MANUFACTURING SPECIFICATION & TESTING REQUIREMENTS OF METALLIC BELLOWS

1.0 APPLICATION:

METALLIC BELLOW IS USED FOR ELECTRICAL CONTINUITY OF BUSDUCT ENCLOSURE (HAVING RATED CONTINUOUS CURRENT OF BUSBAR) WITHOUT OVER-HEATING. IN ADDITION TO THIS, METALLIC BELLOW ALSO PROVIDES FLEXIBILITY.

2.0 MANUFACTURING PARAMETERS/REQUIREMENTS OF METALLIC BELLOW:

I. THE METALLIC BELLOW AND PART ASSEMBLIES SHALL BE SUPPLIED AS PER DRAWING NO. 32001200051 VAR 00 SUITABLE FOR 1600 MM & 1700 MM OD BUSDUCT ENCLOSURE.

II. BELLOW SHALL BE MANUFACTURED BY DIE PRESSING METHOD SO AS TO MAINTAIN FLEXIBILITY IN BELLOW. IN CASE ANY ALTERNATIVE METHOD OF MANUFACTURING IS SUGGESTED, THIS SHOULD BE ACCOMPANIED WITH SUITABLE AND PROPER JUSTIFICATION TO THE SATISFACTION OF BHEL BEFORE CLEARING OF TECHNICAL OFFERS. PARTY SHOULD HAVE PRIOR EXPERIENCE OF MANUFACTURING METALLIC BELLOWS OF AT LEAST 500 MM DIA.PARTY WILL SUBMIT PROOF FOR THE SAME ALONGWITH OFFER.

III. IT SHOULD CONSIST OF STRIPS PRESSED TOGETHER. THICKNESS OF STRIPS TO BE USED TO BE BETWEEN 0.6mm TO 1.0mm. HOWEVER, TOTAL THICKNESS OF BELLOW CALCULATED BY ADDING STRIP THICKNESSES SHOULD NOT BE LESS THAN 10MM.

IV. EACH STRIP SHOULD BE FIRMLY PRESSING ONE OVER THE OTHER WITH NO UNEVENNESS IN BETWEEN. ALSO, THERE SHOULD BE NO DENTS OR VOIDS ON THE SURFACE, PEAKS AND CRESTS OF THE BELLOW. FOR THIS PURPOSE, HYDRAULIC PRESSING IS SUGGESTED.

REV.		PRINTS TO:-	APPROVED -		
ALTD.			Arvind Narayan		
APPD.			PREPARED	ISSUED	DATE
DATE.			S. Basu S.Ba		

V. NO CIRCUMFERENTIAL BUTT WELLDING IS ALLOWED (EXCEPT FOR BOTH EXTREME ENDS) FOR MANUFACTURING THE BELLOW.

VI. LONGITIDUNAL WELDING BETWEEN CURVES OF STRIPS IS ALLOWED. HOWEVER WELDING IN EACH STRIP SHALL BE STAGGERED. (IT WILL NOT MATCH WITH LOCATION OF WELDING WITH OTHER STRIPS). THIS MEANS LOCATION OF WELD JOINT IN EACH CIRCULAR STRIP SHALL BE AT DIFFERENT LOCATION. MOREOVER, ONLY ONE NO. OF WELDED JOINTS IN EACH CYLINDER OF STRIP SHALL BE ALLOWED.

VII. PROPER FINISHING OF LONGITIDUNAL WELDING OF STRIP TO BE ENSURED.

3.0 TESTING RQUIREMENT: FOLLOWING TESTS TO BE CONDUCTED ON EACH BELLOW:

1. VISUAL INSPECTION.
2. DIMENSIONAL VERIFICATION
3. IN PROCESS CHECKS: PHYSCIAL VERIFICATION OF WELDING JOINTS OF LONGITUDINAL WELDING OF ALL STRIPS.
4. MEASURMENT OF COMPRESSION & RECOVERY (+/-5mm)
5. MILI VOLT DROP TEST.
6. 100% DP TEST ON WELDED JOINTS

REV.		PRINTS TO:-	APPROVED -		
ALTD.			Arvind Narayan		
APPD.			PREPARED	ISSUED	DATE
DATE.			S. Basu		

4.0 INSPECTION:

a) STAGE INSPECTION MAY BE DONE BY BHEL BEFORE PRESSING OF STRIPS.

b) FINAL INSPECTION SHALL BE DONE BY BHEL AFTER COMPLETE ASSEMBLY.

5.0 DOCUMENTS TO BE SUBMITTED AT THE TIME OF OFFER:

1. QAP.
2. SIGNED AND SEALED COPY OF DRAWINGS.
3. SIGNED AND SEALED COPY OF THIS SPECIFICATION.
4. A BRIEF WRITE-UP ON PROCESS TO BE FOLLOWED.
5. DETAILS OF EARLIER SUPPLY OF METALLIC BELLOW OF SIZE 500 MM DIA OR MORE.

6.0 DOCUMENTS TO BE SUBMITTED ALONGWITH SUPPLY:

1. RAW MATERIAL TC
2. GUARANTEE CERTIFICATE.
3. INSPECTION/TESTING REPORTS (OF TESTS AS PER CLAUSE 3.0)

7.0 IDENTIFICATION:

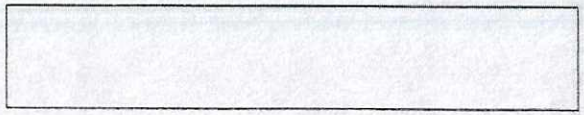
EACH UNIT SHALL BE WITH PROPER AND PERMANENT IDENTIFICATION AT SUITABLE LOCATION ON METALLIC BELLOW. THIS WILL INCLUDE

I. VENDOR CODE
II. MONTH & YEAR OF MANUFACTURING
III. SERIAL NO. OF BELLOW
IV. P.O. NO.

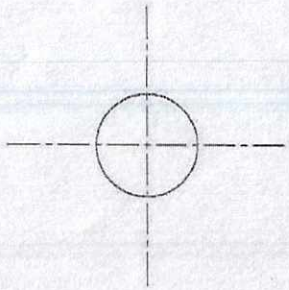
7.0 PACKING RQUIREMENT:

EACH UNIT SHALL BE PACKED IN COMPLETELY COVERD WOODEN BOXES. PROPER CUSHIONING TO BE PROVIDED TO AVOID DAMAGE DURING TRANSIT/STORAGE AS DONE FOR FRAGILE ITEMS.

REV.		PRINTS TO:-	APPROVED		
ALTD.			Arvind Narayan		
APPD.			PREPARED	ISSUED	DATE
DATE.			S. Basu		



ITEM 001



MATERIAL : 12 ø ROD AL
QUANTITY : 10 Nos. / METALLIC BELLOW

LEVELING TEMPORARY PIECES METALIC BELLOW FOR SITE WELDING

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	

CUSTOMER: BHARAT HEAVY ELECTRICALS LIMITED RUDRAPUR

PROJECT/PRODUCT

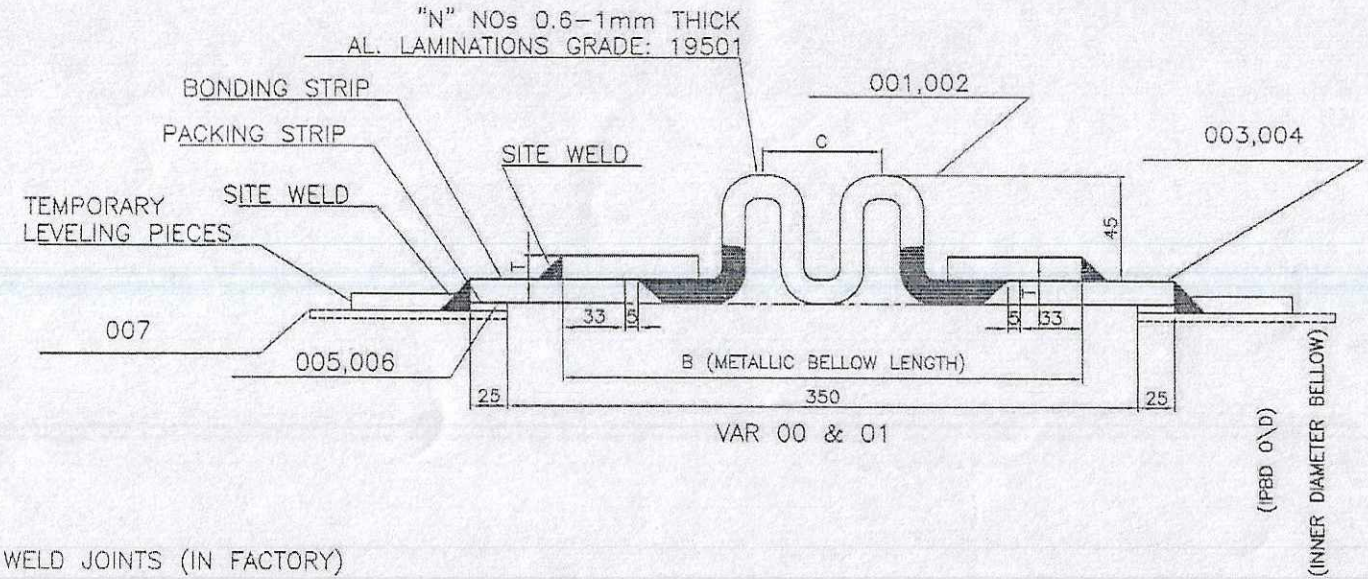
	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	S.BASU	S.Basu	12.03.14	
CKD.	S.BASU			
APPD.	R.K.LAL			

DEPTT. ENGG. | UNTOL.DIM.GR. | SCALE | WEIGHT-KG | REF.TO ASSY.DRG. | IT.NO. | NO.OF ITEM

TITLE: LEVELING PIECES FOR ø1700/1600 IPBD METALIC BELLOW

DRAWING NO. 32001200055 | REV. 00

SHEET NO.- 01 | NO.OF SHEETS- 01 | SIZE- A3



VAR 00 & 01

NO. OF WELD JOINTS (IN FACTORY)

1. TOTAL NO CIRCUMFERENTIAL WELD = 4 No (MAX) -- ONLY BETWEEN STRIP ASSY. & PLATE OR PLATE TO PLATE
   TOTAL NO OF LONGITUDENAL BUTT JOINTS IN STRIPS = 1XNo OF STRIPS
   TOTAL NO OF LONGITUDENAL BUTT JOINTS IN BONDING STRIP= 4 NO
2. PACKING STRIP TO BE LOOSE SUPPLY.
3. SITE WELD IS NOT IN VENDOR SCOPE. SO IT.03 SHALL BE SULLPIED LOOSE ALONGWITH OTHER LOOSE ITEMS.

AS REQD VAR 01	AS REQD VAR 00	ITEM NO.	DESCRIPTION	DWG	IT.NO VAR
		007	LEVELLING PIECES	32001200055	001
06		006	PACKING STRIP SUITABLE FOR 1600 O/D	32001200054	002
	06	005	PACKING STRIP SUITABLE FOR 1700 O/D	32001200054	001
04		004	BONDING STRIP SUITABLE FOR 1600 O/D	32001200053	002
	04	003	BONDING STRIP SUITABLE FOR 1700 O/D	32001200053	001
01		002	1600 O/D N. BELLOW	32001200052	01
	01	001	1700 O/D N. BELLOW	32001200052	00

VAR	DIM-øA(I/D)	DIM-T	DIM-C	"N" NOs.	IPB DIA. (DIM-D)	DIM-B
00	1710	10	40	N No. TO MEET DIM-T	ø1700	250
01	1610	9	40	N No. TO MEET DIM-T	ø1600	250

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED
		ALTERD / CHEKED			ALTERD / CHEKED	01	02.09.14	ALTERD S.BASU / CHEKED ARVIND

BOQ LIST REVISED

CUSTOMER

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

PROJECT/PRODUCT

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	S.BASU	S.Q	12.03.14	
CKD.	S.BASU			
APPD.	R.K.LAL			

DEPTT. / ENGG.	UNTOL.DIM.GR.	SCALE	WEIGHT-KG	REF.TO ASSY.DRG.	IT.NO.	NO.OF ITEM

TITLE

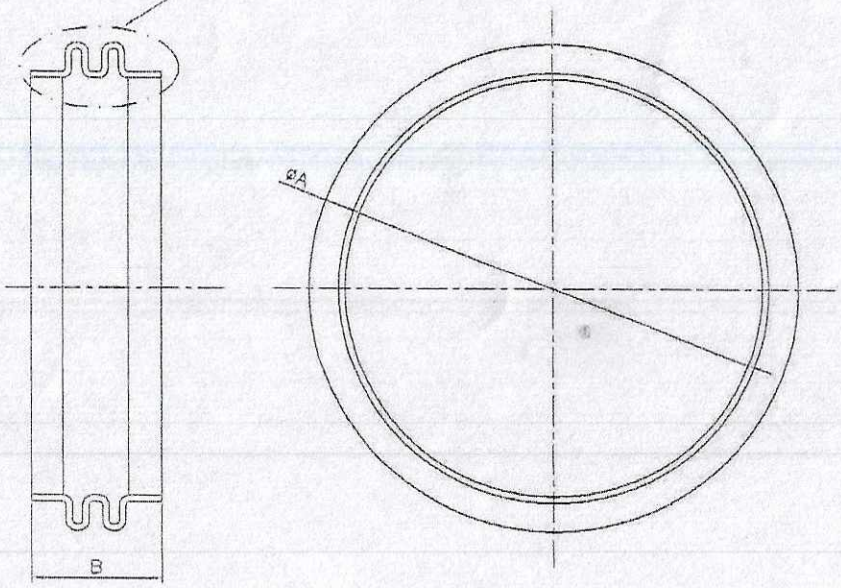
METALIC BELLOW ASSY
FOR ø1700/1600 IPBD

DRAWING NO. 32001200051 REV. 01

SHEET NO.- 01 NO.OF SHEETS- 01 SIZE- A3

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

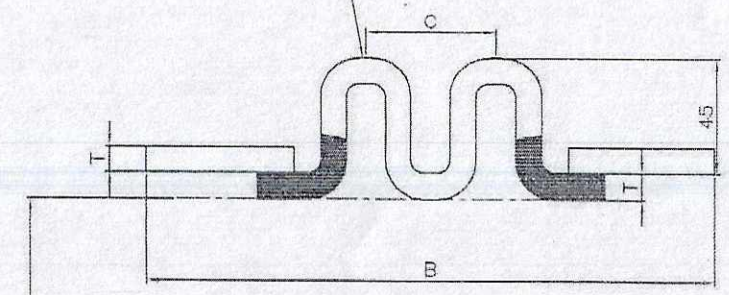
"N" NOs 0.6–1mm THICK
AL. LAMINATIONS GRADE: 19501



FRONT VIEW

SIDE VIEW

VAR 00 & 01



DETAIL–X

VAR	DIM–ØA(I/D)	DIM–T	DIM–C (+/–5)	"N" NOs.	IPB DIA.	DIM–B
00	1710	10	40	N No. TO MEET DIM–T	ø1700	250
01	1610	9	40	N No. TO MEET DIM–T	ø1600	250

NOTE–: 1. INNER DIA OF THE METALLIC BELLOW IS 10MM LARGER THAN OUTER DIA OF ENCLOSURE
2. TOTAL ASSEMBLED LENGTH OF METALLIC BELLOW WOULD BE AS PER DWG NO.32001200051

G.A. FOR METALIC BELLOW

CUSTOMER

PROJECT/PRODUCT

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	S.BASU	S.B	12.03.14	
CKD.	S.BASU			
APPD.	R.K.LAL			

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED

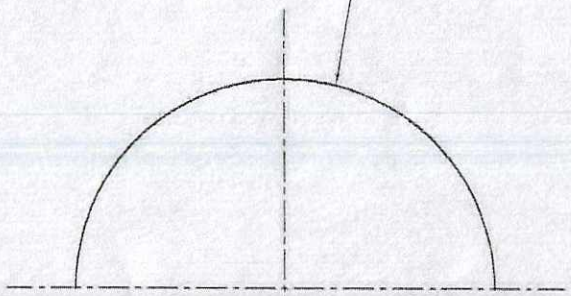
DEPTT.	UNTOL.DIM.GR.	SCALE	WEIGHT–KG	REF.TO ASSY.DRG.	IT.NO.	NO.OF ITEM
ENGG.						

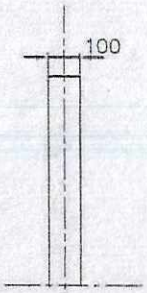
TITLE: G.A. METALIC BELLOW FOR ø1700/1600 IPBD

DRAWING NO. 32001200052 REV. 00

SHEET NO.– 01 | NO.OF SHEETS– 01 | SIZE– A3

"T" Tk ØA ID AL ENCLOSURE BONDING





ITEM 001/002

ITEM	DIM-ØA(I/D)	IPB DIA.	DIM-T
001	1710	ø1700	10
002	1610	ø1600	9

MATERIAL : AL GRADE – 19501
QUANTITY : 4 Nos. / METALLIC BELLOW

BONDING STRIP
METALIC BELLOW

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED

CUSTOMER: BHARAT HEAVY ELECTRICALS LIMITED RUDRAPUR

PROJECT/PRODUCT

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	S.BASU	S.B	12.03.14	
CKD.	S.BASU			
APPD.	R.K.LAL			

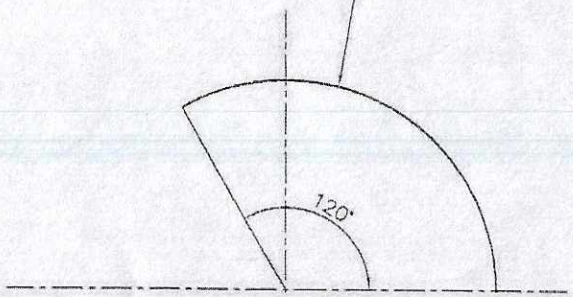
DEPTT.	UNTOL.DIM.GR.	SCALE	WEIGHT-KG	REF.TO ASSY.DRG.	IT.NO.	NO.OF ITEM
ENGG.						

TITLE: BONDING STRIP FOR ø1700/1600 IPBD METALLIC BELLOW

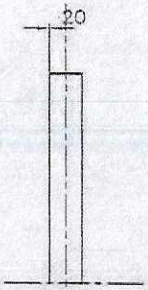
DRAWING NO. 32001200053 REV. 00

SHEET NO.- 01 | NO.OF SHEETS-01 | SIZE- A3

5Tk 1712 ID AL PACKING STRIPS



ITEM : 001/002



IT.NO.	DIM–øA(I/D)	IPB DIA.
001	1710	ø1700
002	1609	ø1600

MATERIAL : AL GRADE – 19501
QUANTITY : 6 Nos. / METALLIC BELLOW

	CUSTOMER	PROJECT/PRODUCT				
BHEL	BHARAT HEAVY ELECTRICALS LIMITED RUDRAPUR		NAME	SIGN.	DATE	NO. OF VAR.
		DRN.	S.BASU		12.03.14	
		CKD.	S.BASU			
		APPD.	R.K.LAL			

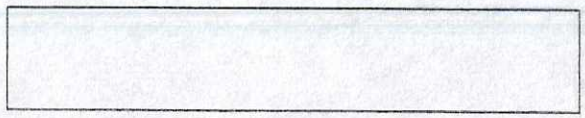
REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED

DEPTT.	UNTOL.DIM.GR.		SCALE	WEIGHT–KG	REF.TO ASSY.DRG.	IT.NO.	NO.OF ITEM
ENGG.							

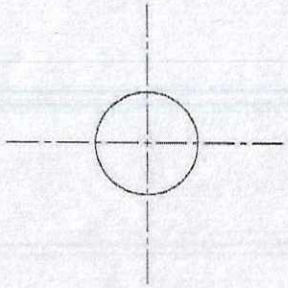
TITLE
PACKING STRIP FOR ø1700/1600 IPBD METALIC BELLOW

DRAWING NO. 32001200054 REV. 00

SHEET NO.– 01 | NO.OF SHEETS–01 | SIZE– A3



ITEM 001



MATERIAL : 12 ø ROD AL
QUANTITY : 10 Nos. / METALLIC BELLOW

LEVELING TEMPORARY PIECES METALIC BELLOW FOR SITE WELDING

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	

CUSTOMER: BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR

PROJECT/PRODUCT

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	S.BASU	S.B	12.03.14	
CKD.	S.BASU			
APPD.	R.K.LAL			

DEPTT. ENGG. | UNTOL.DIM.GR. | SCALE | WEIGHT-KG | REF.TO ASSY.DRG. | IT.NO. | NO.OF ITEM

TITLE: LEVELING PIECES FOR ø1700/1600 IPBD METALIC BELLOW

DRAWING NO. 32001200055 | REV. 00

SHEET NO.- 01 | NO.OF SHEETS- 01 | SIZE- A3

METHOD FOR FITTING THE METALLIC BELLOW AT SITE (BHEL SCOPE)

1. INSERT THE METALLIC BELLOW IN THE GAP BETWEEN THE ENCLOSURE & SLIDE IT TO ONE SIDE OF ENCLOSURE.
2. WELD THE INNER CONDUCTORS.
3. MARK 45 MM LINE ON BUSDUCT ENCLOSURE FROM PERIPHERY
4. PLACE 90 MM BONDING ENCLOSURE, ALIGNING WITH MARKED LINE
5. FIX FIRMLY THE BONDING ENCLOSURE WITH CLAMPS
6. TACK WELD THE BOND ENCLOSURE
7. REPEAT STEPS 4 TO 6 FOR BOTTOM PORTION OF ENCLOSURE
8. MARK ON THE BONDING ENCLOSURE 15 MM FROM PERIPHERY AWAY FROM ENCLOSURE
9. MOVE GENTLY THE BELLOW & ALLIGN WIH 15 MM MARKED LINE
10. REPEAT STEPS 3 TO 9 ON ENCLOSURE OF OTHER SIDE OF BELLOW OPENING
11. IN THE GAP BETWEEN BELLOW & BODING ENCLOSURE, BONDING STRIP TO BE PLACED
12. SPACER FITTED IN THE GAP BETWEEN ENCLOSURE & BONDING STRIP TO BE WELDED
13. STOPPERS TO BE PLACED ON THE BONDING STRIP SURFACE.

STEPS FOR METALLIC BELLOW

CUSTOMER		PROJECT/PRODUCT
BHARAT HEAVY ELECTRICALS LIMITED RUDRAPUR		

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	S.BASU	S.B	12.03.14	
CKD.	S.BASU			
APPD.	R.K.LAL			

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED

DEPTT.	UNTOL.DIM.GR.		SCALE	WEIGHT–KG	REF.TO ASSY.DRG.	IT.NO.	NO.OF ITEM
ENGG.							

TITLE: METALIC BELLOW FOR ø1700/1600 IPBD

DRAWING NO.: M.BELLOW — REV.: 01

SHEET NO.– 01 | NO.OF SHEETS–01 | SIZE– A3