-042	ALUMINIUM LM9			1.030			1
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

DRN CHD	NAME <i>V. Arumugham</i>	SIGN	DATE	NO OF VAR.
APPD	<i>K. Prithvian</i>			

DEPT SB	SCALE NTS	WEIGHT (KG). 1.030	REFERENCE INFORMATION	NO. OF ITEMS
CODE 330			12759/13	

TITLE BEARING FRAME	CARD CODE U 01	DRAWING NO. 2-20-201-00059	REV 07
------------------------	----------------------	-------------------------------	-----------

REV 07	DATE 11.06.01	ALTERED CHD & APPD
ZONE	DRG.UPDATED AND REDRAWN.	

DCN:SB:1298

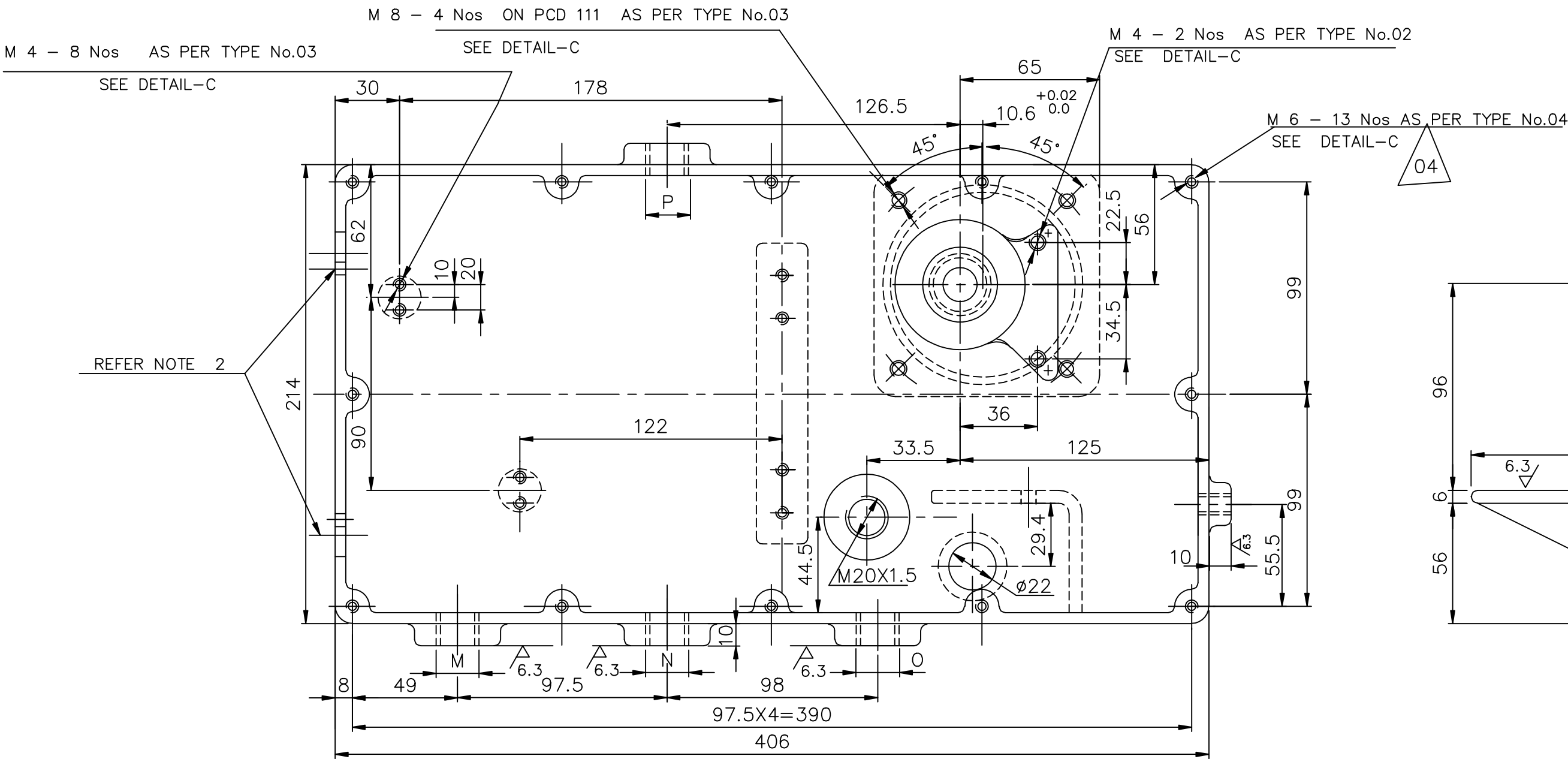
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

Size A2

2-20-201-00357
DRAWING NO.

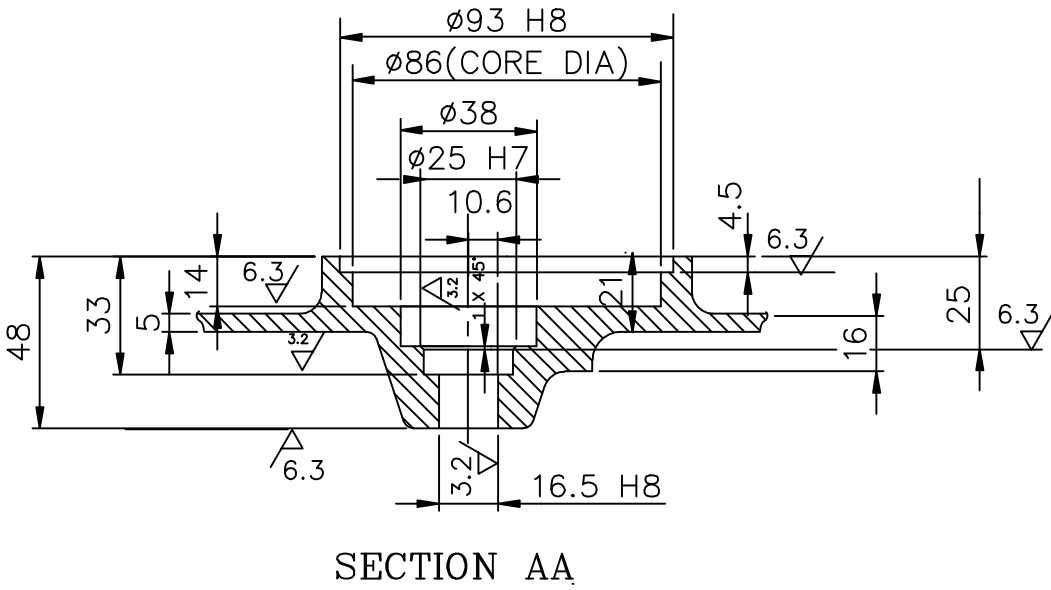
ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

3/3/2024



DIMENSIONS FOR DETAIL-C				
TYPE NO.	DIMENSION A	DIMENSION B	DIMENSION C	NO.OF HOLES
01	M8	17.5	13	4
02	M4	12.5	10	2
03	M4	12	10	8
04	M6	14	12	13

	842020139700	842020139701
M	M 33X2	M 33X2
N	M 33X2	-
O	M 33X2	-
P	-	M 33X2



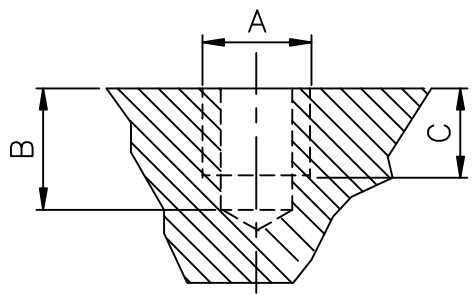
PART CODE : 842020139701
842020139700

	CASTING	16-024-016	ALUMINIUM LM9WP		4.760		2-20-201-00142	1
No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI -620014.				DRN	NAME	SIGN	DATE	NO.OF VAR.	
365-120				CHD	K. Pritharan.				
DEPT SB				APPD	P. Natarajan.				
CODE 330				REFERENCE INFORMATION				NO. OF ITEMS	
TITLE				E-129922 2-20-201-00289/04					
LIMIT SWITCH MOUNT				DRAWING NO.				REV	
				2-20-201-00357				04	

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED
04	24.08.09	CHD & APPD
M6 HOLES IN THE REGION B-5 INCREASED FROM 12 TO 13 Nos.		
DCN: 800909/5009626		

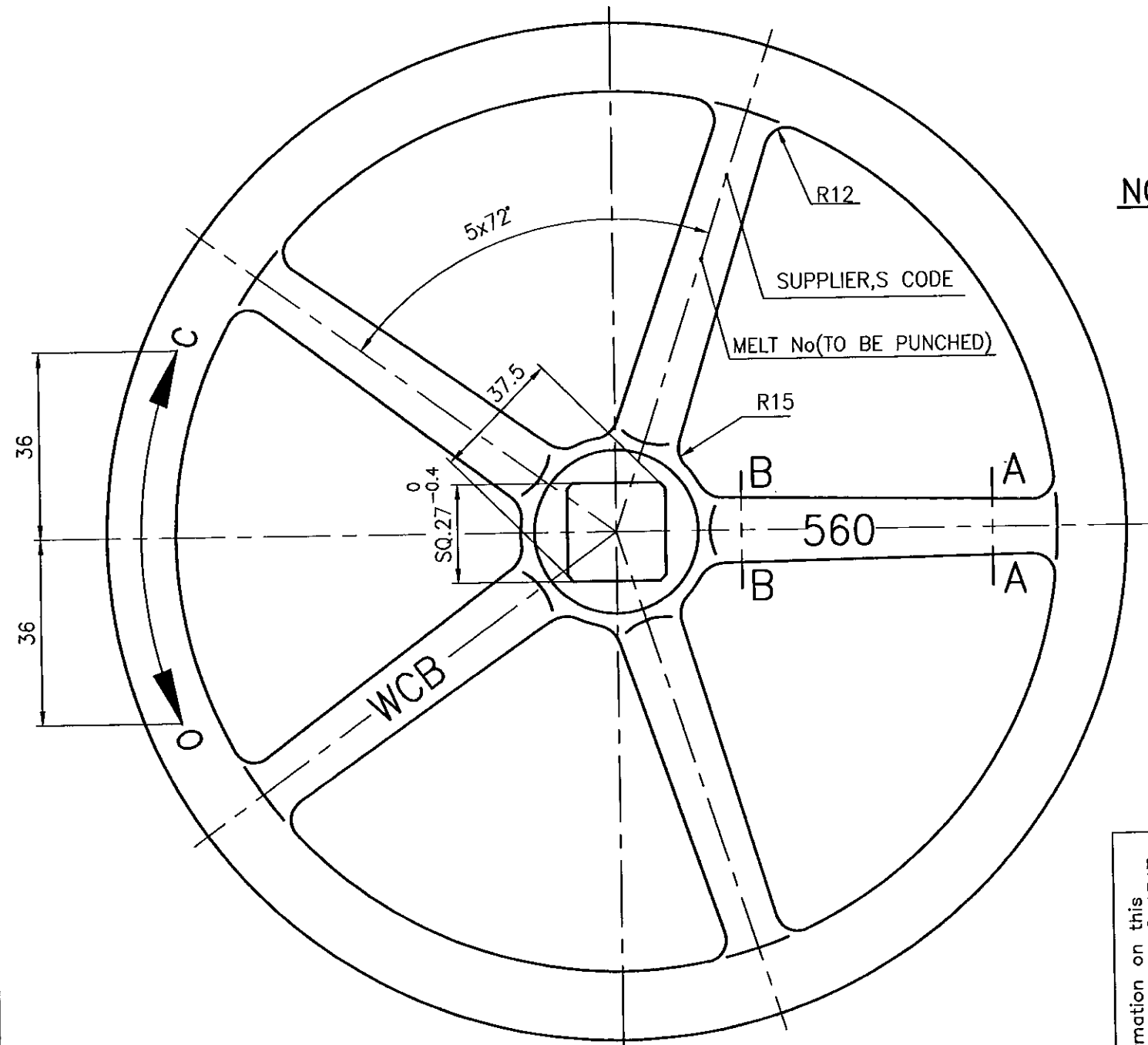


DETAIL C

NOTES:

- FOR CASTING DRAWING REFER DRG.NO: 2-20-201-00142, AFTER FINAL MACHINING SHARP CORNERS ARE TO BE ROUNDED OFF
- SPOT FACE $\phi 50$ AT THESE LOCATIONS TO MAINTAIN 5MM IF THICKNESS IS MORE THAN 5MM.
- FOR QUALITY REQUIREMENTS REFER APPLICABLE LATEST QUALITY PROCEDURES. REFER TABLE FOR M,N, O&P VALDES.

1		2		3		4		5		6		7		8																	
2-V-0000-06166R-2		ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP																													
A	SL.No.	DRAWING No.	MATL. SPECN.	MATL. CODE	DIMENSIONS																				No.OF ARMS	L	Wt.	SIZE	DIA. OF SPINDLE		
					øD	H	øD0	øD1	øD2	øD3	øD4	øD5	R	R1	A	C	E	K	V	R2	R3	B	B1	R4	R5	R6	(NOTE-6)	(kg)		ød	
	01	2-V-K648-06166R/02	A216 WCB (CERTIFY) NORMALISED	92 010 040	400	41	40	85	62	110	103	70	33	12	15	24	31	34	26	13	8	22	26	30	40	10	4	10	9.44	400	32
	02	2-V-K649-06166R/02		92 200 544	450	45	48	100	75	130	123	80	40	15	17	26	33	38	28	14	8	26	30	30	45	12	4	10	11.99	450	36
	03	2-V-K650-06166R/02		92 010 059	500	45	48	100	75	130	123	80	40	15	17	26	33	38	28	14	8	26	30	35	45	12	5	12	15.2	500	40
	04	2-V-K651-06166R/02		92 200 545	560	50	58	110	85	145	138	90	45	18	19	28	37	40	30	15	10	26	30	35	30	12	5	12	17.69	560	44
	05	2-V-K652-06166R/02		92 200 546	630	50	58	110	85	145	138	90	45	18	19	28	37	40	30	15	10	26	30	40	30	12	6	12	20.0	630	48
06	2-V-K653-06166R/02	92 200 547		710	56	85	125	100	165	158	110	53	20	21	30	38	43	32	16	10	30	36	40	30	12	6	16	26.1	710	52	
																	NOTES:														
SECTION-CC SECTION-AA SECTION-BB OPEN CLOSE WCB 120° SIZE (REFER TABLE) SUPPLIER'S CODE																	1. ⊗ INDICATES SURFACES TO BE MACHINED. ALL OTHER SURFACES SHALL BE CAST AS SMOOTH AS POSSIBLE, THE PERMISSIBLE SURFACE ROUGHNESS BEING 100 MICRONS MAXIMUM. 2. THE CASTING SHALL BE FREE FROM BURRS SHARP EDGES OR UNEVENNESS, BLOW HOLES AND ALL OTHER INTERNAL AND EXTERNAL CASTING DEFECTS. 3. UNSPECIFIED CASTING RADIUS R5 MAXIMUM. 4. CASTING SHALL COMPLY WITH REQUIREMENTS OF LATEST APPLICABLE QUALITY PROCEDURE 5. PERMISSIBLE DEVIATIONS OF NON-TOLERANCED CASTING DIMENSIONS REFER LATEST APPLICABLE QUALITY PROCEDURE 6. L = CASTING EMBOSSING LETTER HEIGHT IN MM.														
1		2		3		4		5		6		7		8																	
Size A2																															



REV 01	DATE 23 06.97	ALTERED <i>T.L. [signature]</i> CHD & APPD <i>[signature]</i>
MATL SPECN IS 2108 Gr.A CHANGED AS A216 WCB REFER DCN CS: 0718		

Size A3



PLANT STANDARD

HPBP TIRUCHIRAPPALLI

BPS 419026

Rev. No. 02

PAGE 01 OF 03

HANDWHEEL WITH PYRAMID HOLE (DIA 200 mm AND ABOVE)

0.0 SCOPE

0.1 This standard covers the requirements of off-set arm type handwheel with pyramid hole for sizes Ø 200 mm and above.

1.0 SPECIFICATION AND REFERENCE STANDARDS

Dimensions and preferred sizes	Figure 1 and Table 1 of this standard
Unspecified tolerances	As per relevant QWI
Material	Malleable Iron casting conforming to IS:14329
Surface finish	The surface should be smooth. Should be free from sharp edges and unevenness.
Marking (by embossing)	As shown in figure 1.
Manuufacture, workmanship, Packing, Preservation and other requirements	As per relevant quality procedures.

2.0 REFERRED STANDARDS (Only current versions are applicable)

IS : 14329 - Malleable iron castings.

3.0 DESIGNATION

3.1 A hand wheel of rim diameter 250 mm shall be designated as :

- i) Material spec column : -----
- ii) Description column : **HAND WHEEL 250**
- iii) Drawing No. column : **BPS 419026**
- iv) Material code column : -----

4.0 ORDERING DESCRIPTION

4.1 For placing indents, issuing enquiries and on purchase order, ordering description given below shall be followed.

HAND WHEEL 250 TO BPS 419026

Revisions 02
Brought upto date

Approved
STANDARDS SECTION
PRODUCT ENGINEERING/ FOSSILE BOILER
HPBP, TIRUCHIRAPPALLI

Rev. No. 02	Amd. No.	Reaffirmed	Prepared STANDARDS	Issued STANDARDS	Dt of 1st Issue MAY 1977
Dt. 30-06-2000	Dt.	Year			

5.0 ADDITIONAL INFORMATION

5.1 Copies of this standard shall be sent along with purchase order.

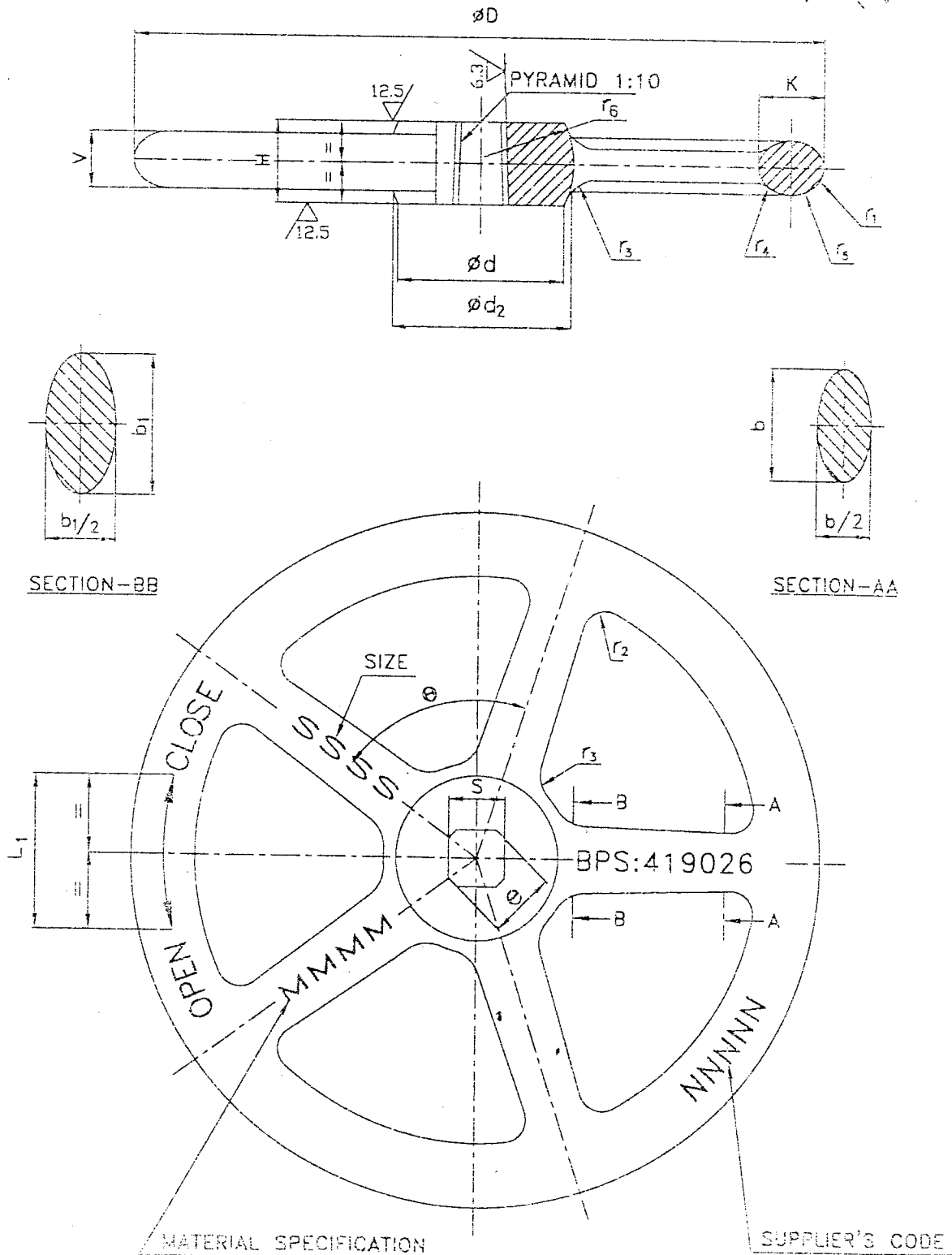
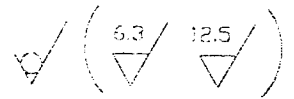
TABLE - 1

(All dimensions are in millimetres)

Rim ϕ of handwheel	ϕD	200	250	315	400	450	500	560	710
Dia of corresponding spindle	ϕd	20	24	28	32	36	40	44	52
Height of handwheel	H	24	28	32	37	42	47	52	62
Hub	S	15	18	21	24	27	30	33	39
		+ 0.0 - 0.3		+ 0.0 - 0.4					
	e	20.8	25	29	33.5	37.5	41.5	46	53
	ϕd_1	40	60	68	70	70	70	90	110
	ϕd_2	45	66	75	80	80	80	105	125
	r_3	10	12	12	15	15	15	15	15
Rim	r_6	28	28	30	30	30	30	30	40
	V	18	20	22	23	24	24	26	40
	k	24	26	30	34	36	36	38	60
	r_1	6	7	7	8	9	9	9	15
	r_4	16	16	18	20	22	24	24	26
	r_5	16	18	20	24	27	30	30	36
Arm	l_1	56	60	60	68	72	72	72	80
	b	18	20	22	26	30	30	30	38
	b_1	24	26	28	34	36	36	36	46
	r_2	6	8	10	11	12	12	12	15
No. of arms	θ	120°	120°	120°	90°	90°	90°	72°	51.43°
Letter size (height) for embossing	N	3	3	3	4	4	4	5	7
Weight in Kg/piece	l	8	8	10	10	12	12	12	15
		2.0	2.3	4.0	5.4	7.0	12.8	14.0	38.0

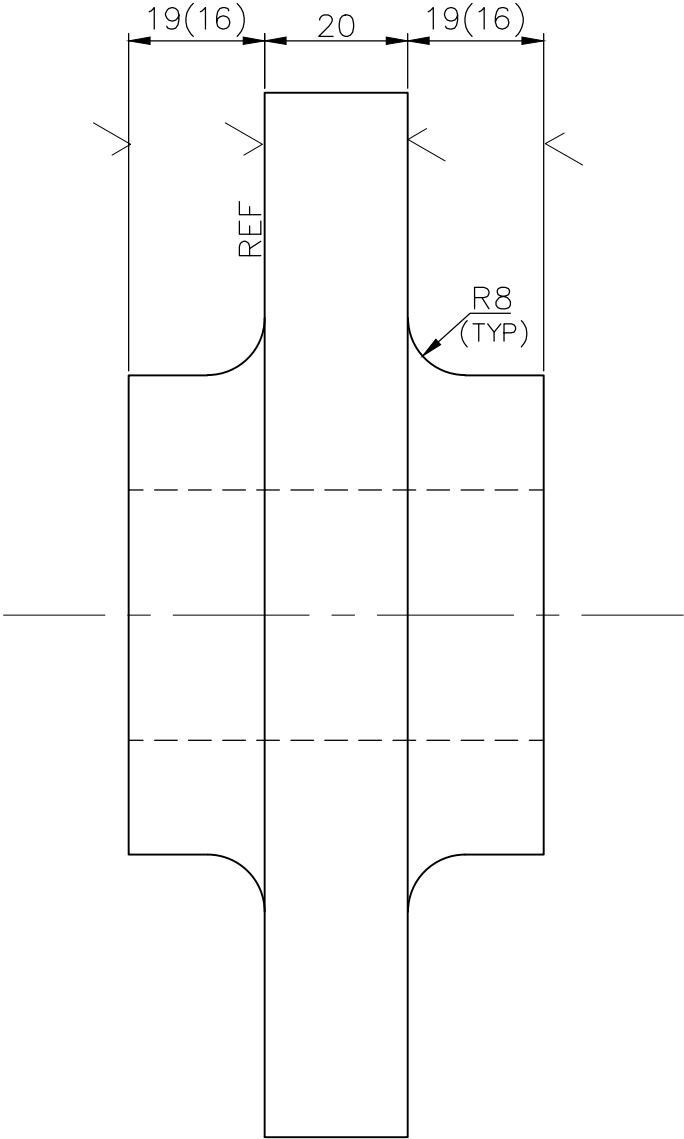
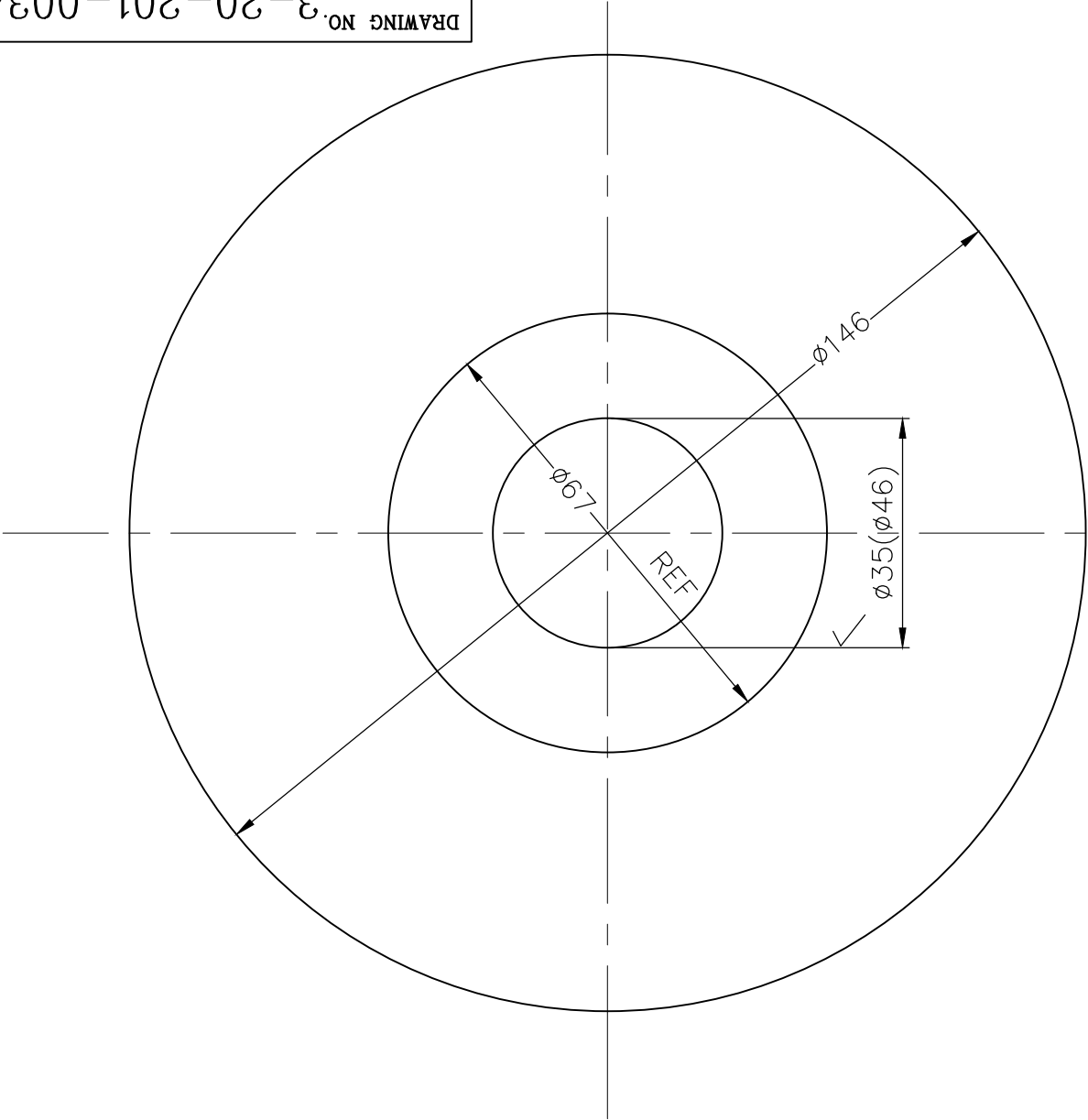
Figure-1

(ALL DIMENSIONS ARE IN MILLIMETRES)
(First Angle Projection)



Note : Size, Material spec and supplier's code are to be given in the purchase order for embossing.

DRAWING NO. 3-20-201-00346

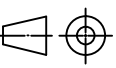


NOTES:-

- ✓ MARKS INDICATE THE SURFACES TO BE MACHINED FURTHER.
- NECESSARY MACHINING ALLOWANCES ARE ALREADY INCLUDED N THE INDICATED DIMENSION. THE FINISH MACHINED DIMENSIONS ARE GIVEN IN BRACKETS FOR INFORMATION ONLY.
- MATERIAL STANDARD FOR THE CASTING IS TO BE ADHERED AS APPLICABLE.
- UNSPECIFIED RADII ARE TO BE 3mm MAXIMUM.
- REFER DRAWING No. 3-20-201-00122 FOR MACHINING.

REV	DATE	ALTERED	J.S
06	05.07.12	CHD & APPD	S.K.G & K.S
DRAWING UPDATED AND REDRAWN.			
DCN : SB : 801294 / 5014784			

02	1	CASTING	920058090200	ASTM A216 Gr. WCB	CERTIFY			3.28		
01	1	CASTING	920058090000	ASTM A48 CL40B				3.28		
STYLE NO	N O O F F	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No

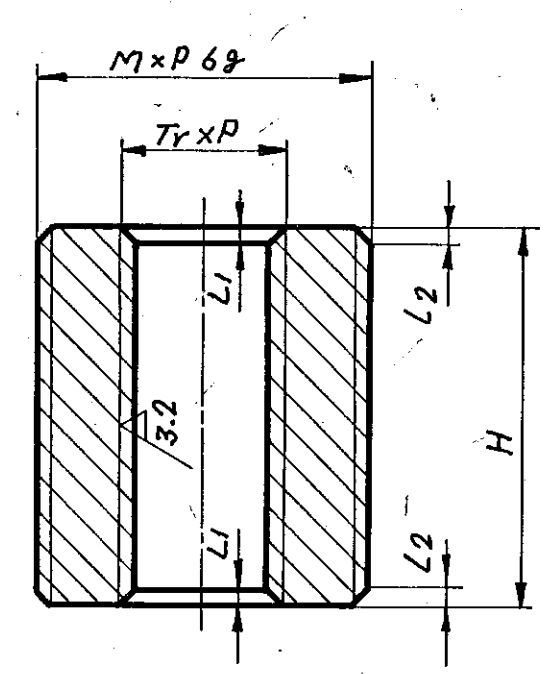
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT												
 365-121				BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.				DRN	NAME V.ARUMUGAM	SIGN V.A	DATE 11.06.01	NO.OF VAR.
								CHD	K.SRIDHARAN	K.S	11.06.01	
								APPD	S.NATARAJAN	S.N	11.06.01	
DEPT SB			SCALE NTS	WEIGHT (KG).		REFERENCE INFORMATION					NO. OF ITEMS	
CODE 330				-								
TITLE ELEMENT GEAR CASTING				CARD CODE U 01		DRAWING NO. 3-20-201-00346					REV 06	

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30/55620-0000 A 2
DRAWING NO.

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN MILLIMETRES)
FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP

SLNO	REVISED DRG. NO.	OLD DRG. NO.	MATERIAL SPECN.	RAW MATL. SIZE	MATERIAL CODE	NET WT. GROSS WT.	SCRAP SORT	M x P - 6g	Tr x P	H	L1	L2	COMP. CODE
1	2.V.2301.02955	2.V.2301.01817	IS 305 Gr. A B1	φ 30 x 22	16006355	0.05 0.11	60	24x15	12x3	18	2	1.5	93 059 075
2	2.V.0231.02955	2.V.0231.01817	"	φ 40 x 30	16006356	0.13 0.30	60	30x15	14x2	28	2	1.5	
3	2.V.2252.02955	2.V.2252.01817	"	φ 40 x 35	16006356	0.12 0.35	60	30x15	16x4	32	2.5	1.5	
4	2.V.0203.02955	2.V.0203.01817	"	φ 40 x 45	16006356	0.12 0.44	60	30x15	20x4	40	2.5	1.5	93 060 169
5	2.V.2251.02955	2.V.2251.01817	"	φ 50 x 45	16006198	0.15 0.69	60	39x15	22x5	41	3.5	1.5	93 0612000000
6	2.V.2257.02955	2.V.2257.01817	"	φ 50 x 45	16006198	0.20 0.69	60	42x2	24x5	40	3.5	2	93 1020330000
7	2.V.0206.02955	2.V.0206.01817	"	φ 50 x 55	16006198	0.45 0.85	60	45x15	24x5	48	3.5	1.5	93 0601150000
8	2.V.0207.02955	2.V.0207.01817	"	φ 50 x 55	16006198	0.55 0.85	60	45x15	26x5	52	3.5	1.5	93 1020320000
9	2.V.2247.02955	2.V.2247.01817	"	φ 50 x 55	16006198	0.25 0.85	60	48x2	28x5	50	3.5	2	93 0065320000
10	2.V.0208.02955	2.V.208.01817	"	φ 50 x 60	16006198	0.55 0.93	60	48x2	28x5	56	3.5	2	93 0609110000
11	2.V.2258.02955	2.V.2258.01817	"	φ 70 x 60	16006354	1.20 1.81	60	60x2	32x6	55	4.0	2	93 0612010000
12	2.V.0210.02955	2.V.0210.01817	"	φ 70 x 75	16006354	0.73 2.26	60	50x15	32x6	71	4.0	1.5	93 0609100000
13	2.V.2476.02955	2.V.2476.01817	"	φ 50 x 55	16006198	0.46 0.85	60	45x2	24x3	50	3.5	2	93 0584470000
14	2.V.2478.02955	2.V.2478.01817	"	φ 50 x 65	16006198	0.55 1.00	60	48x2	28x3	60	3.5	2	93 0586840000
15	2.V.2480.02955	2.V.2480.01861	"	φ 70 x 95	16006354	1.15 2.63	60	60x4	36x3	88	3.5	3	93 0606190000
16	2.V.2481.02955	2.V.2481.01861	"	φ 70 x 102	16006354	1.34 2.83	60	64x4	40x3	95	3.5	3	
17	2.V.2670.02955	2.V.2670.01861	"	φ 80 x 120	16006349	1.47 4.73	60	64x4	44x6	115	3.5	3	93 1013790000
18	2.V.2477.02955	-	SA 439 TYPE-D2	φ 50 x 55	-	0.46 0.85	20	45x2	24x3	50	3.5	2	93 1054850000
19	2.V.2685.02955	-	"	φ 50 x 65	-	0.55 1.00	20	48x2	28x3	60	3.5	2	93 1054860000
20	2.V.2690.02955	-	"	φ 55 x 70	92 200 055	0.55 1.33	30	48x2	28x3	60	3.5	2	93 105 644
21	2.V.2928.02955	-	"	φ 70 x 110	92 018 063	1.15 3.62	30	60x4	36x3	88	3.5	3	93 105 645
22	2.V.M 416-02955	-	"	φ 70 x 60	-	1.20 1.81	30	60x2	32x6	55	4.0	2	93 106 960 0000
23	2.V.M 420-02955	-	IS 5305 Gr. A B1	φ 50 x 45	16006198	0.40 0.70	60	48x2	28x5	39	3.5	2	93 1070370000
24	2.V.M 418-02955	-	IS 5305 Gr. A B1	φ 50 x 45	16006198	0.40 0.80	60	45x15	24x5	30	3.5	1.5	93 1070980000
25	2.V.P338-02955	-	SA 439 TYPE-D2	φ 82 x 120	-	1.47 4.73	60	64x4	44x4	115	3.5	3	93 1082110000



6.3 / 3.2

REV 06	DATE 27.08.96	ALTD. T.C.C. CHD & APPD.	REV 05	DATE 07.08.96	ALTD. N.D. POL/APPD.	REV 04	DATE 17.7.96	ALTD. 14.8.96	REV 03	DATE 7.4.95	ALTD. T.C.C. CHD & APPD.	REV 02	DATE 13.2.95	ALTD. N.D. DHANAPAL/APPD.	REV 01	DATE 27.7.94	ALTD. 10.7.94
SL NO. 24 INCLUDED			SL NO. 23 INCLUDED			SL NO. 22 INCLUDED			SL NO. 20 & 21 INCLUDED			1. SL NO. 18 AND 19 ARE INCLUDED.			MATERIAL SPECN IS: 305 Gr. A B1 WAS IS: 305 Gr. A B1 DCN NO HM 0043		

REV 08	DATE 23.7.97	ALTD. T.C.C. CHD & APPD.	REV 07	DATE 11.9.96	ALTD. T.C.C. CHD & APPD.
SL NO. 25 INCLUDED.		DIMN. H = 30 WAS 40 REFER DCN. CS: 0607			

		BHARAT HEAVY ELECTRICALS LTD., BOILER PLANT UNIT, TIRUCHIRAPALLI-620 014			
DEPT VL	CODE 320	SCALE NTS	WEIGHT (KG)	REF. TO ASSY. DRG.	IT NO.
TITLE YOE BUSH		DRAWN K.N		SIGN M.R.K	DATE 29.6
CHECKED M.R.K		APPROVED J. KUMAR		DATE 30.6.93	
DIMENSIONS TO BE CONTROLLED WITHIN LIMITS AS SHOWN. MACHINING TOLERANCE ± 0.15 UNLESS OTHERWISE SHOWN NON-MACHINING TOLERANCE ±		DRAWING NO. 2-V-0000-02955		15 REV. 17	

BHEL, Tiruchirappalli – 620014.	Quality Assurance	Technical Delivery Conditions
Product: NON FERROUS CASTINGS (VALVES)		
Document No.: TDC:0:413	Rev. No.: 01	Effective date: 31/01/2001 Page 1 of 2

Revision Record: Rev:00:01/07/94; Rev:01:Text rewritten, Cl.5.0 modified.

1.0 MATERIAL

Specification:ASTM:{Latest on date of Purchase Order (PO)}:

Monel "S" (Monel 505) : ASTM A494 Gr. M25S

Nickel Bronze : ASTM B584 C97800

Aluminium Bronze : IS 305 Gr. AB1

Stellite : G-Co65Cr27W6

Supernickron :

Additional Requirement:As listed below (supplementary to Specification)

Size, Qty.,Grade/Class: As per Purchase order & Drawing / Pattern.

2.0 CHEMICAL COMPOSITION & PROCESS

Chemical composition requirements are as below:

Element	Monel S	Al. Bronze	Ni.Bronze	Supernickron	Stellite
C	0.15 max.	--	--	0.35 max.	0.90-1.40
Mn	1.50 max.	1.0 max.	1.0 max.	1.0 max.	1.0 max.
Al	--	8.5-10.5	0.005 max.	--	--
Zn	--	0.5 max.	1.0-4.0	--	--
Sn	--	0.1 max.	4.0-5.5	--	--
Pb	--	0.05 max.	1.0-2.5	--	--
Mg	--	0.05 max.	--	--	--
Si	3.50-4.50	0.25 max.	0.15 max.	5.0 max.	1.5 max.
P	0.03 max.	--	0.05 max.	--	--
S	0.03 max.	--	0.08 max.	--	--
Fe	2.50 max.	1.5-3.5	1.5 max.	10.0 max.	3.0 max.
Ni	60 min.	1.0 max.	24 - 27	65 - 70	3.0 max.
Cu	27 - 33	Remainder	64 - 67	10 - 20	--
Cr	--	--	--	5.0 max.	27 - 31
Mo	--	--	--	--	1.5 max.
W	--	--	--	--	3.5-5.5
Co	--	--	--	--	Remainder

The total of Sn, Pb, Si & Mg shall not exceed 0.30% in the case of Aluminium bronze.

Aluminium bronze castings shall be made in chill moulds only. Stellite castings to be manufactured by investment casting (Lost wax) process.

3.0 DIMENSIONS AND TOLERANCES

Tolerances as per Drawing. Untoleranced dimensions for valve components: VL:STDC:023(latest).

4.0 HEAT TREATMENT (HT)

Monel castings: Solution annealed at 870 deg.C / 30 min / Oil quench. Additionally the test bars to be age hardened at 560 deg.C / 2 hours / air cool.

Supernickron castings: Age hardening to be done in electric furnace at 640 deg.C for a period of not less than 4 hours and then cooled in furnace or in air.

Aluminium bronze, Nickel bronze and Stellite castings can be supplied in the as cast condition, without heat treatment.

5.0 MECHANICAL TESTS

Test bars to be cast integral with the casting or separately. If cast separately, they shall be cast at the same time, same mould type as the castings & from the same ladle. A metal strip with heat number stamped to be fused with the test bar during casting, to maintain traceability. The test bars to be heat treated together with the castings they represent. If 1 casting is made from more than 1 heat, separate test bars for each cast to be poured & all test bars shall satisfy the requirements.

Product: **NON FERROUS CASTINGS (VALVES)**Document No.: **TDC:0:413**Rev. No.: **01**Effective date: **31/01/2001**

Page 2 of 2

Following tests to be conducted per heat / HT batch, as per ASTM A370.

Acceptance as shown:

Test	Monel S	Al. Bronze	Ni. Bronze	Supernickron	Stellite
Hardness	32-42 HRC	135 BHN min.	--	320-380 BHN	38-42 HRC
Tensile strength	--	55 Kg/sq.mm (min)	35.2 Kg/sq.mm (min)	60 Kg/sq.mm (min)	--
0.2% proof strength	--	21 Kg/sq.mm (min)	15.5 Kg/sq.mm (min) (05% proof)	--	--
% Elongation	--	18 min.	10 min.	--	--

6.0 FETTLING, DRESSING & CLEANING

Dressing of castings, free from risers, ingates, notches, under cuts, deep marks etc. Gas cutting if any to be done before HT. Castings to be sand/shot blasted both inside and outside for removal of fused sand, scales, etc. Fused wires, parting line fins, chills etc. to be removed by grinding. Visual inspection of castings for surface quality as per MSS-SP-55. Items to be proof machined wherever required.

7.0 NON DESTRUCTIVE TESTING(NDT) AFTER HEAT TREATMENT

Castings to be free from surface and internal defects like porosity, shrinkage, sand inclusion, crack, cold shut and other harmful defects.

Liquid Penetrant Inspection (LPI): As per ASTM E165 on all castings.

Acceptance: (ANSI B16.34): Cracks are not permitted. For rounded indications (circular or elliptical with length < 3 times width), 4 or more indications in a line separated by 3mm or less edge to edge are not acceptable. Maximum allowable diameter of the indication: 5mm for materials upto 13mm thick & 8mm for materials above 13mm thick.

8.0 REPAIR

Repairs involving fusion welding is prohibited.

9.0 MARKING AND PACKING

Details to be marked on each casting, using low stress stamps / etching / engraving:

1. Foundry code, 2. Specification, grade ("SINK" in the case of supernickron) & Melt number,
2. Other details as per drawing.

10.0 INSPECTION AND CERTIFICATION

Test certificate for each product with following details shall accompany the product & shall be countersigned by inspection agency nominated by BHEL, if specified in PO.

1. Purchase Order No.(BHEL), TDC No., Drawing & Test certificate number.
2. Specification and Grade with applicable year of code, Heat Number, Quantity & Size
3. Melting & Casting process, Chemistry including incidental elements - Heat wise.
4. Heat treatment details of the material and test bars.
5. Mechanical test results, NDE test results with reference & acceptance standard.
6. Dimensional Inspection Report where applicable.

11.0 AUDIT CHECKS AT BHEL

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Items found defective during check or subsequent processing at BHEL are liable for rejection..

S.Lakshmi
Prepared

R.Sasikumar(QA)
Reviewed

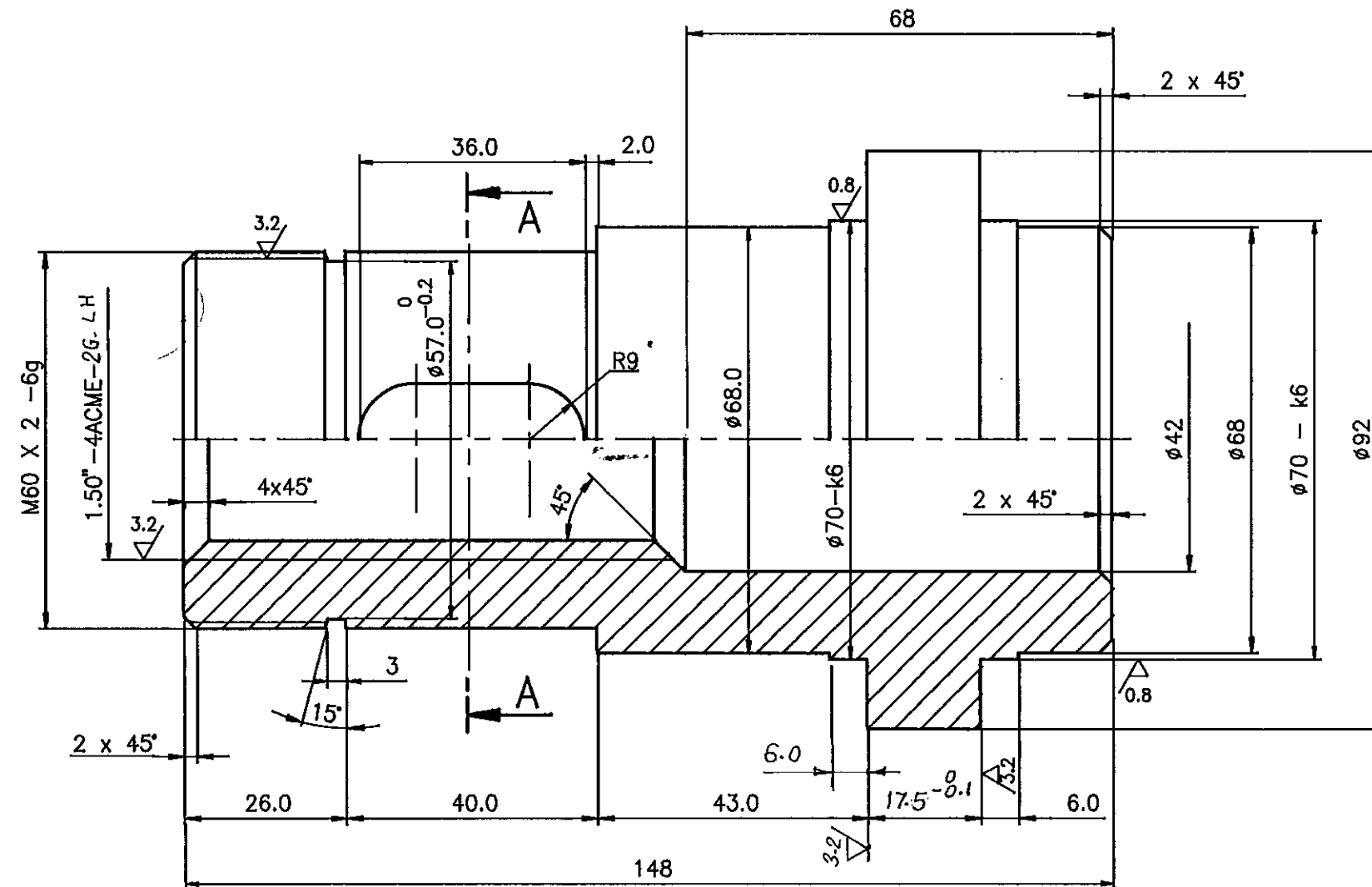
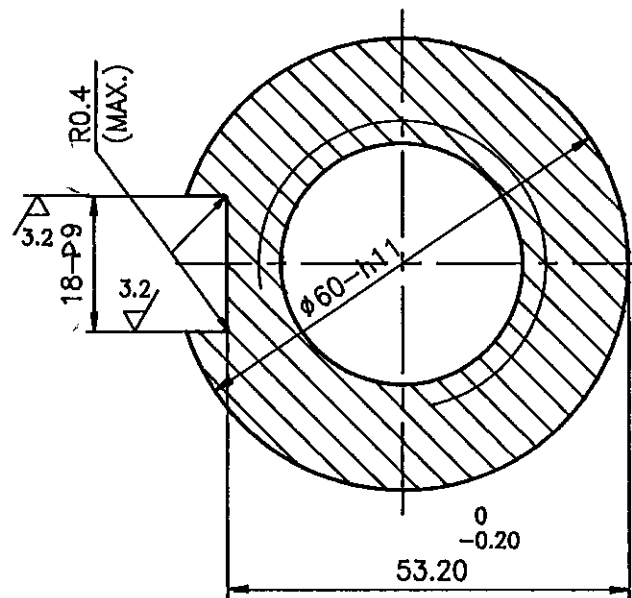
S.Kumar(Engg)

K.Rengachari
Approved

DRAWING NO. 3-V-F504-17450/01

6.3 / 3.2 0.8

SECTION - AA



Ø 70-k6	+0.021
	+0.002
Ø 60-h11	0
	-0.190
18 - P9	-0.018
	-0.061

01	SUGGESTED SIZE BAR Ø94 x 155		IS 305 Gr. AB1 CERTIFY	-	60	2.75	8.30	-	-
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT



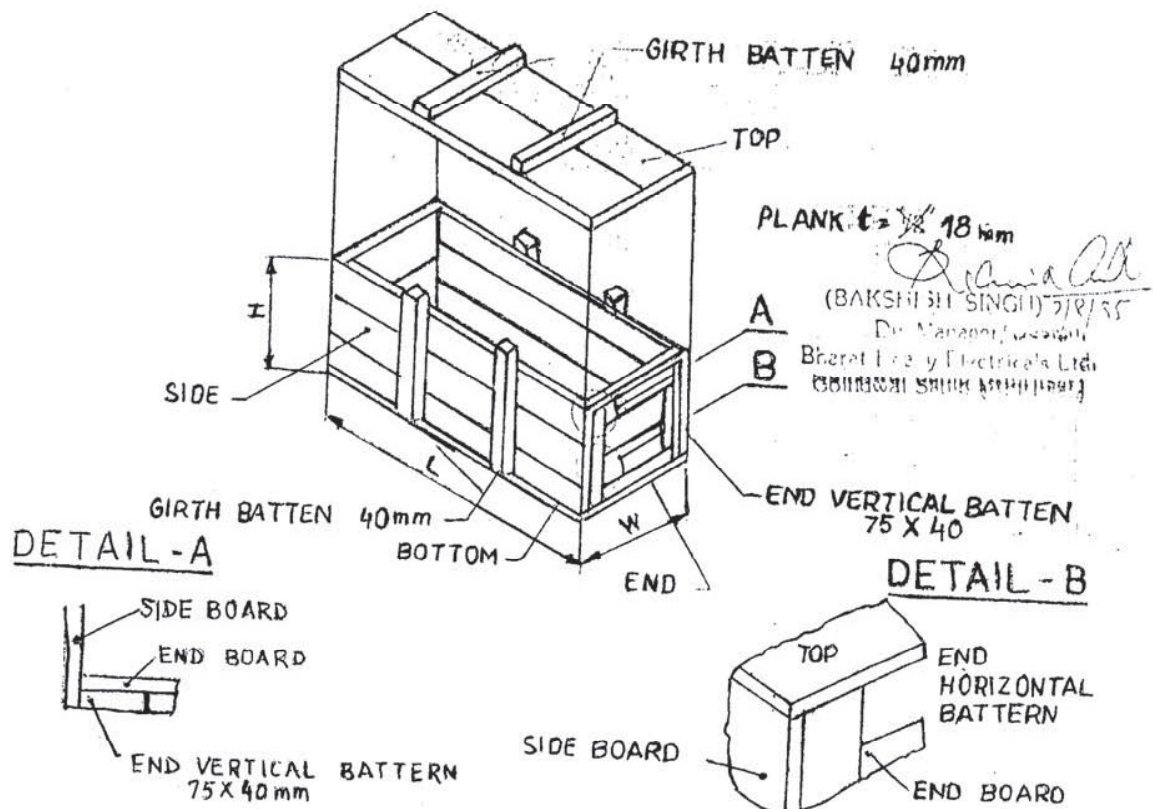
BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.

NAME	SIGN	DATE	NO. OF VAR.
M. SRINIVASAN	<i>[Signature]</i>	31.5.96	
K.S. RAMAN	<i>[Signature]</i>	1.6.96	
N. NAGARAJAN	<i>[Signature]</i>	1.6.96	

REV	DATE	ALTERED
01	1-12-98	CHD & APPD
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CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

DEPT	VL	SCALE	WEIGHT (KG)	REFERENCE INFORMATION	NO. OF ITEMS
CODE	320	NTS	2.75	Component Code : 931662720000 CAD : C317450	
TITLE				DRAWING NO.	REV
				3-V-F504-17450	01



NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. L, W, H ARE INNER DIMENSIONS OF THE BOX.

TYPE NO				
	L	W	H	
1A	320	250	260	
1	320	250	430	
2	430	370	430	
2A	500	450	550	

	BHEL –IVP-Goindwal Quality Department Technical Delivery Conditions	DOC NO TDC:WOODENBOX: Rev:06 Rev date: 18.08.2018
Product: : Assembled Wooden boxes and loose wooden planks		

1. General:

This TDC lays down instructions for supply of assembled wooden boxes and loose wooden planks at industrial valves plant for transportation of the valves/wall blowers/Loose Components & other finished products.

2. Wood Species:

The following wood species can be used for Wooden boxes/planks:

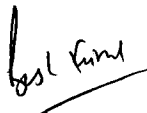
Coniferous Wood:

Trade Name	Botanical Name
Fir	Abies pindrow
Deodar	Cedrus deodara
Chir	Pinus roxburghil
Kali	Pinus wallichians
Khasi Pine	Pinus khasya
Spruce	Picea smithiana boiss

Non Coniferous Wood:

Trade Name	Botanical Name
Rubber wood	Hevea brasiliensis
Salai	Boswellia serrata
Bahera	Terminalia bellirica
Jaman	Syzygium cumini
Lendi	Lagerstroemia parviflora
Mango	Hangifera indica
Machilus(Kalamavu)	Machilus macrantha
Irul	Xylis xylocarpa
Irulbaken	Hopes
Karumarudu	Terminalia tomentosa
Murtenga	Bursera serrata
Nangal	Mesua ferrea
Pillamarudu	Terminalia paniculata
Sal	Shorea Robusta

Any other species of wood as per Groups I, II of IS 6662 will also be accepted.



Product: : Assembled Wooden boxes and loose wooden planks

3. Compliance With Standards:

Assistance has been derived from the following standards in the preparation of this specification.

BHEL Corporate Packing Standard No.. : AA 51402 for non-coniferous wood

BHEL Corporate Packing Standard No.. : AA 51401 for coniferous wood

IS 1326-1992: Non-Coniferous Sawn Timber (Baulks & Scantling)

IS 5966-1993: Non-Coniferous Timber in Converted Form for General Purposes

IS: 190 – 1991 Grade I: Coniferous Sawn Timber (Baulks & Scantling)

IS: 6662 – 1993 : Timber Species Suitable For Wooden Packaging Groups I & II

4. Requirements:

- 4.1 Wooden boxes shall be duly provided with a 70 GSM (Colourless/Transparent) Multi Layered Cross Laminated Polythene Film Specification No: AA51420 on inner surface of four sides of box & inner surface of top cover using blue nails to protect the valves from outside rain water or condensing moisture. The length of blue nails shall be 16mm.
- 4.2 Wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20 mm. The film used for top cover shall project outside on 4 sides by at least 100 mm and shall be nailed properly on sides. The film is not required for the base of the boxes.
- 4.3 Corner plates and sling plates made of mild steel sheet measuring as per drawing shall be used.
- 4.4 Two consecutive planks shall be joined by lap joint as per drawing.
- 4.5 The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 85mm wherever a 25mm planks is joined to a 50mm plank. The extra length of nail after nailing in both planks shall be bend properly. Nailing should be done in such a way that head of nail shall be outside the box. Distance between any two nails shall not be more than 100mm.

5. Dimensions and Tolerances:

Width, thickness and length of all components of wood used in wooden boxes shall be as specified in drawing/Purchase Order. Dimensional tolerances shall be as follows:

Width: +/- 5mm

Thickness : +2/-1 mm (for thickness less than 20 mm)

+3/-1 mm (for thickness $\geq$ 20 mm)

Length: +/- 2% of total length or 25 mm whichever is lower.

	BHEL –IVP-Goindwal Quality Department Technical Delivery Conditions	DOC NO TDC:WOODENBOX: Rev:06 Rev date: 18.08.2018
Product: : Assembled Wooden boxes and loose wooden planks		

6. Moisture Content:

The timber shall have moisture content as stated below within a depth of 15mm from the surface excluding a length of 300 mm from each end at the time of inspection. The moisture content will be determined in accordance with IS: 287

October to June : 30%
July to September (Rainy season) : 40%.

7. Permissible Defects:

- 7.1 Brashness, splits across the grains, shakes, cups, twist, insect attack, centre heart in planks are the defects which are not acceptable.
- 7.2 **Bow:** Shall be permissible upto a maximum of 2mm for 300mm
- 7.3 **End Splits:** The largest end splits at each end shall be measured and the length added together. The added lengths of these shall not exceed 60 mm per meter run of the piece.
- 7.4 **Live / Dead Knots:** A maximum of 5 Knots/m length are permissible; however, the knots shall not be so grouped or located as to affect the strength of the piece. Knots above 35mm. diameter are not permissible. Major axis of the knot shall be taken as the diameter of this knot.
- 7.5 **Surface Cracks:** Surface cracks with a depth of 10% subjected to maximum of 10 mm are permissible. A continuous crack of any depth all along the length is not permissible.

8. Certificate:

The supplier shall furnish a certificate with each lot/consignment in support of the species of the wood, moisture content, size of the nails used, GSM of polythene used, dimension report of one piece per type per lot and any special information which the tenderer feel is essential for the quality of the packing boxes.

9. Identification and Marking:

The boxes shall be marked/painted in order to identify the source of supply on one of two small side faces.

- SUPPLIER NAME:
- BOX TYPE:
- BOX SERIAL NO.:
- SUPPLIER INVOICE NO.:

Following marking has to be done using paint/ink & stencil on one long side face-

- CONSIGNEE :
- INVOICE NO.:
- OA NO./WO. NO.:




	BHEL –IVP-Goindwal Quality Department Technical Delivery Conditions	DOC NO TDC:WOODENBOX:
		Rev:06 Rev date: 18.08.2018
Product: : Assembled Wooden boxes and loose wooden planks		

- CASE NO.:
- MATERIAL/QTY:
- WEIGHT:
- FROM :BHEL/GOINDWAL/TARN TARAN

The ink shall be non-fading/indelible and non-washable by water.

Loose planks supplied by supplier as per PO shall be done colour coding on one end as per colour allotted to supplier.

10. Inspection: Supplier shall submit inspection report as per below format for one box of each type per lot of supply:

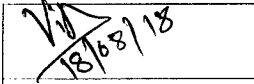
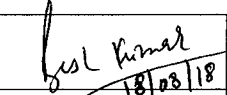
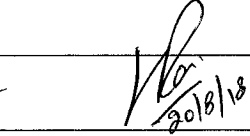
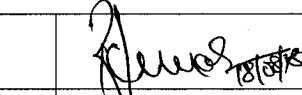
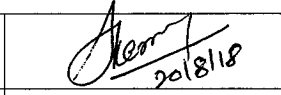
Inspection Format for wooden boxes and planks:									
Date of inspection:						Box inspection format no: Wooden box insp:001			
Supplier name									
Supplied batch details									
Observed dimensions									
Box type	L	W	H	C	D	Dimension	LENGTH	width	Thickness
						Plank			
						Resting Beam			
						others			
SN	Type of check		Remarks						
1	Polythene film								
2	Corner and sling plates								
3	Planks overlapping								
4	Moisture content								
5	Size of nails used								
6	Defect details (If found above permissible limit as per clause No. 7)								
7	Identification and Marking								
8	Other remarks(If any)								




	BHEL –IVP-Goindwal Quality Department Technical Delivery Conditions	DOC NO TDC:WOODENBOX: Rev:06 Rev date: 18.08.2018
Product: : Assembled Wooden boxes and loose wooden planks		

11. AUDIT CHECKS AT BHEL:

BHEL reserves the right to carry out audit checks for wood species, polythene film confirmation to standard, nails size, Corner & Sling plate material & dimension, planks & overall box dimensions. Items found defective during check at BHEL will be rejected.

				
Vikas Kumar	Rajesh Kumar	Harpreet Rai	Rakesh Kumar	S R Kenny
Sr. Engr/QM	Dy Mgr/CML	Sr DGM/CML	Sr DGM/MM	AGM/QM &HSE
Prepared by		Reviewed by		Approved by



CORPORATE PURCHASING SPECIFICATION

AA51401

Rev No. 03

PAGE 1 of 6

CONIFEROUS TIMBER FOR GENERAL PACKING PURPOSES

1.0 GENERAL:

This specification governs the quality requirements of Coniferous timber supplied in the form of planks, battens beams and sleepers. The coniferous timber differs from non-coniferous (broad leave) timber in its gross appearance, anatomical structure and properties. In general, it works more easily under the tools and can be easily nailed.

2.0 APPLICATION:

Used for general packing purposes.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no National standard covering this material. However, assistance has been derived from the following National standards:

IS: 190 – 1991 Grade I : Coniferous Sawn Timber (Baulks & Scantling)

IS: 6662 – 1993
Groups III & IV : Timber Species Suitable For Wooden Packaging

4.0 TERMINOLOGY:

For the purpose of this specification, the definitions given in IS: 707 (Glossary of terms applicable to timber and timber products) shall apply except for the beam which is defined as follows:

Beam is defined as converted timber whose cross-sectional dimensions exceed 50mm in both directions.

5.0 SPECIES:

Shall be as stated on the order. Some standard species are:

<u>Trade Name</u>	<u>Botanical Name</u>	<u>Abbreviation</u>
Fir	Abies pindrow	FIR
Deodar	Cedrus deodara	DEO
Chir	Pinus roxburghil	CHR
Kali	Pinus wallichians	KAL
Khasi Pine	Pinus khasya	KPI
Spruce	Picea smithiana boiss	SPR

Revisions:

Cl. 6.2.2 of MOM of WG – (T&PM)

APPROVED:INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC(T&PM)

Rev No.03

Amd No.01

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt:01-10-1995

Dt:02-05-2002

Year:2018

HEP, Bhopal

Corp.R&D

MAR. '80

CORPORATE PURCHASING SPECIFICATION



6.0 DIMENSIONS AND TOLERANCES:

6.1 Sizes:

Width, thickness and length of timber shall be clearly stated on the order.

6.2 Tolerances:

6.2.1 Width : 50 to 250 mm Tolerance : +3 mm

6.2.2 Thickness: 20 to 250 mm Tolerance: +3 mm
- 1 mm

6.2.3 Length:

Standard length : 1 to 12 metres in multiples of 0.5 metre
Tolerance : $\pm 2\%$ or ± 25 mm whichever is less.

Note:

1.0 Measurements:

1.1 When nominal sizes are ordered, length, width and thickness shall be measured on the basis of accepted sizes. Plus tolerances shall not be added while computing the volume.

1.2 The measurements of length, width, thickness and computation of volume shall be as follows:

- a) The length shall be measured in metres in midline of a piece. The fractions of a metre shall be rounded off to the nearest lower 10 mm.
- b) The width shall be measured at the narrowest place in millimetres and shall be rounded off to the nearest lower one millimetre.
- c) The thickness shall be measured at the narrowest place in millimeters and shall be rounded off to the nearest lower one millimeter.
- d) The volume shall be computed in cubic meters correct to three places of decimal on the basis of accepted sizes

2.0 Single sampling plan based on IS: 2500 shall be followed.

7.0 MOISTURE CONTENT:

The timber shall have moisture content as stated below within a depth of 15mm from the surface excluding a length of 300mm from each end at the time of inspection. The moisture content will be determined in accordance with IS: 287

October to June : 30%

July to September (Rainy season): 40%



CORPORATE PURCHASING SPECIFICATION

AA51401

Rev No.03

PAGE 3 of 6

8.0 FREE FROM DEFECTS:

Timber shall be free from the following defects:

Brashness, splits across the grain, shakes, spring, twist, insect attack, any kind of decay (rot), any sign of Infection, open centre heart, centres heart on planks and any other defect.

Defects to the extent specified below are permissible. These defects shall be measured in accordance with IS: 3364.

8.1 Bow:

Shall be permissible up to a maximum of 2 mm for 300 mm length.

8.2 Cud:

Shall be permissible up to a maximum of 6 mm for 300 mm width

8.3 Centre heart:

Shall be permissible only on sleepers when it is not further than 35 mm from the nearest edge. This does not apply to beams of cross sections above 200 X 200 mm.

8.4 Wane:

- a) For sections up to and including 150 X 150 mm:

Shall be permissible upto 1/5 of the width on the broad face subject to a maximum of 70 mm and upto 1/3 of the width on the narrow face subject a maximum of 50 mm, provided that one broad face is completely free from this defect. The wane shall be measured at its deepest part

- b) For sections above 150 X 150 mm:

The cumulative lengths of waness on all the sides should not be more than one length of the piece.

8.5 End splits:

The longest end split at each end shall be measured and the lengths added together. The total length of these shall not exceed 80mm per meter run of the piece.

8.6 Live knots:

8.6.1 Knots on the surface:

- a) Up to & including 25 mm diameter:

A maximum of 5 knots/meter length are permissible. However, the knots shall not be so grouped or located as to affect the strength of the piece.

- b) Over 25mm and up to and including 70 mm diameter:

A maximum of 2 knots/metre length are permissible.

CORPORATE PURCHASING SPECIFICATION



8.6.2 Knots on the edges:

- a) Up to and including 10 mm diameter and for full thickness:

A maximum of 2 knots/metre length are permissible

- b) Over 10 mm and up to & including 50 mm diameter and for less than half thickness:

A maximum of 2 knots/metre length are permissible.

8.7 Dead knots:

- a) Below 10 mm diameter:

A maximum of 3 knots/metre length are allowed provided that the knots are not so grouped or located as to affect the strength.

- b) From 10 mm to up to and including 25mm diameter:

A maximum of 2 knots allowed to the extent of 1 knot/metre length.

- c) Above 25 mm diameter:

Not allowed

Note: (For clauses 8.6 & 8.7): Major axis of the knot should be taken as the diameter of the knot

8.8 Surface cracks:

Surface cracks with a maximum depth of 10% of the thickness are permissible. A continuous crack of any depth all along the length is not permissible.

8.9 Sap Wood:

Permissible up to a maximum of 12 percent of the cross sectional area.

9.0 END COATING:

Timber shall be coated with any of the following effective compositions upto a distance of 80 mm from each end

- 9.1 Thick coal tar or bituminous paint.

- 9.2 Resin and lamp black (10:1) melted, mixed and applied hot.

- 9.3 Hardened gloss oil.

- 9.4 Paraffin wax.

- 9.5 Molasses and lime (3:1).

- 9.6 Geru/Yellow clay



CORPORATE PURCHASING SPECIFICATION

AA51401

Rev No.03

PAGE 5 of 6

10.0 INSPECTION AT SUPPLIER'S WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL's representative. BHEL representative shall have free access at all times while work on the contract is being performed to all parts of the manufacturer works. The manufacture shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with this specification.

The manufacturer shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his works the manufacturer, shall make necessary arrangements for carrying out the prescribed tests elsewhere. The manufacturer shall notify BHEL in advance about the readiness of the material for inspection and testing. BHEL reserves the right to test the material at BHEL's Works and the final acceptance of the material shall be based on these test results

11.0 TEST CERTIFICATES:

Three copies of test certificate shall be supplied unless otherwise stated on the order.

In addition, supplier shall ensure to enclose one copy of test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall have the following information:

AA51401 (Rev.No. 03): CONIFEROUS TIMBER FOR GENERAL PACKING PURPOSES

BHEL order No.:

Supplier's References:

Type & Specie:

Treatment, if any:

Results of Dimensional Inspection:

Moisture content:

Defects as per clause 8.0:

Size:

Quantity supplied:

12.0 MARKING:

The timber shall be marked/painted with the following:

AA 514 01

BHEL order No. :

Supplier's Name :

Size & Quantity :

CORPORATE PURCHASING SPECIFICATION



13.0 REJECTION AND REPLACEMENT:

If the material does not conform to the requirements of this specification or found defective during further processing, such material shall be rejected not withstanding any previous certification of satisfactory testing and/or inspection. The supplier shall under take to replace the rejected consignment at his own cost and the rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.

14.0 REFERRED STANDARDS:

The following is the list of the latest standards, as published by the respective issuing bodies, referred to in this specification.

- | | | |
|-------------|-------------|-------------|
| 1) IS: 190 | 2) IS: 287 | 3) IS: 707 |
| 4) IS: 2500 | 5) IS: 3364 | 6) IS: 6662 |



CORPORATE PURCHASING SPECIFICATION

AA51402

Rev No. 03

PAGE 1 of 5

NON-CONIFEROUS TIMBER FOR GENERAL PACKING PURPOSES

1 GENERAL

This specification governs the quality requirements of Non-Coniferous Timber supplied in the form of planks, battens, beams and sleepers.

2 APPLICATION

Used for general packing purposes.

3 COMPLIANCE WITH NATIONAL STANDARDS

There is no National standard covering this material. However, assistance has been derived from the following National standards:

- IS 1326-1992: Non-Coniferous Sawn Timber (Baulks & Scantling)
- IS 5966-1993: Non-Coniferous Timber in Converted Form for General Purposes
- IS 6662-1993 Groups I & II: Timber Species Suitable For Wooden Packaging

4 TERMINOLOGY

For the purpose of this specification, the definitions given in IS 707 (Glossary of terms applicable to timber and timber products) shall apply except for the beam which is defined as follows:

Beam is defined as converted timber whose cross-sectional dimensions exceed 50mm in both directions.

5 SPECIES

Shall be as stated on the order- Some standard species are:

Trade Name	Botanical Name
Rubber wood	Hevea brasiliensis
Salai	Boswellia serrata
Bahera	Terminalia bellirica
Jaman	Syzygium cumini
Trade Name	Botanical Name
Lendi	Lagerstroemia parviflora
Mango	Hangifera indica
Machilus(Kalamavu)	Machilus macrantha
Irul	Xylis xylocarpa
Irulbaken	Hopes
Karumarudu	Terminalia tomentosa
Murtenga	Bursera serrata
Nangal	Mesua ferrea
Pillamarudu	Terminalia paniculata
Sal	shorea robusta

Revisions:

Clause 6.2.3 of MOM of WG (T&PM)

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE – MRC(T&PM)

Rev No.03

Amd No. 03

Reaffirmed

Prepared
HEP, Bhopal

Issued
Corp.R&D

Dt. of 1st Issue
01-03-1980

Dt:01-10-1995

Dt:

Year:2018



Silver oak	Grevillea robusta
Tada(Dhaman)	Grewia tillifolia

Any other species of wood as per Groups I & II of IS 6662 may also be ordered.

6 DIMENSIONS AND TOLERANCES

6.1 Sizes

Width, thickness and length of timber shall be clearly stated on the order.

6.2 Tolerances

6.2.1 Width: 50 to 250 mm, Tolerance: ± 3 mm

6.2.2 Thickness: 20 to 250 mm, Tolerance: $+3$ mm
 -1 mm

6.2.3 Length

Standard length : 1 to 12 metres in multiples of 0.5 metre

Tolerance : $\pm 2\%$ or ± 25 mm whichever is less.

Note

1) Measurements

1.1) When nominal sizes are ordered, length, width and thickness shall be measured on the basis of accepted sizes. Plus tolerances shall not be added while computing the volume.

1.2) The measurements of length, width, thickness and computation of volume shall be as follows:

- The length shall be measured in metres in midline of a piece. The fractions of a metre shall be rounded off to the nearest lower 10 mm.
- The width shall be measured at the narrowest place in millimetres and shall be rounded off to the nearest lower one millimetre.
- The thickness shall be measured at the narrowest place in millimetres and shall be rounded off to the nearest lower one millimetre.
- The volume shall be computed in cubic metres correct to three places of decimal on the basis of accepted sizes.

2) Single sampling plan based on IS 2500 shall be followed.

7 MOISTURE CONTENT

The timber shall have a moisture content as stated below within a depth of 15mm from the surface excluding a length of 300mm from each end at the time of inspection. The moisture content will be determined in accordance with Appendix-A of IS 287.

October to June : 30%

July to September (Rainy season) : 40%

8 FREE FROM DEFECTS

Timber shall be free from the following defects:

Brashness, splits across the grain, shakes, spring, twist, insect attack, any kind of decay (rot), any sign of infection, open centre heart, centre heart on planks and any other defect.

Defects to the extent specified below are permissible. These defects shall be measured in accordance with IS 3364.

8.1 Bow

Shall be permissible upto a maximum of 2mm for 300mm length.



CORPORATE PURCHASING SPECIFICATION

AA51402

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PAGE 3 of 5

8.2 Wane

- a) For sections upto and including 150 X 150 mm:

Shall be permissible upto 1/5 of the width on the broad face subject to a maximum of 60mm and upto 1/3 of the width on the narrow face subject a maximum of 40mm, provided that one broad face is completely free from this defect. The wane shall be measured at its deepest part.

- b) For sections above 150 X 150 mm

The cumulative lengths of waness on all the sides should not be more than one length of the piece.

8.3 End splits

The longest end split at each end shall be measured and the lengths added together. The total length of these shall not exceed 60mm per metre run of the piece.

8.4 Live knots upto 35mm diameter

A maximum of 5 knots/metre length are permissible. However, the knots shall not be so grouped or located as to affect the strength of the piece.

Live knots above 35mm diameter are not permissible.

8.5 Dead knots

- a) Below 10mm diameter

A maximum of 3 knots/metre length are allowed provided that the knots are not so grouped or located as to affect the strength.

- b) From 10mm to upto and including 25mm diameter

A maximum of 2 knots allowed to the extent of 1 knot/metre length.

- c) Above 25mm diameter

Not allowed.

Note: (For clauses 8.4 & 8.5): Major axis of the knot should be taken as the diameter of the knot.

8.6 Surface cracks

Surface cracks with a depth of 10% subject to a maximum of 10mm are permissible. A continuous crack of any depth all along the length is not permissible.

8.7 Sap wood

Permissible upto a maximum of 12 percent of the cross sectional area.

9 END COATING

Timber shall be coated with any of the following effective compositions upto a distance of 80mm from each end.

- 9.1 Thick coal tar or bituminous paint.

- 9.2 Resin and lamp black (10:1) melted, mixed and applied hot.

- 9.3 Hardened gloss oil.

- 9.4 Paraffin wax.

- 9.5 Molasses and lime (3:1).

- 9.6 Geru/Yellow clay.

**10 INSPECTION AT SUPPLIER'S WORKS**

Whenever specified, tests and inspection are to be conducted in the presence of BHEL's representative. BHEL representative shall have free access at all times while work on the contract is being performed to all parts of the manufacturer works. The manufacture shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with this specification.

The manufacturer shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his works the manufacturer shall make necessary arrangements for carrying out the prescribed tests elsewhere. The manufacturer shall notify BHEL in advance about the readiness of the material for inspection and testing.

BHEL reserves the right to test the material at BHEL's Works and the final, acceptance of the material shall be based on these test results.

11 TEST CERTIFICATES

Three copies of test certificate shall be supplied unless otherwise stated on the order.

In addition, supplier shall ensure to enclose one copy of test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall have the following information:

- AA51402, Rev.No.03 : NON-CONIFEROUS TIMBER FOR GENERAL PACKING PURPOSES
- BHEL order No. :
- Supplier's References :
- Type & Specie :
- Treatment, if any :
- Results of Dimensional Inspection :
- Moisture content :
- Defects as per clause 8 :
- Size :
- Quantity supplied :

12 MARKING

The timber shall be marked/painted with the following:

- AA51402
- BHEL order No.
- Supplier's Name
- Size & Quantity

13 REJECTION AND REPLACEMENT

If the material does not conform to the requirements of this specification or found defective during v further processing, such material shall be rejected notwithstanding any previous certification of satisfactory testing and/or inspection. The supplier shall under take to replace the rejected consignment at his own cost and the rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.



CORPORATE PURCHASING SPECIFICATION

AA51402

Rev No. 03

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14 REFERRED STANDARDS

The following is the list of the latest standards, as published by the respective issuing bodies, referred to in this, specification.

- 1) IS 287
- 2) IS 707
- 3) IS 1326
- 4) IS 2500
- 5) IS 3364
- 6) IS 5966
- 7) IS 6662

**CORPORATE PURCHASING SPECIFICATION****AA 514 20****Rev. No. 02****PAGE 1 OF 4****MULTILAYERED CROSS LAMINATED POLYETHYLENE FILM****1.0 GENERAL:**

This specification governs the quality requirements of multilayered cross laminated polyethylene film. The cross lamination gives qualities of extra toughness, together With flexibility and lightness coupled with good weather resistance to ultra violet rays.

2.0 APPLICATION:

Used for packing and allied purposes.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian Standard covering this type of material.

4.0 AVERAGE WEIGHT, DIMENSIONS AND TOLERANCES:**4.1 Average weight & Sizes:**

Average weight (G.S.M), Width and Length shall be as stated on the order.

4.2 Average Weight & Tolerance:

45, 60, 70, 90, 105, 120, 150, 200, & 250 GSM with a tolerance of $\pm 10\%$.

4.3 Width and tolerance:**4.3.1 Preferred widths:**

900, 1000, 1500, 2000, 2500, 3000 and 3660 mm.

4.3.2 Tolerance on width:

Width, mm		Tolerance($\pm$) mm
Above	Upto & Includ.	
900	1250	8
1250	2500	20
2500	3000	40
3000	3660	50

Revisions :
As per e-mail dt. 4-08-2008 from Shri.Gopal Bhat,
SDGM, Bhopal

APPROVED:
INTERPLANT MATERIAL RATIONALISATION
COMMITTEE- WG (T&PM)

Rev. No. 02	Amd. No.	Reaffirmed	Prepared BHOPAL	Issued Corp. R&D	Dt. of 1st Issue 1st October 1995
Dt.: 01.11.2008	Dt:	Year:			

AA 514 20	CORPORATE PURCHASING SPECIFICATION	
Rev. No. 02		
PAGE 2 OF 4		

5.0 MANUFACTURE:

The film shall be comprised of several layers of plastic film placed criss-cross over one another and bonded by a special cold-roll technique. Film shall be resistant to most of organic & inorganic chemicals.

‘BHEL’ emblem of size A40 shall be embossed by thermostatic control on the film at an interval of 1000 mm along the length of the film.

The colour of the emblem shall be Air Craft Blue (Shade No. 108) as per IS: 5 or Black / Red.

One vertical heat sealing joint will be acceptable for films between 1200 mm and 2400 mm at the interval of 1200 mm width.

Two vertical heat sealing joint will be acceptable for films above 2400 mm at the interval of 1200 mm width.

6.0 APPEARANCE AND FINISH:

The film shall be uniform in colour, texture and finish. And also shall be free from pinholes, undispersed raw material, streaks and foreign particles and holes, tears or blisters. The edge shall be free of nicks and cuts to unaided eye.

7.0 COLOUR:

Unless otherwise specified, the film shall be supplied in Natural Colour (essentially colourless) for 45 GSM, yellow colour for 70 GSM & Blue colour for 90 GSM. Any other colour can also be ordered, if agreed mutually.

For film of other average weights, colour shall be as stated on the order.

8.0 ODOUR:

The film shall be free from any objectionable odour.

9.0 TEST METHOD:

Unless otherwise specified, the test shall be conducted in accordance with the relevant methods of IS : 2508.

10.0 TEST SAMPLES:

One Square metre (1 sq.m) of ordered thickness shall be supplied for testing purpose.



CORPORATE PURCHASING SPECIFICATION

AA 514 20

Rev. No. 02

PAGE 3 OF 4

11.0 PHYSICAL PROPERTIES:

Substance (GSM): 45, 50, 60, 70, 90, 105, 120, 150, 200, & 250.

Tolerance: $\pm 10\%$.

12.0 MECHANICAL PROPERTIES:

12.1 Tensile Strength at Break:

Direction N/mm^2 , min.

Direction - I 35

Direction - II 37

12.2 Elongation at Break:

Direction - I 500 percent, min.

Direction - II 400 percent, min.

12.3 Tear Resistance in/grams (ASTM – D 1922):

GSM 45 60 70 90 105 120 150 200 250

Direction I 800 1800 1800 2150 2500 3200 3500 4500 5500

Direction II 650 1500 1500 1950 2000 2000 2500 3500 4500

13.0 INSPECTION AT SUPPLIERS' WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL'S representative.

BHEL'S representative shall have free access at all times while the work on the contract is being performed, to all parts of the manufacturer's works.

The manufacturer shall offer BHEL's representative all reasonable facilities without charge to satisfy the latter that the material is being furnished in accordance with this specification. The manufacturer shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities do not exist at his works, the manufacturer shall make necessary arrangements for carrying out the prescribed tests elsewhere.

The manufacturer shall notify BHEL's representative in advance about the readiness of the material for inspection and testing.

BHEL reserves the right to test the material at BHEL's works and the final acceptance of the material shall be based on these test results.

AA 514 20	CORPORATE PURCHASING SPECIFICATION	
Rev. No. 02		
PAGE 4 OF 4		

14.0 TEST CERTIFICATES:

Three copies of test certificates shall be supplied unless otherwise stated on the order.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material. The test certificate shall bear the following information:

AA 514 20: Multilayered Cross Laminated Polyethylene Film.

Rev. No. 02

BHEL Order No.

Batch / Lot No.

Results of dimensional inspection.

Test results of clauses 11 and 12.

15.0 PACKING AND MARKING:

To be supplied in bundles / packages suitably packed to prevent damage during transit and storage.

AA 514 20

BHEL Order No.

Manufacturer’s name and grade

Batch No. / Lot No. and date of manufacture

Average weight, Width, Length and colour

Net weight of the Bundle / Package

16.0 REJECTION AND REPLACEMENT:

In the event of any film proving defective during the course of preparation, testing, subsequent use, etc such material shall be rejected notwithstanding any previous certification of satisfactory testing and / or inspection.

The supplier shall under take to replace the rejected film at his own cost and the rejected material shall be taken by the supplier after fulfilling the commercial terms and conditions.

17.0 REFERRED STANDARDS (Latest Publications Including Amendments) :

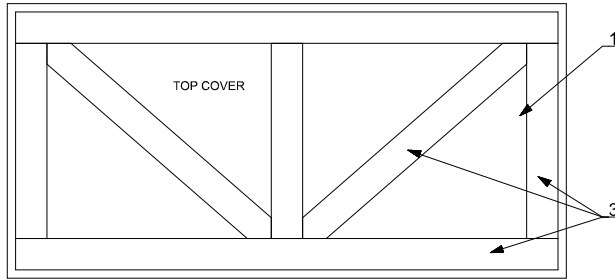
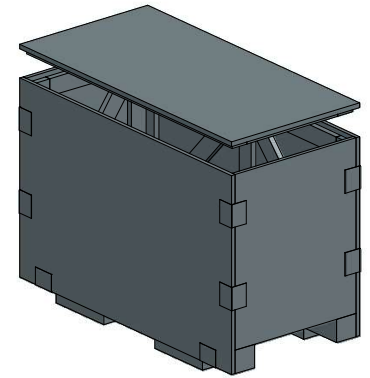
1. IS: 5 2. IS: 2508 3. ASTM - D 1992

1-SH-PLY-001

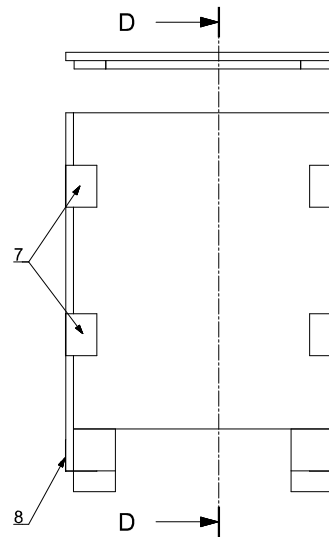
100 OUTWARD

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

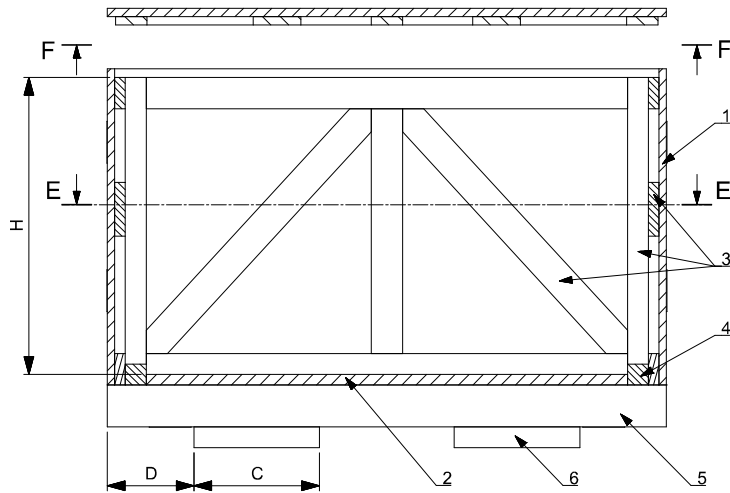
S.NO.	MATERIAL	BOX TYPE	DIMENSIONS				
			L	W	H	C	D
1	-	3A	670	670	500	-	200
2	-	4	710	630	600	-	200
3	-	5	850	630	670	250	200
4	VP5110599017	6	1000	770	670	250	200
5	-	7	1100	430	670	300	200
6	VP5110599025	9A	1250	570	710	300	200
7	-	10A	1300	770	850	300	200
8	VP5110599033	13A	1500	680	710	300	200
9	VP5110599041	14A	1850	770	710	300	200



SECTION F-F



SECTION D-D



SECTION E-E

ITEM NO.	DESCRIPTION	SIZE (MM) / DETAILS	MATERIAL
1	PLYWOOD	12 MM THICKNESS	PLYWOOD
2	BOTTOM PLANKS	25 MM THICKNESS	WOOD
3	SOFT WOOD BATTEN	75 X 25	WOOD
4	END TRAVERSE BAR	50 X 50	WOOD
5	RUNNER	100 X 100	WOOD
6	RESTING BEAM	100 X 50	WOOD
7	SIDE PLATE	150 X 100 X 1	M.S. SHEET
8	SLING PLATE	150 X 100 X 1	M.S. SHEET

NOTES:

1. TO AVOID RAIN WATER ENTRY, ALL INNER SIDES EXCEPT BOTTOM SHALL BE FULLY COVERED BY POLYTHENE FILM (REFER LATEST APPLICABLE TDC).
2. SECURE THE ASSEMBLIES WITH ENOUGH SIDE SUPPORTS TO AVOID MOVEMENT OF ASSEMBLIES DURING TRANSIT.
3. ITEM-6 MUST BE PROVIDED BELOW EACH RUNNER.
4. UNDER EACH RUNNER, ITEM-6 IS SINGLE & CONTINUOUS (FOR S.NO. 1 & 2) AND SPLIT (FOR S.NO. 3 TO 10).
5. ITEM-7 IS 2 NOS. AT EACH VERTICAL CORNER.
6. PLYWOOD TO WOOD SHALL BE NAILED / SCREWED.

REV	DATE	ALTERED BY	CHKD & APPD BY
1			

CAUTION: The information on this drawing is for reference only. It is not to be used for manufacturing or assembly without the approval of the company.		TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	
Bharat Heavy Electricals Ltd UNITS: INDUSTRIAL VALVE PLANT GOINDWAL SAHIB - 143422		NAME: RAVINDER SINGH SIGNATURE: RAVINDER SINGH DATE: 17-08-2026	
DEPT: EC CODE: ---		APPROVAL: GURBAX SINGH DATE: 17-08-2026	
TITLE: PACKING BOX (PLYWOOD)		WEIGHT (kg): 0.00	
DRAWING NO: 1-SH-PLY-001		REV: 00	



SPECIFICATION FOR ASSEMBLED PACKING BOX OF PLYWOOD / WOOD

1 General

This specification prescribes the requirements of assembled packing boxes.

2 Compliance with Standards

There is no Indian Standard Covering this type of material. However, assistance has been derived from the following standards:

IS 4990: 2024 - Plywood for Concrete Shuttering Works

BHEL Standard No.: AA 51401 – Specification for coniferous wood

BHEL Standard No.: AA 51402 – Specification for non-coniferous wood

BHEL Standard No.: AA 51420 – Specification for Multi-layered Cross Laminated Polyethylene Film

3 Technical Requirements for Plywood

Specification of plywood used shall be as per following:

Item	Specification
Standard	IS-4990, certified
Grade	BWP / exterior waterproof grade
Faces	Film-faced on both sides, (CSFF)
Surface	Smooth, continuous film; no blistering, peeling, cracks or exposed core
Others	Plywood outside faces, used for marking and stenciling, shall be plain single color without any printed text or logo

4 Technical Requirements for Wood

The wood used shall be as per the requirements of following standards.

BHEL Standard No.: AA 51401 – Specification for coniferous wood

BHEL Standard No.: AA 51402 – Specification for non-coniferous wood

5 Other Technical Requirements

- To protect the items from outside rain water or condensing moisture, Plywood boxes shall be duly provided with a 70 GSM (Colorless/Transparent) Multi Layered Cross Laminated Polythene Film on inner surface of top cover.
- The Multi Layered Cross Laminated Polythene Film shall be as per requirement of BHEL Specification No: AA51420.
- Wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20 mm. The film used for top cover shall project outside on 4 sides by at least 100 mm and shall be nailed properly on sides. The film is not required for the base of the boxes.



BHEL, IVP, GOINDWAL SAHIB
TECHNICAL DELIVERY CONDITIONS

TDC: PLYWOOD BOX Rev. 00

Page 2 of 5

- d. Side plates and sling plates made of mild steel sheet measuring as per drawing shall be used.
- e. Joints in plywood is not permissible.
- f. Nails shall be of dia. of 2.5 mm and length 50 mm for joining plywood with wooden batten. The extra length of nail after nailing in thru plywood and wood batten shall be bend properly. Nailing should be done in such a way that head of nail shall be outside the box. Distance between any two nails shall not be more than 100 mm.
- g. In case, screws are used for plywood with wooden batten, they can be of dia. 3.5 mm x 32 mm length. For plywood with runner joint, the screw size can be 3.5 mm x 50 mm. Distance between two screws shall be 100 mm to 150 mm. Distance from edge shall be minimum 25 mm.

6 Dimensions and Tolerance

Width, thickness and length of packing boxes shall be as specified in drawing/Purchase Order.
Dimensional tolerances on box parameters shall be as follows:

Assembled box	Width	Height	Length
Tolerance →	± 5 mm	± 5 mm	± 10 mm

Parameter	Wood	Plywood
Thickness	+2/-1 mm (for thickness < 20 mm) +3/-1 mm (for thickness ≥ 20 mm)	± 10 % (for thickness < 6 mm) ± 5 % (for thickness ≥ 6 mm)

7 Marking

7.1 Stencilling

The boxes shall be painted using paint & stencil on two faces as per following.

The font size shall be 40 mm and gap between the two lines must be 20 mm.

The start of stenciling, i.e. left upper corner, shall be 100 mm from both left and top edge of box.

On any small side face (End shook)	On any long side face (Side shook)
- SUPPLIER NAME: - SUPPLIER INVOICE NO.: - BOX TYPE: - BOX SERIAL NO.:	- CONSIGNEE: _____ - PO NO./WO. NO.: _____ - CASE NO.: _____ - MATERIAL/QTY: _____ - WEIGHT: _____ FROM: BHEL, IVP, GOINDWAL SAHIB

7.2 Symbols

Following symbols shall be placed on the plywood boxes. The design of these symbols shall be as per IS-1260 Part-2 / ISO 7000. The overall height of symbols shall be 100 mm. Symbols shall be painted / inked. They need not be framed by border lines.

Rev:00 Dt.12.09.2026

Initial release.



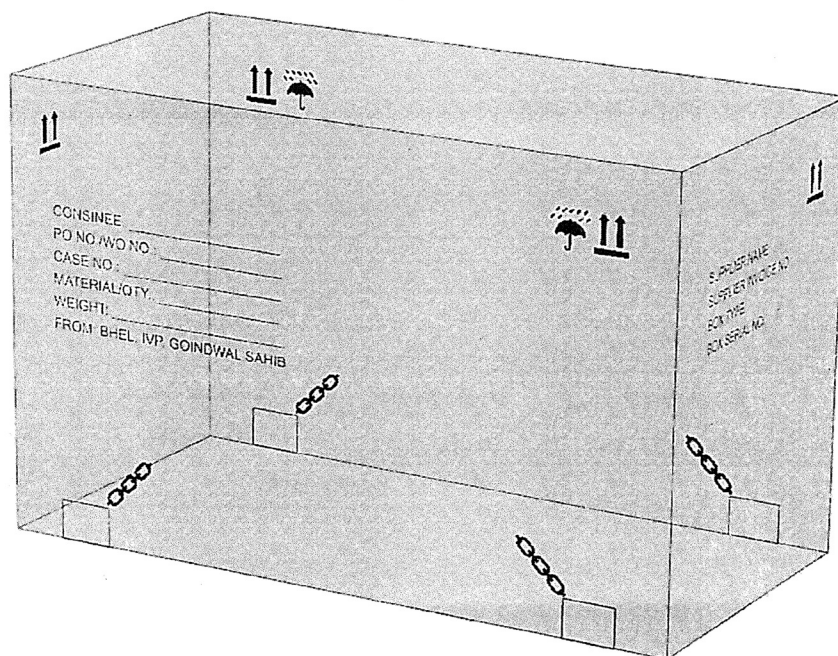
BHEL, IVP, GOINDWAL SAHIB
TECHNICAL DELIVERY CONDITIONS

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	Sling Here	Keep away from rain	This side Up
Symbol			
Box Face	Long side (Both faces)	Long side (Both faces)	All faces
Location	Near to Sling plate	Upper Right corner	Upper Right corner
Position	At 45° to horizontal	100 mm from top edge, 15 mm from adjacent symbol	100 mm gap from edges
Pictorial			

Pictorial representation of box marking is given below:





BHEL, IVP, GOINDWAL SAHIB
TECHNICAL DELIVERY CONDITIONS

TDC: PLYWOOD BOX

Rev. 00

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7.3 Color

The color to be used for symbols / stenciling is black. If the plywood face is colored, then the color of symbols / stenciling painted on box face shall be in contrast to plywood face color. The use of red or orange shall be avoided unless existing regional or national regulations expressly lay down such use.

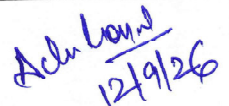
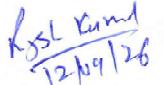
The paint / ink used for marking shall be non-fading and non-washable by water.

8 Inspection and Acceptance criteria

Supplier to submit internal inspection report duly stamped and signed in BHEL format (Format no. BIF: PWBI:001) provided with this TDC (Annexure-1) with each lot/consignment.
Along with this, MTC of plywood used (as per IS-4990) shall also be submitted.

9 Others

BHEL reserves the right to carry out audit checks for Wood species, Plywood, Polythene film confirmation to standard, Nails size, Corner & Sling plate material & dimension, Planks & Overall box dimensions. Items found defective during check at BHEL will be rejected. BHEL may carry out Audit check for wood species at any time during supply

 12/9/2026	 12/9/26	 12/9/26	 12/9/26	 12/9/26
Sanju Kohli	Achin Goyal	Rajesh Kumar	Ravinder Singh	Shallay Kohli
Sr. Mgr/QM	Manager/CM, LM	Sr. Mgr/MM	Sr. Mgr/EC	SDGM/QM & BE
Prepared by		Reviewed by		Approved by

Rev:00 Dt.12.09.2026

Initial release.



BHEL, IVP, GOINDWAL SAHIB
TECHNICAL DELIVERY CONDITIONS

TDC: PLYWOOD BOX Rev. 00

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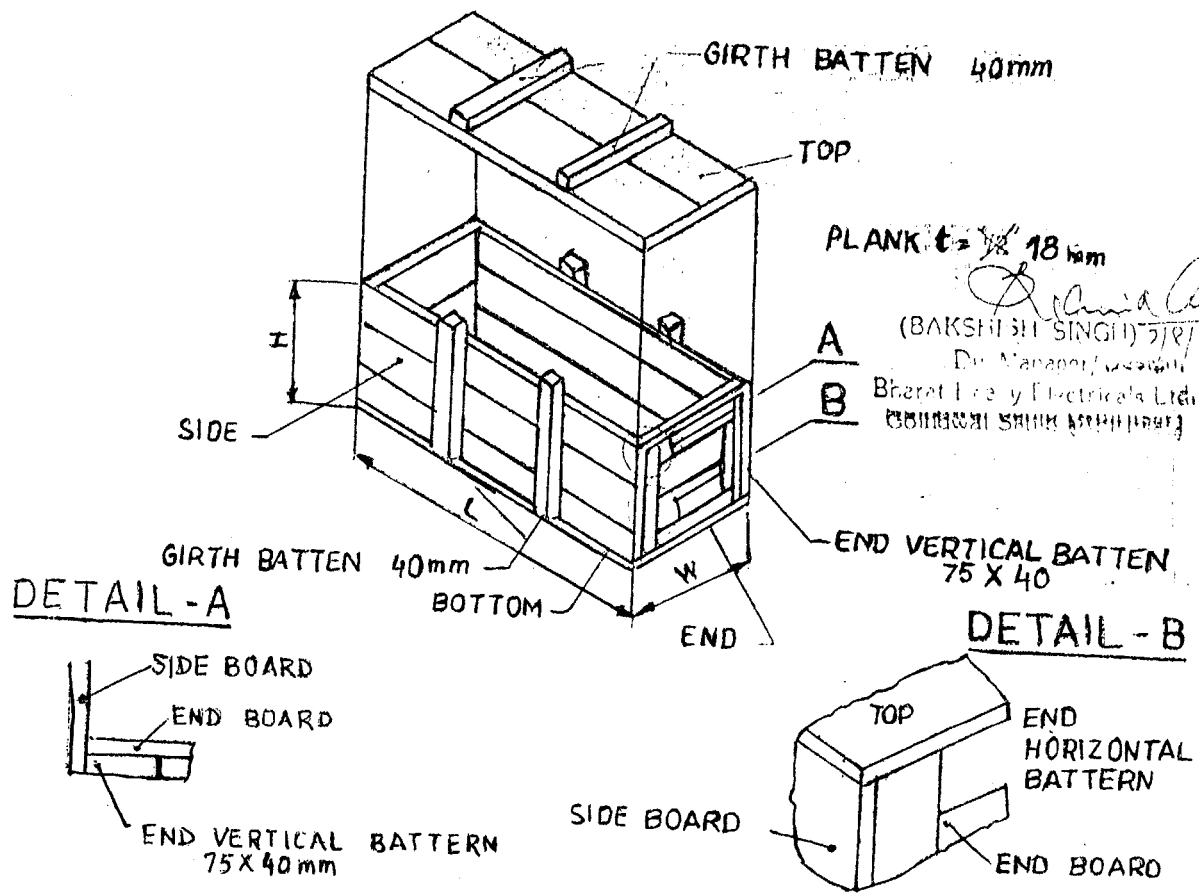
ANNEXURE-1

Inspection Report of Plywood Box										Format No.
										BIF: PWBI:001
PO No:						Date of inspection:				
Supplier Name:										
Supplied Batch Details/Bill No.										
Observed Dimensions										
Box Type	Qty	L	W	H	C	D	Dimension	Length	Width	Thickness
							Plank			
							Resting Beam			
							Others			
S. No.	Type of Check						Remarks			
1	Polythene film (GSM)									
2	Corner and sling plates									
3	MTC for Plywood used									
4	Moisture Content									
5	Size of Nails used									
6	Identification and Marking									
7	Type/Name of Wood used						Coniferous			
							Non-Coniferous			
8	Other Remarks (If any)									

Note: The inspection report shall be submitted for one piece per type per lot.

Rev:00 Dt.12.09.2026

Initial release.



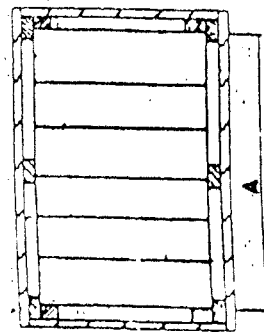
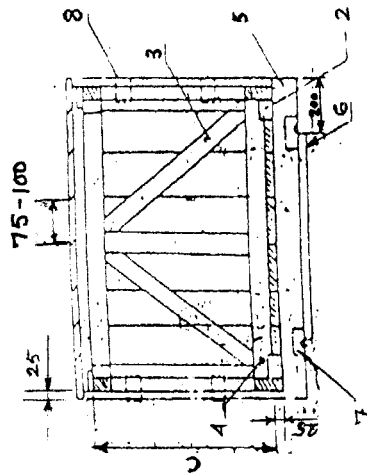
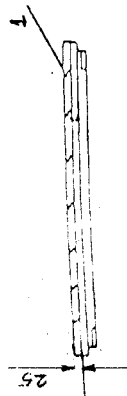
Box Type No 2A is added.
Bakshi Singh
 24/8/2002

TYPE NO				
	L	W	H	
1A	320	250	260	
1	320	250	430	
2	430	370	430	
2A	500	450	550	

NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. L, W, H ARE INNER DIMENSIONS OF THE BOX.

TYPE	DIMENSIONS			QTY
	A	B	C	
16	2134	915	1220	
16A	2743	1220	1070	
16B	2743	1220	1525	



NOTE

1. HARD WOOD PLANKS THICKNESS AS PER T.D.C.
2. END TRAVERS BAR 100X50
3. DIAGONAL BRACE 75X25
4. HARD WOOD BATTEN 75X25
5. RUNNER 100X100 MM.
6. RESTING BEAM 100X50 MM.
7. SLING PLATE [M.S. SHEET]
8. SIDE PLATE [M.S. SHEET]

ALL DIMENSIONS ARE IN MM
A - LENGTH
B - BREADTH
C - HEIGHT



BHARAT HEAVY ELECTRICALS LTD.
PACKING BOX

DRAWING NO: 2-SH-BW-022R06

TYPE	DIMENSIONS			QTY	REMARKS
	A	B	C		
1	670	670	470		1. ALL THE PLANKS ARE TO BE THE GIVEN THICKNESS
2	710	670	600		
3	810	670	670		
4	1000	770	670		2. BOTTOM 2 RUNNERS
5	1100	870	670		
6	1200	970	670		
7	1300	1070	670		
8	1400	1170	670		
9	1500	1270	670		
10	1600	1370	670		
11	1700	1470	670		
12	1800	1570	670		
13	1900	1670	670		
14	2000	1770	670		
15	2100	1870	670		
16	2200	1970	670		
17	2300	2070	670		
18	2400	2170	670		
19	2500	2270	670		
20	2600	2370	670		
21	2700	2470	670		
22	2800	2570	670		
23	2900	2670	670		
24	3000	2770	670		
25	3100	2870	670		
26	3200	2970	670		
27	3300	3070	670		
28	3400	3170	670		
29	3500	3270	670		
30	3600	3370	670		
31	3700	3470	670		
32	3800	3570	670		
33	3900	3670	670		
34	4000	3770	670		
35	4100	3870	670		
36	4200	3970	670		
37	4300	4070	670		
38	4400	4170	670		
39	4500	4270	670		
40	4600	4370	670		
41	4700	4470	670		
42	4800	4570	670		
43	4900	4670	670		
44	5000	4770	670		
45	5100	4870	670		
46	5200	4970	670		
47	5300	5070	670		
48	5400	5170	670		
49	5500	5270	670		
50	5600	5370	670		
51	5700	5470	670		
52	5800	5570	670		
53	5900	5670	670		
54	6000	5770	670		
55	6100	5870	670		
56	6200	5970	670		
57	6300	6070	670		
58	6400	6170	670		
59	6500	6270	670		
60	6600	6370	670		
61	6700	6470	670		
62	6800	6570	670		
63	6900	6670	670		
64	7000	6770	670		
65	7100	6870	670		
66	7200	6970	670		
67	7300	7070	670		
68	7400	7170	670		
69	7500	7270	670		
70	7600	7370	670		
71	7700	7470	670		
72	7800	7570	670		
73	7900	7670	670		
74	8000	7770	670		
75	8100	7870	670		
76	8200	7970	670		
77	8300	8070	670		
78	8400	8170	670		
79	8500	8270	670		
80	8600	8370	670		
81	8700	8470	670		
82	8800	8570	670		
83	8900	8670	670		
84	9000	8770	670		
85	9100	8870	670		
86	9200	8970	670		
87	9300	9070	670		
88	9400	9170	670		
89	9500	9270	670		
90	9600	9370	670		
91	9700	9470	670		
92	9800	9570	670		
93	9900	9670	670		
94	10000	9770	670		
95	10100	9870	670		
96	10200	9970	670		
97	10300	10070	670		
98	10400	10170	670		
99	10500	10270	670		
100	10600	10370	670		
101	10700	10470	670		
102	10800	10570	670		
103	10900	10670	670		
104	11000	10770	670		
105	11100	10870	670		
106	11200	10970	670		
107	11300	11070	670		
108	11400	11170	670		
109	11500	11270	670		
110	11600	11370	670		
111	11700	11470	670		
112	11800	11570	670		
113	11900	11670	670		
114	12000	11770	670		
115	12100	11870	670		
116	12200	11970	670		
117	12300	12070	670		
118	12400	12170	670		
119	12500	12270	670		
120	12600	12370	670		
121	12700	12470	670		
122	12800	12570	670		
123	12900	12670	670		
124	13000	12770	670		
125	13100	12870	670		
126	13200	12970	670		
127	13300	13070	670		
128	13400	13170	670		
129	13500	13270	670		
130	13600	13370	670		
131	13700	13470	670		
132	13800	13570	670		
133	13900	13670	670		
134	14000	13770	670		
135	14100	13870	670		
136	14200	13970	670		
137	14300	14070	670		
138	14400	14170	670		
139	14500	14270	670		
140	14600	14370	670		
141	14700	14470	670		
142	14800	14570	670		
143	14900	14670	670		
144	15000	14770	670		
145	15100	14870	670		
146	15200	14970	670		
147	15300	15070	670		
148	15400	15170	670		
149	15500	15270	670		
150	15600	15370	670		
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157	16300	16070	670		
158	16400	16170	670		
159	16500	16270	670		
160	16600	16370	670		
161	16700	16470	670		
162	16800	16570	670		
163	16900	16670	670		
164	17000	16770	670		
165	17100	16870	670		
166	17200	16970	670		
167	17300	17070	670		
168	17400	17170	670		
169	17500	17270	670		
170	17600	17370	670		
171	17700	17470	670		
172	17800	17570	670		
173	17900	17670	670		
174	18000	17770	670		
175	18100	17870	670		
176	18200	17970	670		
177	18300	18070	670		
178	18400	18170	670		
179	18500	18270	670		
180	18600	18370	670		
181	18700	18470	670		
182	18800	18570	670		
183	18900	18670	670		
184	19000	18770	670		
185	19100	18870	670		
186	19200	18970	670		
187	19300	19070	670		
188	19400	19170	670		
189	19500	19270	670		
190	19600	19370	670		
191	19700	19470	670		
192	19800	19570	670		
193	19900	19670	670		
194	20000	19770	670		
195	20100	19870	670		
196	20200	19970	670		
197	20300	20070	670		
198	20400	20170	670		
199	20500	20270	670		
200	20600	20370	670		
201	20700	20470	670		
202	20800	20570	670		
203	20900	20670	670		
204	21000	20770	670		
205	21100	20870	670		
206	21200	20970	670		
207	21300	21070	670		
208	21400	21170	670		
209	21500	21270	670		
210	21600	21370	670		
211	21700	21470	670		
212	21800	21570	670		
213	21900	21670	670		
214	22000	21770	670		
215	22100	21870	670		
216	22200	21970	670		
217	22300	22070	670		
218	22400	22170	670		
219	22500	22270	670		
220	22600	22370	670		
221	22700	22470	670		

Date of Issue: 04-03-2004
Date of Implementation: 04-03-2004
Rev: 03

**Technical Delivery Conditions
For
Wooden Packing Boxes Made Of Non-Coniferous Timber**

1. General:

This specification governs the quality of packing boxes of non-coniferous in the form of planks, battens as per the dimensions and drawing in different sizes as per annex.

2. Application:

Packing boxes/crates/battens shall be used at industrial valves plant for transportation of the valves and shall be duly provided with a black polythene lining, sufficiently strong to protect the valves from outside rain water or condensing moisture during and after transportation. The lining is not required for the base of the boxes. Corner plates made of mild steel measuring 150 x 100 x 1.0 mm. shall be nailed at two places for strengthening each vertical corner of the boxes and the base.

Compliance With National Standard:

Assistance has been derived from the following standards in the preparation of this specification.

-BHEL Corporate P.S. No. : AA 51402
-IS-1326-1976: Spn. For Non-Coniferous Timber
-IS-5966-1970: Spn. For Non-Coniferous Timber
in converted from for general purpose.

Dimensions & Tolerances:

Width, thickness and length of Planks/Battens Shall have the following tolerance:

Width	:	+ 3mm	from 75-100mm
		- 0	
Thickness	:	+ 5mm	from 100-200mm
		- 0	

Box Type No.	Planks	Diagonal Brace	Battens
2	18 +3 -0		+5 on the ordered -0 dimensions
3,3A, 4,4A, 5,5A, 6, 7,9A, 10A, 13A	20 +3 -0	25 +3 -0	+5 on the ordered -0 dimensions
9,9B, 10,11A, 13,14,14A, 14B, 15,16,16A, 16B	25 +3 -0	25 +3 -0	+5 on the ordered -0 dimensions

Length : As Per the Dimensions of the Boxes/ordered.

Moisture Content:

Normally no. Seasoning is required, however the moisture content should not exceed more than 40%.

Freedom from Defects:

- Brashness, splits across the grains, shakes, cups, twist, insect attack, centre heart in planks are the defects which are not acceptable.
- Following defects are acceptable when measured in accordance with IS-3364

Bow:

Shall be permissible upto a maximum of 2mm for 300mm

End Splits:

The largest end splits at each end shall be measured and the length added together. The added lengths of these shall not exceed 80mm per meter run of the piece.

Live / Dead Knots:

A maximum of 5 Knots/m length are permissible; however, the knots shall not be so grouped or located as to affect the strength of the piece. Knots above 35mm. diameter are not permissible. Major axis of the knot shall be taken as the diameter of this knot.

Surface Cracks:

Surface cracks with a depth of 10 % subject to a depth of 10mm are permissible. A continuous crack of any depth all along the length is not permissible. /

Certificate:

The supplier shall furnish a certificate with each lot/consignment in support of the species of the wood, moisture content, size of the nails used, and any special information which the tenderer feel is essential for the quality of the packing boxes and battens distance between two nails should be 50mm. Any hard wood species are acceptable.

Marking:

The boxes shall be marked/painted in order to identify the source of supply on two faces with additional stenciling on one face as:-

- CONSIGNEE:
- OA NO./WO. NO.:
- CASE NO. :
- NO. OF VALVES:
- WEIGHT:
- FROM: BHEL/GOINDWAL/TARN TARAN

BHEL/IVP/GOINDWAL**SIZES FOR THE PACKING BOXES**

Box size No. Type	Dimensions (overall) (L. x W. x H.)
2	430x 370x 430
3A	670x 670x 500
4	710x 630x 600
5	850x 630x 600
6	1000x 770x 670
7	1100x 430x 670
9A	1250x 570x 710
10A	1300x 770x 850
13A	1300x 650x 710
14A	1850x 700x 710
14B	1850x 700x 1050
9B	1250x 570x 1050
16	2134x 915x 1220
16A	2743x 1220x 1070
16B	2743x 1220x 1525

N.B. 1. Supplier's Name and type of the box shall be stenciled on the boxes

	CORPORATE PURCHASING SPECIFICATION	AA 514 02
		REV.No. 03
		PAGE 1 OF 6

NON-CONIFEROUS TIMBER FOR GENERAL PACKING PURPOSES

1.0 GENERAL:

This specification governs the quality requirements of Non-Coniferous Timber supplied in the form of planks, battens, beams and sleepers.

2.0 APPLICATION:

Used for general packing purposes.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no National standard covering this material. However, assistance has been derived from the following National standards:

IS:1326-1992	Non-Coniferous Sawn Timber (Baulks & Scantling)
IS:5966-1993	Non-Coniferous Timber In Converted Form For General Purposes.
IS:6662-1993 Groups I & II	Timber Species Suitable For Wooden Packaging

4.0 TERMINOLOGY:

For the purpose of this specification, the definitions given in IS:707 (Glossary of terms applicable to timber and timber products) shall apply except for the beam which is defined as follows:

Beam is defined as converted timber whose cross-sectional dimensions exceed 50mm in both directions.

5.0 SPECIES:

Shall be as stated on the order.
Some standard species are:

<u>Trade Name</u>	<u>Botanical Name</u>
Rubber wood	Hevea brasiliensis
Salai	Boswellia serrata
Bahera	Terminalia bellirica
Jaman	Syzygium cumini

Revision: Cl. 6.2.3 of MOM of WG (T&PM)			Approved: INTERPLANT STANDARDIZATION COMMITTEE-WG(T&PM)		
Rev.No. 03	Amd.No.	Reaffirmed	Prepared BHOPAL	Issued CORP. R&D	Dt. of 1st Issue MAR '80
Dt. 1.10.95	Dt.	Year:			

AA 514 02	CORPORATE PURCHASING SPECIFICATION	
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<u>Trade Name</u>	<u>Botanical Name</u>
Lendi	Lagerstroemia parviflora
Mango	Mangifera indica
Machilus(Kalamavu)	Machilus macrantha
Irul	Xylis xylocarpa
Irulbaken	Hopes
Karumarudu	Terminalia tomentosa
Murtenga	Bursera serrata
Nangal	Mesua ferrea
Pillamarudu	Terminalia paniculata
Sal	Shorea robusta
Silver oak	Grevillea robusta
Tada(Dhaman)	Grewia tillifolia

Any other species of wood as per Groups I & II of IS:6662 may also be ordered.

6.0 DIMENSIONS AND TOLERANCES:

6.1 Sizes:

Width, thickness and length of timber shall be clearly stated on the order.

6.2 Tolerances:

6.2.1 Width	: 50 to 250 mm	Tolerance : ± 3 mm
6.2.2 Thickness	: 20 to 250 mm	Tolerance : $+3$ mm -1 mm

6.2.3 Length:

Standard length : 1 to 12 metres in multiples of 0.5 metre.

Tolerance : $\pm 2\%$ or ± 25 mm whichever is less.

Note:

1.0 Measurements:

1.1 When nominal sizes are ordered, length, width and thickness shall be measured on the basis of accepted sizes. Plus tolerances shall not be added while computing the volume.

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	CORPORATE PURCHASING SPECIFICATION	
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1.2 The measurements of length, width, thickness and computation of volume shall be as follows:

- The length shall be measured in metres in midline of a piece. The fractions of a metre shall be rounded off to the nearest lower 10 mm.
- The width shall be measured at the narrowest place in millimetres and shall be rounded off to the nearest lower one millimetre.
- The thickness shall be measured at the narrowest place in millimetres and shall be rounded off to the nearest lower one millimetre.
- The volume shall be computed in cubic metres correct to three places of decimal on the basis of accepted sizes.

2.0 Single sampling plan based on IS:2500 shall be followed.

7.0 **MOISTURE CONTENT:**

The timber shall have a moisture content as stated below within a depth of 15mm from the surface excluding a length of 300mm from each end at the time of inspection. The moisture content will be determined in accordance with Appendix-A of IS:287.

October to June	: 30%
July to September (Rainy season)	: 40%

8.0 **FREE FROM DEFECTS:**

Timber shall be free from the following defects:

Brashness, splits across the grain, shakes, spring, twist, insect attack, any kind of decay (rot), any sign of infection, open centre heart, centre heart on planks and any other defect.

Defects to the extent specified below are permissible. These defects shall be measured in accordance with IS:3364.

8.1 **Bow:**

Shall be permissible upto a maximum of 2mm for 300mm length.

8.2 **Wane:**

- For sections upto and including 150 X 150 mm:

Shall be permissible upto 1/5 of the width on the broad face subject to a maximum of 60mm and upto 1/3 of the width on the narrow face subject a maximum of 40mm, provided that one broad face is completely free from this defect. The wane shall be measured at its deepest part.



b) For sections above 150 X 150 mm:

The cumulative lengths of wanes on all the sides should not be more than one length of the piece.

8.3 End splits:

The longest end split at each end shall be measured and the lengths added together. The total length of these shall not exceed 60mm per metre run of the piece.

8.4 Live knots upto 35mm diameter:

A maximum of 5 knots/metre length are permissible. However, the knots shall not be so grouped or located as to affect the strength of the piece.

Live knots above 35mm diameter are not permissible.

8.5 Dead knots:

a) Below 10mm diameter:

A maximum of 3 knots/metre length are allowed provided that the knots are not so grouped or located as to affect the strength.

b) From 10mm to upto and including 25mm diameter:

A maximum of 2 knots allowed to the extent of 1 knot/metre length.

c) Above 25mm diameter:

Not allowed.

Note: (For clauses 8.4 & 8.5): Major axis of the knot should be taken as the diameter of the knot.

8.6 Surface cracks:

Surface cracks with a depth of 10% subject to a maximum of 10mm are permissible. A continuous crack of any depth all along the length is not permissible.

8.7 Sap wood:

Permissible upto a maximum of 12 percent of the cross sectional area.

9.0 END COATING:

Timber shall be coated with any of the following effective compositions upto a distance of 80mm from each end.

9.1 Thick coal tar or bituminous paint.

**CORPORATE PURCHASING SPECIFICATION**

AA 514 02

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- 9.2 Resin and lamp black (10:1) melted, mixed and applied hot.
- 9.3 Hardened gloss oil.
- 9.4 Paraffin wax.
- 9.5 Molasses and lime (3:1).
- 9.6 Geru/Yellow clay.

10.0 INSPECTION AT SUPPLIER'S WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL's representative. BHEL representative shall have free access at all times while work on the contract is being performed to all parts of the manufacturer works. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with this specification.

The manufacturer shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his works the manufacturer shall make necessary arrangements for carrying out the prescribed tests elsewhere. The manufacturer shall notify BHEL in advance about the readiness of the material for inspection and testing.

BHEL reserves the right to test the material at BHEL's Works and the final acceptance of the material shall be based on these test results.

11.0 TEST CERTIFICATES:

Three copies of test certificate shall be supplied unless otherwise stated on the order.

In addition, supplier shall ensure to enclose one copy of test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall have the following information:

AA 514 02 (Rev.No.03) : Non-Coniferous timber for general packing purposes

BHEL order No.	:
Supplier's References	:
Type & Specie	:
Treatment, if any	:
Results of Dimensional Inspection	:
Moisture content	:
Defects as per clause 8	:
Size	:
Quantity supplied	:

**12.0 MARKING :**

The timber shall be marked/painted with the following:

AA 514 02

BHEL order No. :

Supplier's Name :

Size & Quantity :

13.0 REJECTION AND REPLACEMENT :

If the material does not conform to the requirements of this specification or found defective during further processing, such material shall be rejected notwithstanding any previous certification of satisfactory testing and/or inspection. The supplier shall under take to replace the rejected consignment at his own cost and the rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.

14.0 REFERRED STANDARDS:

The following is the list of the latest standards, as published by the respective issuing bodies, referred to in this specification.

- | | | | |
|------------|------------|------------|------------|
| 1) IS:287 | 2) IS:707 | 3) IS:1326 | 4) IS:2500 |
| 5) IS:3364 | 6) IS:5966 | 7) IS:6662 | |