



BHARAT HEAVY ELECTRICAL LIMITED, BHOPAL

Enquiry No. :

Due Date :

Supplier Qtn. No.:

Date :

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF 420 kV, 2500 A, 630KV PF Voltage Withstand, 1425 kVp OIP CONDENSER BUSHING

NOTE:-

- 1 The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.
- 2 The offer and all documents enclosed with offer should be in English language only.

NAME & ADDRESS OF THE SUPPLIER :

SCOPE: SUPPLY OF 420 kV, 2500A, 630KV PF Voltage Withstand, 1425 kVp BIL OIP CONDENSER BUSHINGS COMPLYING WITH THE SPECIFICATIONS AS BELOW :

Spec No. : BCE/PS/420/24, Rev00

Date: 21.06.2019

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	WORKPIECE MATERIAL				
1.1	Item : Oil Impregnated Paper (OIP) Condenser Bushing	Vendor to note			
2.0	SPECIFICATION :				
2.1	The electrical and mechanical characteristics of bushings shall be in accordance with IEC: 60137:2017.	Vendor to confirm			
2.2	Valid type test reports as per IEC:60137 (2017) for 420 kV OIP bushings , conducted <u>within last 10(ten) years prior to the date of bid opening</u> shall be submitted alongwith the bid.	Vendor to confirm and submit the test reports alongwith the bid			
2.2.1	The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by client / third party.	Vendor to confirm			

E7593010

16

Signature

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.2.3	If the supplier fails to submit the type test reports as mentioned above, offer of the supplier shall be rejected.	Vendor to confirm			
2.3	The porcelain bushings must be shipped in crates to prevent them from breaking. The bushings can be packed in a slanted position on their own support so that the bushing insulation is always covered with oil. Each bushing must be lying on a solid base and protected by adequate filling material to avoid free-movement during transportation. If the manufacturer deems it necessary, the bushings can be strapped with nylon belts to block them in place.	Vendor to confirm			
2.3.1	Bushings shall be manufactured and tested in accordance with IS:2099 & IEC-60137. Hollow column insulator shall be manufactured and tested in accordance with IEC-62155 / IS:5621. The insulators shall also conform to IEC 60815 as applicable.	Vendor to confirm			
2.3.2	Insulators shall be manufactured and conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & 2544, 5621 & IEC-62155, as applicable.	Vendor to confirm			
2.3.3	Bushings insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.	Vendor to confirm			
2.3.4	The bushing shall be of porcelain and have adequate current capacity to use the equipment to its maximum overload capacity.	Vendor to confirm			
2.3.5	All the porcelain shall have adequate physical properties and glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar other defects.	Vendor to confirm			
2.3.6	Insulators shall be manufactured from high quality porcelain. Porcelain used shall be homogeneous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to moisture.	Vendor to confirm			

157
Singh

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.3.7	Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service.	Vendor to confirm			
2.3.8	The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture.	Vendor to confirm			
2.3.9	All portions of the assembled porcelain enclosures and support insulators other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.	Vendor to confirm			
2.3.10	All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.	Vendor to confirm			
2.4	The bidder may also offer composite silicon rubber insulator, conforming to IEC- 61462.	Vendor to confirm			
2.4.1	The hollow silicone composite insulators shall comply with the requirements of the IEC publications IEC 61462 and the relevant parts of IEC 62217.	Vendor to confirm			
2.4.2	The design of the composite insulators shall be tested and verified according to IEC 61462 (Type & Routine test).	Vendor to confirm			
2.4.3	Polymer / composite insulator shall be seamless sheath of a silicone rubber compound.	Vendor to confirm			
2.4.4	The housing & weather sheds should have silicon content of minimum 30% by weight.	Vendor to confirm			
2.4.5	It should protect the bushing against environmental influences, external pollution and humidity.	Vendor to confirm			

14
Srinivas ..

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.4.6	It shall be extruded or directly moulded on the core.	Vendor to confirm			
2.4.7	The interface between the housing and the core must be uniform and without voids.	Vendor to confirm			
2.4.8	The strength of the bond shall be greater than the tearing strength of the polymer.	Vendor to confirm			
2.4.9	The manufacturer shall follow non-destructive technique (N.D.T.) to check the quality of jointing of the housing interface with the core.	Vendor to confirm			
2.4.10	The technique being followed with detailed procedure and sampling shall be finalized during finalization of MQP.	Vendor to confirm			
2.4.11	The weather sheds of the insulators shall be of alternate shed profile as per IEC 60815 The weather sheds shall be vulcanized to the sheath (extrusion process) or moulded as part of the sheath (injection moulding process) and free from	Vendor to confirm			
2.4.12	The vulcanization for extrusion process shall be at high temperature and for injection moulding shall be at high temperature & high pressure.	Vendor to confirm			
2.4.13	Any seams / burrs protruding axially along the insulator, resulting from the injection moulding process shall be removed completely without causing any damage to the housing.	Vendor to confirm			
2.4.14	The track resistance of housing and shed material shall be class 1A4.5 according to IEC 60587.	Vendor to confirm			
2.4.15	The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer.	Vendor to confirm			

13
Srinivas

Date: 21.06.2019

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.4.16	The composite insulator shall be capable of high pressure washing.	Vendor to confirm			
2.5	When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action.	Vendor to confirm			
2.6	No radio interference shall be caused by the bushings when operating at the normal rated voltage. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona.	Vendor to confirm			
2.7	End fittings shall be free from cracks, seams, shrinks, air holes and rough edges.	Vendor to confirm			
2.8	End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must be supported by test documents.	Vendor to confirm			
2.9	All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.	Vendor to confirm			
2.10	Clamps and fittings shall be of hot dip galvanised/stainless steel.	Vendor to confirm			
2.11	Spare Bushing shall be specially packed suitable for long storage with non-returnable.	Vendor to confirm			
2.12	Bushings of identical current and voltage ratings must be interchangeable.	Vendor to confirm			
2.13	All dimensions to match as per drg. no. <u>000-T-E-A-002-R00</u> attached at <u>Annexure-I</u>	Vendor to confirm			
2.14	Supplier to submit their Quality Plan for review by BHEL.	Vendor to confirm			
3.0	Technical Parameters				
3.1	Rated Voltage	420 kV	Vendor to specify		
3.2	Rated Current (Min.)	2500 A	Vendor to specify		
3.3	Lightning impulse withstand voltage	1425 kVp	Vendor to specify		
3.4	Switching impulse withstand voltage	1050 kVp	Vendor to specify		



Engineer

12

SNO	DESCRIPTION OF BHEL REQUIREMENT		SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
3.5	One minute power frequency withstand voltage	630 kVrms	Vendor to specify			
3.6	Minimum total creepage distances	10500 mm (25 mm/kV)	Vendor to specify			
3.7	Tan delta of bushings	≤ 0.004	Vendor to specify			
3.8	Max partial discharge level at Um	< 10 pC	Vendor to specify			
3.9	Test tap voltage withstand level	2 kVrms	Vendor to specify			
3.10	Corona Extinction Voltage	320 kV rms	Vendor to Confirm			
3.11	Maximum Oil end length incl shield (mm)	1525 mm (please read in conjunction with drg. no. 000-T-E-A-002-R00)	Vendor to Confirm			
3.12	Terminal dia. (mm)	60mm (preferable)	Vendor to Confirm			
3.13	Bottom porcelain max. dia. (mm)	330 mm	Vendor to Confirm			
3.14	Flange, PCD	8 holes, dia. 20 mm equally spaced on PCD 430 mm	Vendor to Confirm			
3.15	CT space min.	600 mm	Vendor to Confirm			
3.16	Type of Lead	Bottom connected	Vendor to Confirm			
3.17	Shape of bottom connector	Only rectangular / square shaped connector is acceptable. Hexagonal bottom connector is not acceptable.	Vendor to Confirm			
3.18	Half connector for transformer lead (Alongwith fixing hardware)	Matching with the bushing bottom connector in Cl. No.3.17	Vendor to Confirm & Supply			
4.0	DOCUMENTATION : Following documents in English language should be submitted along with the bid for our evaluation.		Vendor to Confirm			
4.1	OGA Drawing		Vendor to submit			
4.2	Type test reports		Vendor to submit			
4.3	Instruction manual		Vendor to submit			
4.4	Quality Plan		Vendor to submit			
5.0	GUARANTEE :					
5.1	12 months from the date of commissioning of the transformer and 18 months from the date of supply, whichever is later.		Vendor to Confirm			

Signature...


Spec No. : BCE/PS/420/24, Rev00					
Date: 21.06.2019					
SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6	ROUTINE TEST INSPECTION:				
6.1	Routine tests to be conducted on all bushings as per IEC 60137:2017. The routine tests may be witnessed by BHEL/customer/TPIA at supplier's works.	Vendor to confirm			
7.0	VENDOR APPROVAL BY CUSTOMER:				
7.1	The list of vendors approved by customer (UPPTCL) shall be final and the only same shall be considered for procurement process. BHEL will take up with customer for vendor approval. The vendor shall support BHEL with any documentation required during approval process.	Vendor to confirm			

Singh

Prepared By:
Singiren.E.Kandulna
Dy. Mgr (BCE)

Mahendra Kurre

Checked By:
Mahendra Kurre
AGM (BCE & CIE)

Aseem Dhamija

Approved By:
Aseem Dhamija
AGM (BCE, CIE & TRX)



BHARAT HEAVY ELECTRICAL LIMITED, BHOPAL

Enquiry No. :

Due Date :

Supplier Qtn. No.:

Date :

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF 800 kV, 2500 A, 1075KV PF Voltage Withstand, 2400 kVp OIP CONDENSER BUSHING

NOTE:-

- 1 The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.
- 2 The offer and all documents enclosed with offer should be in English language only.

NAME & ADDRESS OF THE SUPPLIER :

SCOPE: SUPPLY OF 800 kV, 2500A, 1075KV PF Voltage Withstand, 2400 kVp BIL OIP CONDENSER BUSHINGS COMPLYING WITH THE SPECIFICATIONS AS BELOW :

Spec No. : BCE/PS/800/23, Rev00

Date: 21.06.2019

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	WORKPIECE MATERIAL				
1.1	Item : Oil Impregnated Paper (OIP) Condenser Bushing	Vendor to note			
2.0	SPECIFICATION :				
2.1	The electrical and mechanical characteristics of bushings shall be in accordance with IEC: 60137:2017.	Vendor to confirm			
2.2	Valid type test reports as per IEC:60137 (2017) for 800 kV OIP bushings , conducted <u>within last 10(ten) years prior to the date of bid opening</u> shall be submitted alongwith the bid.	Vendor to confirm and submit the test reports alongwith the bid			
2.2.1	The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by client / third party.	Vendor to confirm			

Singh

Spec No. : BCE/PS/800/23, Rev00				
Date: 21.06.2019				

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.2.3	If the supplier fails to submit the type test reports as mentioned above, offer of the supplier shall be rejected.	Vendor to confirm			
2.3	The porcelain bushings must be shipped in crates to prevent them from breaking. The bushings can be packed in a slanted position on their own support so that the bushing insulation is always covered with oil. Each bushing must be lying on a solid base and protected by adequate filling material to avoid free-movement during transportation. If the manufacturer deems it necessary, the bushings can be strapped with nylon belts to block them in place.	Vendor to confirm			
2.3.1	Bushings shall be manufactured and tested in accordance with IS:2099 & IEC-60137. Hollow column insulator shall be manufactured and tested in accordance with IEC-62155 / IS:5621. The insulators shall also conform to IEC 60815 as	Vendor to confirm			
2.3.2	Insulators shall be manufactured and conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & 2544, 5621 & IEC-62155, as applicable.	Vendor to confirm			
2.3.3	Bushings insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.	Vendor to confirm			
2.3.4	The bushing shall be of porcelain and have adequate current capacity to use the equipment to its maximum overload capacity.	Vendor to confirm			
2.3.5	All the porcelain shall have adequate physical properties and glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar	Vendor to confirm			
2.3.6	Insulators shall be manufactured from high quality porcelain. Porcelain used shall be homogeneous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to moisture.	Vendor to confirm			
2.3.7	Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service.	Vendor to confirm			
2.3.8	The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture.	Vendor to confirm			

Signature

Date: 21.06.2019

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.3.9	All portions of the assembled porcelain enclosures and support insulators other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.	Vendor to confirm			
2.3.10	All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.	Vendor to confirm			
2.4	The bidder may also offer composite silicon rubber insulator, conforming to IEC- 61462.	Vendor to confirm			
2.4.1	The hollow silicone composite insulators shall comply with the requirements of the IEC publications IEC 61462 and the relevant parts of IEC 62217.	Vendor to confirm			
2.4.2	The design of the composite insulators shall be tested and verified according to IEC 61462 (Type & Routine test).	Vendor to confirm			
2.4.3	Polymer / composite insulator shall be seamless sheath of a silicone rubber compound.	Vendor to confirm			
2.4.4	The housing & weather sheds should have silicon content of minimum 30% by weight.	Vendor to confirm			
2.4.5	It should protect the bushing against environmental influences, external pollution and humidity.	Vendor to confirm			
2.4.6	It shall be extruded or directly moulded on the core.	Vendor to confirm			
2.4.7	The interface between the housing and the core must be uniform and without voids.	Vendor to confirm			
2.4.8	The strength of the bond shall be greater than the tearing strength of the polymer.	Vendor to confirm			

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.4.9	The manufacturer shall follow non-destructive technique (N.D.T.) to check the quality of jointing of the housing interface with the core.	Vendor to confirm			
2.4.10	The technique being followed with detailed procedure and sampling shall be finalized during finalization of MQP.	Vendor to confirm			
2.4.11	The weather sheds of the insulators shall be of alternate shed profile as per IEC 60815 The weather sheds shall be vulcanized to the sheath (extrusion process) or moulded as part of the sheath (injection moulding process) and free from imperfections.	Vendor to confirm			
2.4.12	The vulcanization for extrusion process shall be at high temperature and for injection moulding shall be at high temperature & high pressure.	Vendor to confirm			
2.4.13	Any seams / burrs protruding axially along the insulator, resulting from the injection moulding process shall be removed completely without causing any damage to the housing.	Vendor to confirm			
2.4.14	The track resistance of housing and shed material shall be class 1A4.5 according to IEC 60587.	Vendor to confirm			
2.4.15	The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer.	Vendor to confirm			
2.4.16	The composite insulator shall be capable of high pressure washing.	Vendor to confirm			
2.5	When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action.	Vendor to confirm			
2.6	No radio interference shall be caused by the bushings when operating at the normal rated voltage. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona.	Vendor to confirm			

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
2.7	End fittings shall be free from cracks, seams, shrinks, air holes and rough edges.	Vendor to confirm			
2.8	End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must be supported by test documents.	Vendor to confirm			
2.9	All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.	Vendor to confirm			
2.10	Clamps and fittings shall be of hot dip galvanised/stainless steel.	Vendor to confirm			
2.11	Spare Bushing shall be specially packed suitable for long storage with non-returnable.	Vendor to confirm			
2.12	Bushings of identical current and voltage ratings must be interchangeable.	Vendor to confirm			
2.13	All dimensions to match as per drg. no. <u>000-T-E-A-002-R00</u> attached at <u>Annexure-I</u> .	Vendor to confirm			
2.14	Supplier to submit their Quality Plan for review by BHEL.	Vendor to confirm			
3.0	Technical Parameters				
3.1	Rated Voltage	800 kV			
3.2	Rated Current (Min.)	2500 A			
3.3	Lightning impulse withstand voltage	2400 kVp			

Signature

Date: 21.06.2019

SNO	DESCRIPTION OF BHEL REQUIREMENT		SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
3.4	Switching impulse withstand voltage	1550 kVp	Vendor to specify			
3.5	One minute power frequency withstand voltage	1075 kVrms	Vendor to specify			
3.6	Minimum total creepage distances	20000 mm (25 mm/kV)	Vendor to specify			
3.7	Tan delta of bushings	≤ 0.004	Vendor to specify			
3.8	Max partial discharge level at Um	$< 10 \text{ pC}$	Vendor to specify			
3.9	Test tap voltage withstand level	2 kVrms	Vendor to specify			
3.10	Corona Extinction Voltage	508 kV rms	Vendor to Confirm			
3.11	Maximum Oil end length (including shield) (mm)	2285 $\pm$ 5 (please read in conjunction with drg. no. 000-T-E-A-002-R00)	Vendor to Confirm			
3.12	Terminal dia. (mm)	60mm (preferable)	Vendor to Confirm			
3.13	Bottom porcelain max. dia. (mm)	528 mm	Vendor to Confirm			
3.14	Flange, PCD	12 holes, dia. 32 mm equally spaced on PCD 711 mm	Vendor to Confirm			
3.15	CT space min.	600 mm	Vendor to Confirm			
3.16	Type of Lead	Bottom connected	Vendor to Confirm			
3.17	Half connector & fixing hardware for transformer lead	Matching with the bushing bottom connection in Cl. No.3.16	Vendor to Confirm & Supply			
4.0	DOCUMENTATION : Following documents in English language should be submitted along with the bid for our evaluation.		Vendor to Confirm			
4.1	OGA Drawing		Vendor to submit			
4.2	Type test reports		Vendor to submit			
4.3	Instruction manual		Vendor to submit			
4.4	Quality Plan		Vendor to submit			
5.0	GUARANTEE :					
5.1	12 months from the date of commissioning of the transformer and 18 months from the date of supply, whichever is later.		Vendor to Confirm			

Signature

5

Date: 21.06.2019

SNO	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
6.0	ROUTINE TEST INSPECTION:				
6.1	Routine tests to be conducted on all bushings as per IEC 60137:2017. The routine tests may be witnessed by BHEL/customer/TPIA at supplier's works.	Vendor to confirm			
7.0	VENDOR APPROVAL BY CUSTOMER:				
7.1	The list of vendors approved by customer (UPPTCL) shall be final and the only same shall be considered for procurement process. BHEL will take up with customer for vendor approval. The vendor shall support BHEL with any documentation required during approval process.	Vendor to confirm			

Prepared By:
Singiren.E.Kandulna
Dy. Mgr (BCE)

Checked By:
Mahendra Kurre
AGM (BCE & CIE)

Approved By:
Aseem Dhamija
AGM (BCE, CIE & TRX)