Annexure 1

Specification and Technical Requirements

1) Press Tools

a) Press tools and dies are required for obtaining the components (Bellows) as per drawings No. RD DG 3 14109 02 and RD DG 3 14109 03.
b) Work flow and technology proposed to achieve the finished component from raw material stage should be clearly described and appropriate maximum press tonnage required for forming bellows indicated.
c) It may be noted that both the bellows are essentially same except for the teeth provided on the circumference. There is a circumferential stagger of 3.0^{o} between them as shown in the drawings. The tool design development should accordingly be based on this fact.
d) Outer diameter of bellow can be obtained either with press tool or other appropriate manufacturing process.
e) Inner diameter i.e. dia. 320 mm of bellow must be achieved using press tool.
f) Holes on bellows at pcd of 370 mm should be pierced at once in single operation.
g) Bellow teeth must be formed with the help of die and punch with or without indexing mechanism either one tooth at a time or multiple teeth at a time or all teeth at a time.
h) While designing Press tools the condition that Top and Bottom bellows should have complete line contact circumferentially at dia 585 when placed one over other as shown in the Drg. No. RD DG 3 14109 01 should be kept in view and be met.
i) Concentricity of all the important circular dimensions such as Inside diameter, pcd of bellow and nozzle assembly holes and bellow outside diameter must be ensured.
j) Press tools should be designed using appropriate design standard.
k) Press tools should be manufactured using CNC machining processes to achieve specified dimensional accuracy, assembly requirements and consistency in manufacture.
l) The tool set developed shall be the property of BHEL, and will be delivered to BHEL along with necessary preservation measures.

2) Bellows

a) Material - SS 316, ASTM A240/240M.
b) Material thickness- Gauge 16 (1.5 mm) and Gauge 18 (1.2 mm).
c) ASTM A505 (page 6) for thickness tolerances.
d) Material test certificate traceable to manufacturer.
e) Tolerances for linear and angular dimensions are as per IS 2102 Part 1 or ISO 2768 -1 and Tolerance class f (fine) to be considered.
f) Bellow profile shall be inspected using pre-approved templates made for this purpose.

Quality Requirements

A) Press tools

1) Proposed process for obtaining the final dimension of bellow should be discussed with BHEL for its technical view prior to development and manufacturing of press tools.
2) A quality plan to ensure the quality of raw material used, manufacturing process and dimensional accuracy of the press tools shall be submitted for acceptance of BHEL.
3) Developed press tools will be inspected by BHEL after manufacturing.

B) Bellows

1) Raw material and material certification shall be inspected by BHEL.
2) Appropriate profile templates have to be made by vendor and the same shall be inspected by R&D for both thicknesses.
3) One sample bellow each of Top and Bottom bellows will be inspected for each thickness, using pre approved profile templates for profile and dimensional accuracy.
4) All bellows to be supplied as per ordered quantity shall be inspected before dispatch.

General Requirements:

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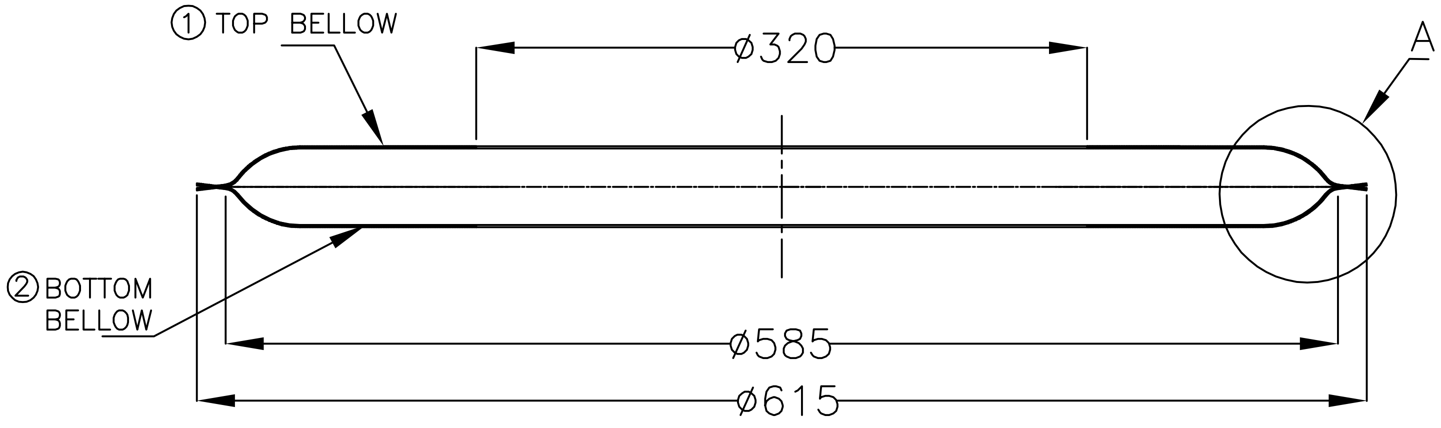
1) Vendor should be certified for ISO-9001 2008
2) Vendor should have integrated manufacturing facilities like press and other machinery.
3) Vendor should have die design capability.
4) Vendor should have experience in sheet forming technologies and attach their customers list.
5) Stage wise implementation of quality plan prepared based on quality requirements have to be followed.
6) Raw material for major components of Press Tool set may be selected judiciously to minimize the cost of the tool set without compromising on the quality of the bellows to be produced.
7) Appropriate templates, as may be required shall be made for facilitating inspection of bellows.

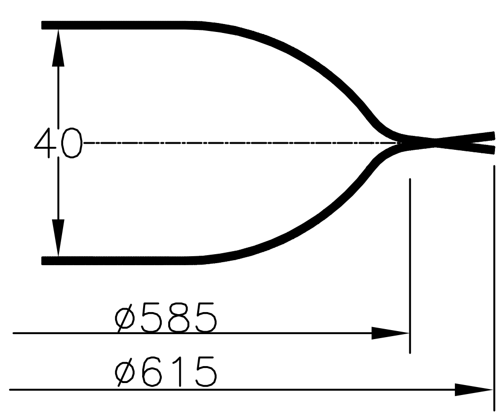
Criteria for Qualification:

It is mandatory for prospective vendor to meet the Specification and Technical requirement, Quality requirements and conditions stated at S. No. 1 to 4 in General Requirements.

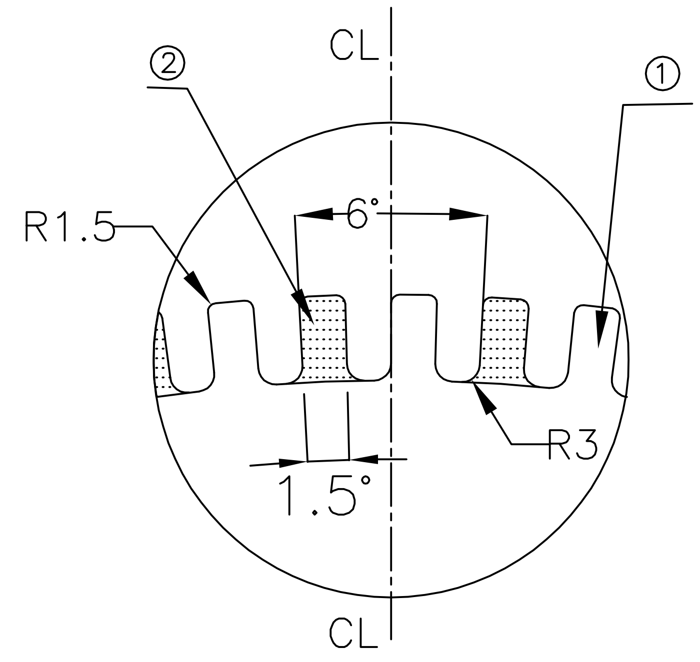
A.Sandeep
Engineer/HTF



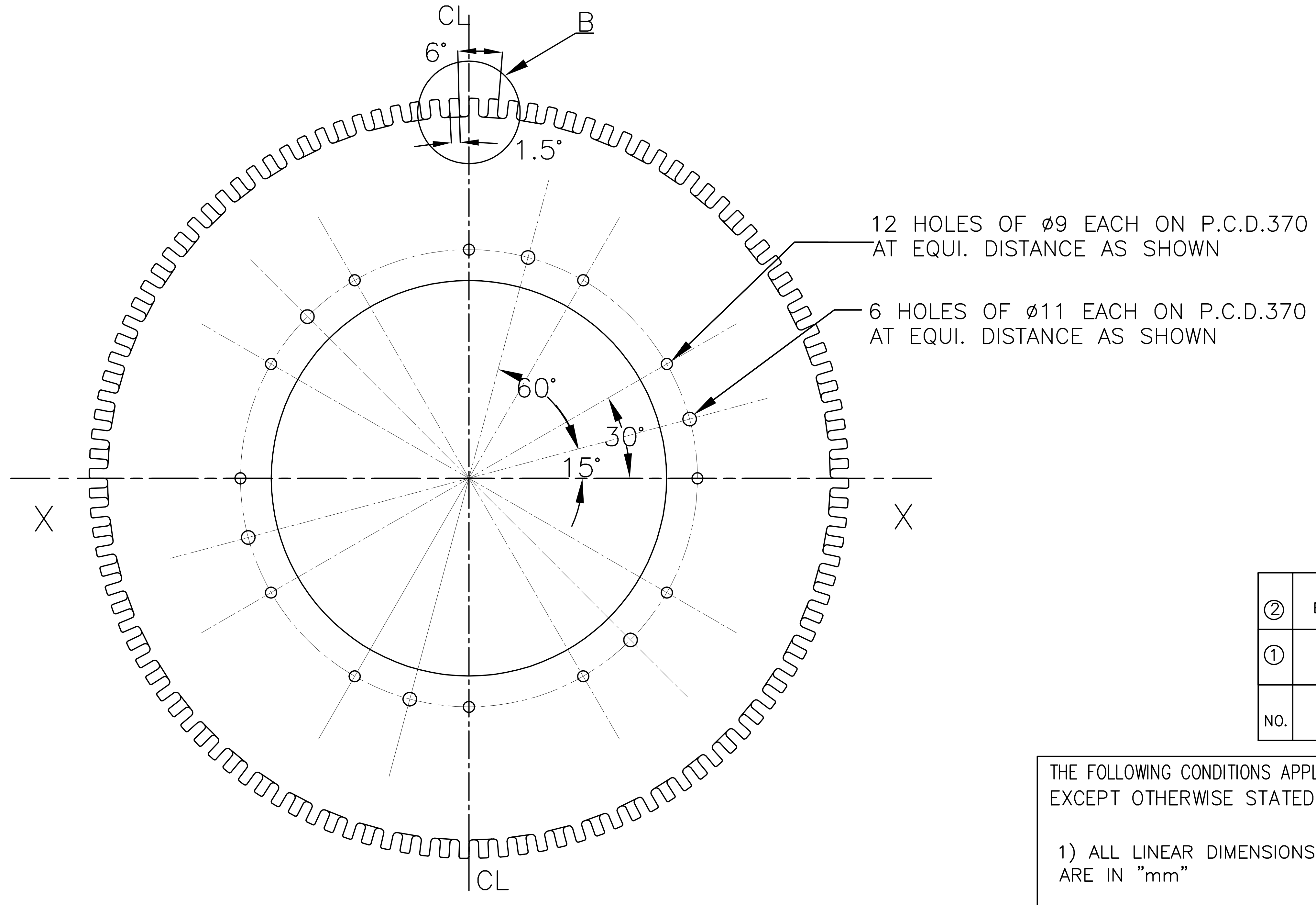
SECTION XX



DETAIL A



DETAIL B



PLAN

NO.	DESCRIPTION	DRAWING .NO.	VAR. NO.	MATERIAL SPECN.	QUANTITY	NET WT. /EACH
②	BOTTOM BELLOW	RD DG 3 14109 03	2	SS 316	6	2.43 kg
			1	SS 316	6	1.94 kg
①	TOP BELLOW	RD DG 3 14109 02	2	SS 316	6	2.43 kg
			1	SS 316	6	1.94 kg

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1) ALL LINEAR DIMENSIONS ARE IN "mm"

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	DEVPT. OF BELLOW TYPE SPRAY NOZZLE			
BHARAT HEAVY ELECTRICALS LTD. CORP. R&D HYDERABAD		NAME	SIGN.	DATE
	DRN.	A.S.		10.09.9
	CHD.	M.D.M.		15.09.9
	APPD.	U.N.R.		19.09.9

NO.OF VAR.: N.A

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HTF	NTS		N.A	N.A	N.A

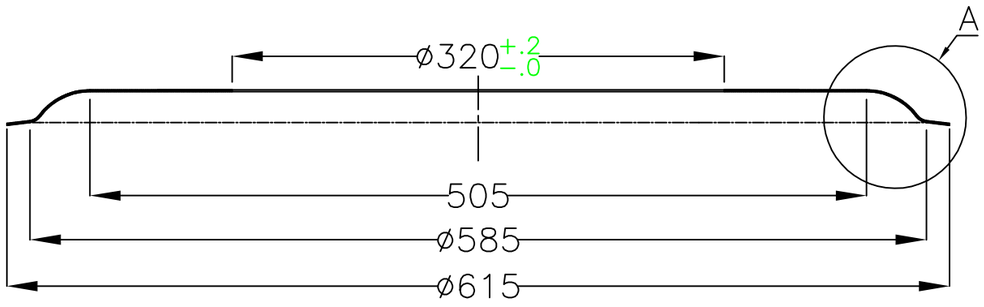
CODE 45

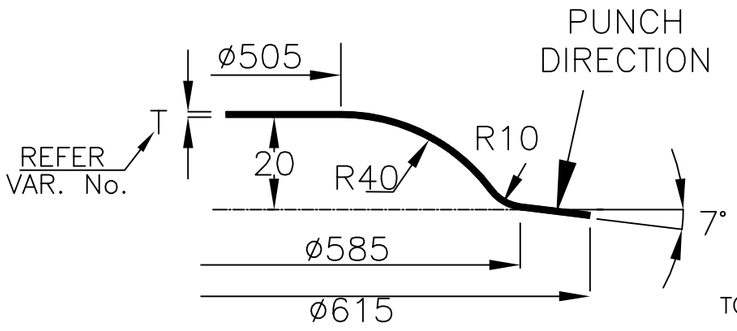
TITLE: BELLOW ASSEMBLY

DRAWING NO. RD DG 3 14109 01 — REV. 00

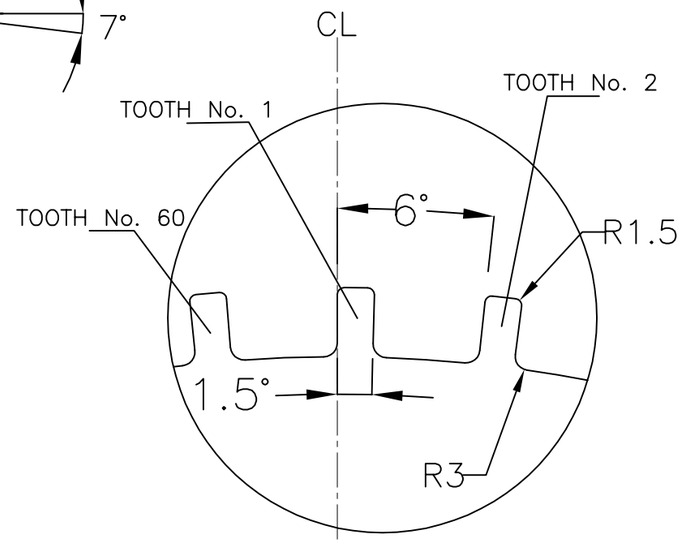
SHEET NO. 01 — NO OF SHEETS 01

DRG. NO. RD DG 3 14109 00002



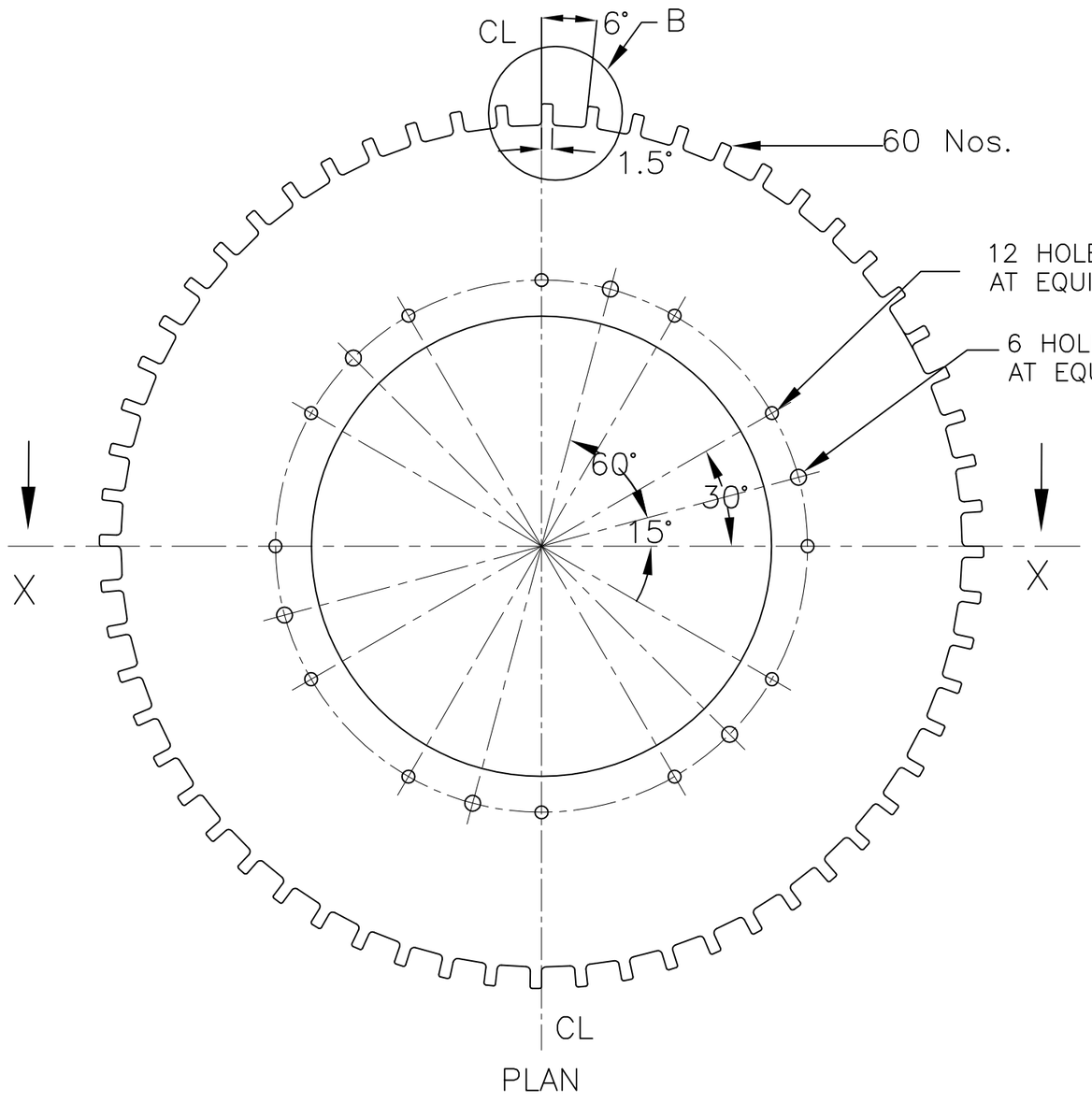


DETAIL A



DETAIL B

SECTION XX



PLAN

NOTE 1:TOOTH PUNCHING FROM OUTER SIDE ONLY. DIRECTION AS SHOWN.

VAR. NO.	DESCRIPTION	MATERIAL SPECN.	QUANTITY	NET WT. /EACH
2	TOP BELLOW (T=1.5 mm) (GAUGE 16)	SS 316	6	2.43 kg
1	TOP BELLOW (T=1.2 mm) (GAUGE 18)	SS 316	6	1.94 kg

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1) ALL LINEAR DIMENSIONS ARE IN "mm".
2) ASTM A505 FOR THICKNESS TOLERANCES.
3) IS 2102–PART 1 FOR TOLERANCES ON LINEAR & ANGULAR DIMENSIONS

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: DEVPT. OF BELLOW TYPE SPRAY NOZZLE

BHARAT HEAVY ELECTRICALS LTD.
CORP. R&D HYDERABAD

	NAME	SIGN.	DATE
DRN.	A.S.		10.09.9
CHD.	M.D.M.		15.09.9
APPD.	U.N.R.		19.09.9

NO.OF VAR. N.A

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HTF	NTS		RD DG 3 83507 01	2	12
CODE 45					

TITLE: TOP BELLOW

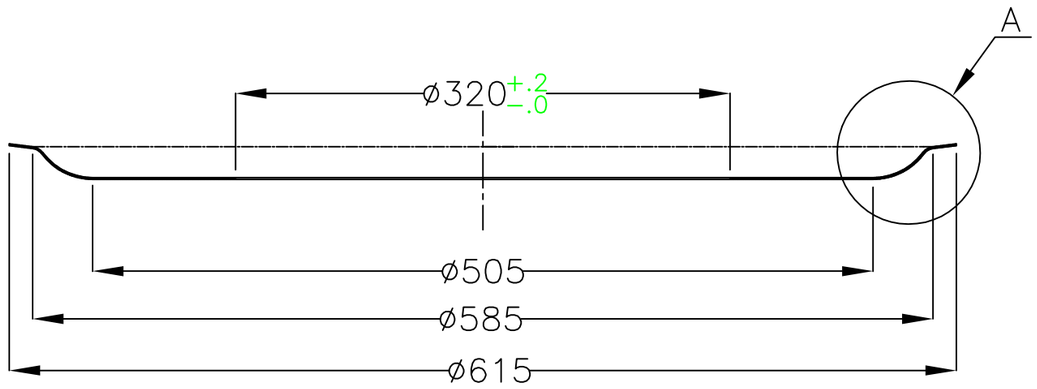
DRAWING NO. RD DG 3 14109 02 — REV. 00

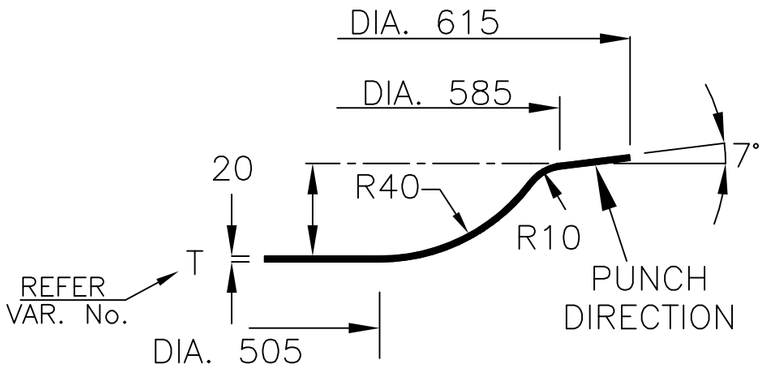
SHEET NO. 01 — NO OF SHEETS 01

REV.	DATE	ALTERED	CHECKED	APPD.	ZONE

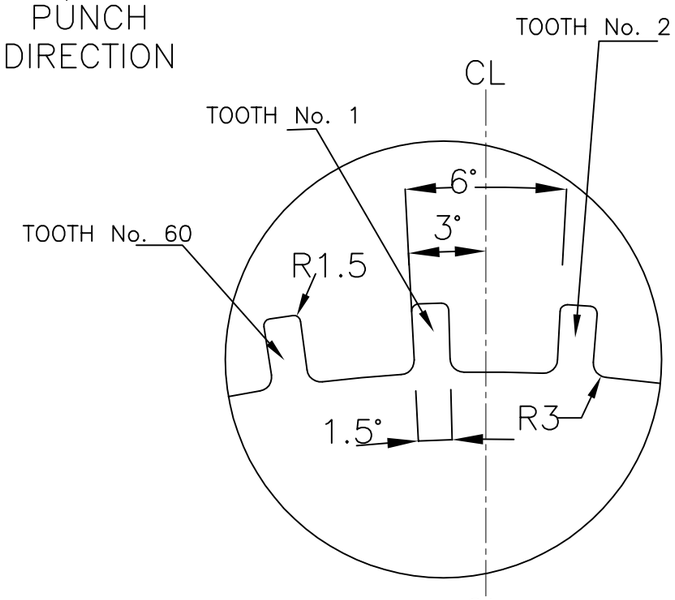
COMPUTER FILE NAME :- FD01901113687-01
INVENTORY NO | SIGN. AND DATE | REF. DRG. NO.

DRG. NO. RD DG 3 14109 03



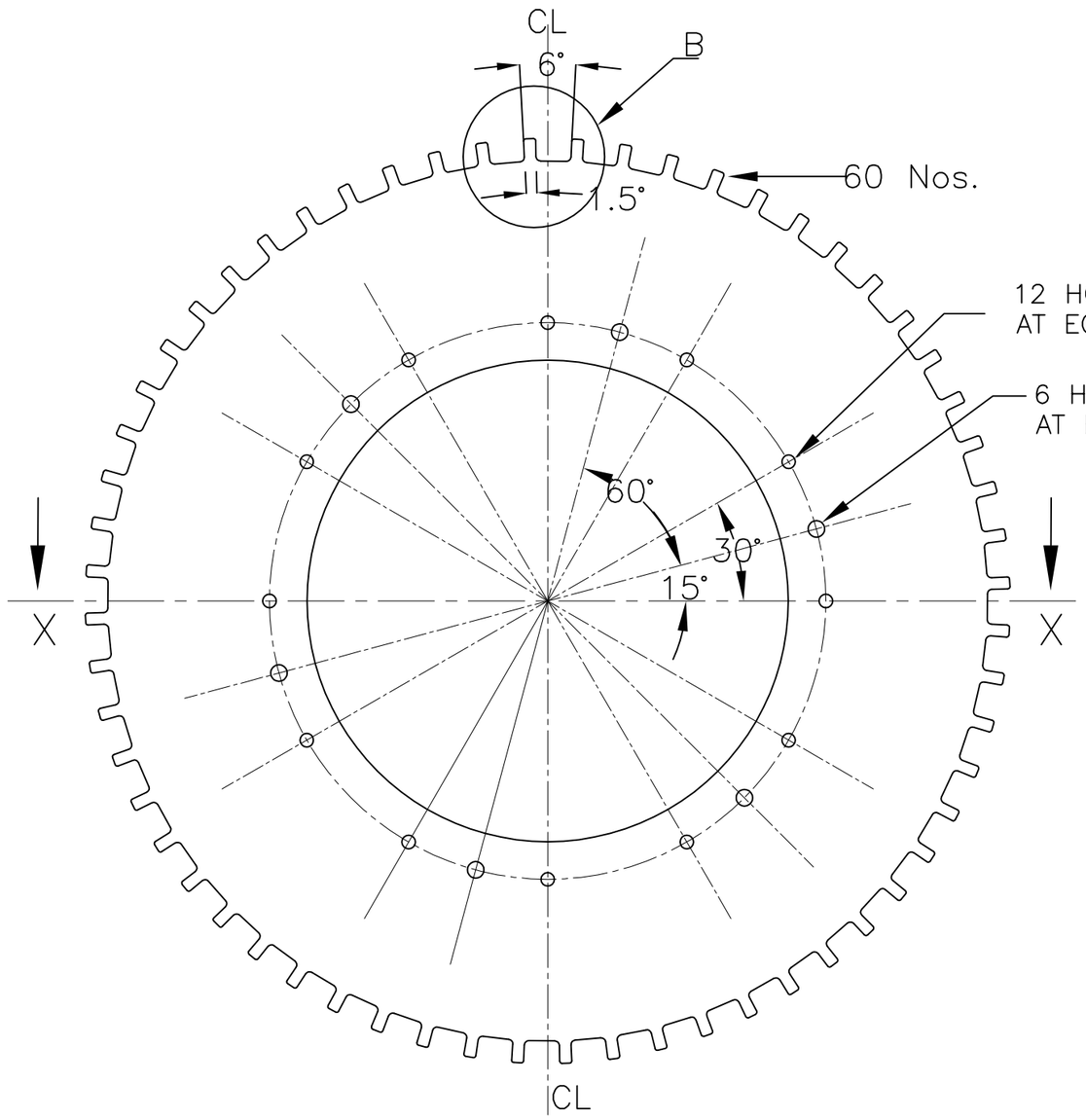


DETAIL A



DETAIL B

SECTION XX



PLAN

NOTE 1:TOOTH PUNCHING FROM OUTER SIDE ONLY.
DIRECTION AS SHOWN.

VAR. NO.	DESCRIPTION	MATERIAL SPECN.	QUANTITY	NET WT. /EACH
2	BOTTOM BELLOW (T=1.5 mm) (GAUGE 16)	SS 316	6	2.43 kg
1	BOTTOM BELLOW (T=1.2 mm) (GAUGE 18)	SS 316	6	1.94 kg

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1) ALL LINEAR DIMENSIONS ARE IN "mm".
2) ASTM A505 FOR THICKNESS TOLERANCES.
3) IS 2102–PART 1 FOR TOLERANCES ON LINEAR & ANGULAR DIMENSIONS

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

DEVPT. OF BELLOW TYPE SPRAY NOZZLE

BHARAT HEAVY ELECTRICALS LTD.
CORP. R&D HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	A.S.		10.09.9	N.A
CHD.	M.D.M.		15.09.9	
APPD.	U.N.R.		19.09.9	

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
HTF	NTS		RD DG 3 14109 01	2	12
CODE 45					

TITLE: BOTTOM BELLOW

DRAWING NO. RD DG 3 14109 03 — REV. 00

SHEET NO. 01 — NO OF SHEETS 01

COMPUTER FILE NAME : FP01801113687-01

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO

REV. | DATE | ALTERED / CHECKED | APPD. | ZONE