



633534/2022/HEP-CDE41100


 Heat Exchanger Group BHEL - Bhopal		QUALITY ASSURANCE PLAN (QAP) Bare Rubber Bellow for R.E. Joints						QAP		CDE-17-3142				
								Revision No.		04				
								Date of Issue		27.09.2021				
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SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATEGORY OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C & A				D*	M	C	A	
1	2	3	4	5	6	7	8	9	D*	**10			11	

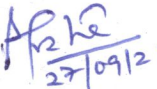
1.0 RAW MATERIALS INSPECTION													
1.1	Neoprene Rubber	Polymer Identification	Major	Testing	One sample per batch	IS 3400 Part XXII	Presence of Chloroprene	TC	√	P	V	V	
		Tensile Strength	Major	Testing	--do--	IS 3400 Part I	120 kg/cm ² .g(Min)	TC	√	P	V	V	
		Elongation at break	Major	Testing	--do--	IS 3400 Part I	350% Min.	TC	√	P	V	V	
		Shore hardness	Major	Measure	--do--	ASTM D 2240/ IS 3400 Part XXIII	65± 5° Shore A /Approved Drg.	TC	√	P	V	V	
		Ozone resistance test	Major	Testing	--do--	ASTM-D-1149 Method-B or IS-3400 part XX	No crack for 72 Hr. in ozone concentration@ 50 PPHM	TC	√	P	V	V	
		Hydro stability test	Major	Testing	--do--	ASTM-D-3137	±10% variation in Tensile strength & ± 5% changes in volume after 96 hrs.	TC	√	P	V	V	
		Blow Lamp Test (Flame Resistance Test.)	Major	Testing	--do--	IS 1891 Part V Annexure-B	Able to extinguish itself within 4 sec.	TC	√	P	V	V	
		Kerosene dip test	Major	Testing	--do--	Dipping for 01 hr in Kerosene at room temp Max.	No visible defects cracks. Swelling in volume not to exceed ± 10%	TC	√	P	V	V	

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 P: PERFORM W: WITNESS AND V: VERIFICATION/RECORD REVIEW AS APPROPRIATE.
 H: CUSTOMER HOLD POINT


TC-TEST CERTIFICATE, IR-INSPECTION REPORT


 27.09.2021
 Prepared by :
 Pawan Rai(Sr. Engr-CDE)


 27/09/2021
 Checked by :
 Ashok Mahor(Sr. DGM-CDE)



 27/09/21
 Approved by :
 SP Vatsa (HOD-CDE)


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1.2	Natural Rubber After Compounding	Adhesion of rubber to metal	Major	Testing	One sample per batch	IS-3400 Part (XIV) method-A /ASTMD429	60 lbs / linear inch. Width without stripping	TC	√	P	V	V		
		Adhesion of rubber to Fabric	Major	Testing	--do--	IS-3400 Part(V)	25 lbs / linear inch. Width without stripping	TC	√	P	V	V		
		Fabric Strength	Major	Breaking Load	--do--	IS 1969 (Strip method) for ASTM D-5035	700 lbs/ linear inch. width without stripping	TC	√	P	V	V		
1.3	Reinforcement Ring	Mechanical tests (Tensile Strength)	Major	Testing	--do--	IS:1570 Part-I, Fe 690	690 MPa (Min.)	TC	√	P	V	V		
1.4	Split Retaining rings	Chemical, & Mechanical tests (TS,YS & EL)	Major	Chemical & Mechanical Testing	--do--	Approved drawing		TC	√	P	V	V		
2.0 IN PROCESS INSPECTION														
2.1	Manufacturing of Rubber bellow	Flange compactness before curing	Major	Visual	100%	Approved Drg		IR		P	V	-		
		Two layers inner cover with Staggered Lap joints Circumferential and Longitudinal	Major	Visual	100%	Approved Drg		IR		P	V	-		
		Drilling holes in bellow flange coated with self vulcanizing rubber	Major	Visual	100%	Approved Drg		IR		P	V	-		

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IN PROCESS INSPECTION (Cont.)													
2.2	Vulcanizing of Rubber Bellow	Vulcanizing (Pressure, Temp, Duration)	Major	Visual & Measure	100%	100%	Manufacturer's std. (Min. 2 Hrs. curing)	IR		P	V	-	
		Surface after curing	Major	Visual & Measure	100%	100%	Manufacturer's std , (No defect)	IR		P	V	-	
2.3	Split Retaining Ring	Visual & Dimensional	Major	Visual & Measure	100%	100%	Approved Drg	IR		P	V	-	
		Hot dip Galvanizing; if applicable as per drg requirement	Major	Hot dip Galvanizing check	100%	100%	Galvanizing thickness:0.1 to 0.13 mm/Approved drg	IR		P	V	-	
3.0	FINAL INSPECTION												
3.1	Rubber Bellow	Visual & Flange Dimensional conformity	Major	Visual & Measure	100%	100%	Approved Drawing	IR	√	P	W	W	
3.2		Vacuum test for 30 minutes (min)/As per approved Drg	Major	Test	100%	02 Nos./Lot	Approved Drawing	IR	√	P	W	W	
3.3		Hydraulic test for 30 minutes (min) /As per approved Drg	Major	Test	100%	02 Nos./Lot	Approved Drawing	IR	√	P	W	W	

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3.4	Rubber Bellow	Permanent set in circumference measured after 24 hrs of Hydro test	Major	Test	100%	02 Nos./Lot	Approved Drawing	Permanent set shall be within +/-0.5%	IR	√	P	W	W	
3.5		Combined Movement test at Design Pressure. a) Compression & Lateral movement b) Elongation & Lateral movement as applicable as per approved drg	Major	Test	100%	02 Nos./Lot	Approved Drawing	No Leakage & deformation	IR	√	P	W	W	
3.6		Deflection test (lateral, compression & Elongation) at 30mm Hg(abs) vacuum & from 0 to Design pressure(g) at an interval of 01 kg/sq.cm(g) for deflection of 5,10,15,20 & 25 mm (as applicable)/ As per approved drg	Major	Test	100%	02 Nos./Lot	Approved Drawing	Stiffness to be limited to value as per approved Bellow drg for all pressures.	IR	√	P	W	W	Note: Force Vs Deflection curves to be plotted.


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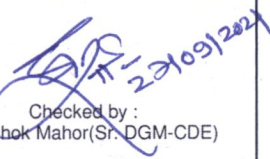
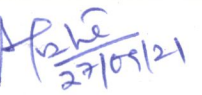
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3.7	Rubber Bellow	Manual cleaning, Painting with brush or spray.	Minor	Visual	100%	Manufacturer's std ,	IR		P	V	-			
3.8		Tag marking, packing	Major	Visual	--do--	Suitable sturdy wooden box to be used to avoid damage during transit & storage.	IR		P	V	-	PO Number, supplier name & EB Number mention on bellow by indelible ink.		

NOTES:

- Drilling holes on the rubber bellow flange will be coated with self-vulcanizing rubber and also on the periphery of the flanges.
- Surface check on Bellows after Curing to be free from any visual defects.
- Four(04) copies of all test certificates (covering all the tests/ steps as mentioned in the above QAP) duly signed by BHEL-IA/ Customer (as per the approved QAP) shall be furnished along with the final dispatch documents. Sequence of documents shall be as per the QAP only with proper index sheet at top.
- Life cycle test shall be carried out on Rubber bellow of required or above size(NB). If Life cycle test already carried out , report shall be submitted to BHEL/Customer acceptance. In case vendor does not have Life cycle test report or the report submitted is not found acceptable, vendor shall carryout the Life cycle test without commercial implication. Life Cycle Test is NOT APPLICABLE for Rubber bellows of Conventional type RE Joints.
- All Testings to be done in NABL/ govt. approved lab.

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