

512081/2021/O/o PED/TI/RDSO Research Designs & Standards Organisation
(Traction Installation directorate)

Reasoned document on the final Draft of the Specification No. TI/SPC/PSI/HVCB/0121 for 220kV/132kV/110kV/100kV/66kV/55kV Double Pole, Triple Pole, Outdoor SF6 Circuit Breaker for Indian Railway.

Only those clauses has been mentioned on which any of the firm has required changes.

SN	RDSO Specification Requirement	Comment of the firm	RDSO remarks (Accepted/Not-accepted)
1.	Clause No. 1.3 All the provisions contained in RDSO's ISO procedures laid down in Document No. - QO - D-8.1-11 Ver. 1.2 dated 22.06.2020 (titled "Vendor changes in approved status") and subsequent versions /amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.	<u>M/s APPSIL:</u> - Request you to kindly provide document no. QO-D-8.1-11 Ver.1.2 dated 22.06.2020 for reference/review.	ISO Documents are available on RDSO Website i.e. www.rdso.indianrailways.gov.in under Vendor Interface and can be referred.
2.	Clause No. 2.1(ix) IS: 5621	<u>M/s APPSIL:</u> IS: 5621 (1980) / IEC 62155 Adding IEC 62155 in this clause, as mentioned in clause no - 5.1.1.2 of the specs.	Accepted.
3.	Clause No. 2.1(x) IS:13947-Part V :Sec.1	<u>M/s APPSIL:</u> IS:13947-Part V : Sec.1 / IEC 60947-5 Adding IEC 60947-5 in this clause, similar to clause no - 2.1 (xvii) of the specs.	Accepted.
4.	Clause No. 2.1(xi) IS:7906 (Pt.I)	<u>M/s APPSIL:</u> IS:7906 (Pt.I) / EN 10270-2 FdSiCr We are following international standards - EN 10270-2 FdSiCr for springs.	Accepted.
5.	Clause No. 2.1(xii) IS:7907 (Pt.I)	<u>M/s APPSIL:</u> IS:7907 (Pt.I) / EN 10270-2 FdSiCr We are following international standards - EN 10270-2 FdSiCr for springs.	Accepted.
6.	Clause No. 3.1 The Circuit Breaker is used as Transformer Circuit Breaker on Primary Side of Traction Transformer for Voltage of 55kV, 66KV, 100KV, 110KV, 132KV and 220KV and also for incoming and Outgoing Transmission Line at Traction Substation.	<u>M/s APPSIL:</u> The offered circuit breakers conform to IEC 62271-100 standards. We are offering CBs suitable for maximum service voltage of 72.5 kV, 145 kV & 245 kV. Please note. This is just for clarifying that we will be offering:- - 72.5 kV CB for 55 kV & 66 kV CB requirements - 145 kV CB for 100/110 & 132 kV CB requirements - 245 kV CB for 220 kV CB requirements	Noted

7.	<p>Clause No. 4.1 (XVII), First pole to clear factor</p>	<p><u>M/s Siemens:</u> First pole to clear factor is depends upon the system earthing. Please specify based on your system Earthing, if it is Grounded system then 1.3 and ungrounded system 1.5</p>	<p>Requirement of 1.3 or 1.5 is already mentioned in the specification.</p>												
8.	<p>Clause No. 4.2(2) From a point where a man may be required to stand for operation or for attending the breaker (sectional clearance). (mm).</p> <table border="1" data-bbox="191 499 581 632"> <thead> <tr> <th colspan="4">Rated System Voltage (kV)</th> </tr> </thead> <tbody> <tr> <td>55/66</td> <td>100/110</td> <td>132</td> <td>220</td> </tr> <tr> <td colspan="2">3500</td> <td>4000</td> <td>5000</td> </tr> </tbody> </table>	Rated System Voltage (kV)				55/66	100/110	132	220	3500		4000	5000	<p><u>M/s GE T&D :</u> Sectional clearance is the distance between two sections of substation, which enables a person to work on one section of a substation in a safe manner, while the other section is charged. It shall be maintained at site for equipment to equipment. Hence, we recommended for deletion of this clause as it is not applicable for the circuit breaker manufacture to meet this requirement. Also, please note when there is a maintenance there will not be any power in the line. Incase if there is no change in the clause with the above justification, we would request you to extend the clearance of 100/110kV to 132kV to meet this requirement as we are offering the same equipment for both the ratings.</p>	<p>The Description mentioned in the Para of the specification is self-explanatory. No change is required.</p>
Rated System Voltage (kV)															
55/66	100/110	132	220												
3500		4000	5000												
9.	<p>Clause No. 4.2 Technically lesser clearance can be considered if these are well proven by lightning impulse and switching Impulse tests as per RDSO specification and as per IS/IEC: 60071-2 or latest.</p>	<p><u>M/s APPSIL:</u> Technically lesser clearance can be considered if these are well proven by lightning impulse and switching impulse tests as per RDSO specification and as per IS/IEC: 60071-2 or latest. <u>M/s Siemens:</u> Technically lesser clearance can be considered if these are well proven by lightning impulse and switching impulse tests (wherever applicable) as per RDSO specification and as per IS/IEC: 60071-2 or latest. Switching impulse test is only applicable for circuit breaker of rated voltage more than 245kV.</p>	<p>Rated lightning impulse withstand voltage is mentioned in the table 1a of IS/IEC 62271-1: 2007 (reaffirmed: 2018). Also, in IS/IEC 62271-1: 2007 (reaffirmed: 2018), values for switching impulse has been specified for voltages $\geq 300\text{kV}$ but this specification is up to 245kV only. Accordingly, the clause has been modified in the final draft specification.</p>												
10.	<p>Clause No. 5.1 The Circuit Breaker shall be of outdoor type suitable for mounting on steel structure. The Circuit Breaker shall be of Double Pole or Triple Pole (as required) identical to Single pole units operated through common operating mechanisms or operated through individual operating mechanisms for each pole suitably connected for instep operation.</p>	<p><u>M/s APPSIL:</u> The Circuit Breaker shall be of outdoor type suitable for mounting on steel structure. The Circuit Breaker shall be of Double Pole or Triple Pole (as required) identical to Single pole units operated through common operating mechanisms or operated through individual operating mechanisms for each pole suitably connected for instep operation. Meaning of wordings - "for instep operation" is not clear, and hence we</p>	<p>The word 'instep' has been replaced with 'simultaneous' for clarity.</p>												

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		propose to alter this clause.	
11.	<p>Clause No. 5.1.1.2 PORCELAIN HOLLOW INSULATOR</p> <p>The porcelain hollow insulators used as the support insulators and interrupting chamber insulator for the Circuit Breaker shall be outdoor type conforming to IS: 5621 (1980). The porcelain hollow insulator shall be of single piece construction i.e., there shall be no joint with in the porcelain. To reduce joints for leakage of SF6 gas, more than one porcelain hollow insulator shall not be used for interrupting chamber insulator or support insulator. The shed profile shall have a lip at the extremity but free from ribs on the underside so as to avoid accumulation of dust and pollutants and permit easy cleaning.</p>	<p><u>M/s APPSIL:</u> Vacuum SF6 Circuit Breaker manufacturer shall declare make of the Hollow Insulator used in QAP and SOGP (to be approved by RDSO). We propose to replace word "vacuum" with "SF", since this specifications is meant only for SF6 CBs.</p> <p><u>M/s Siemens:</u> The minimum creepage distance of support insulator & interrupting chamber insulator shall be same. Different creepage distance for support insulator & interrupting chamber insulator is cannot be provided. Creepage distance of both the insulators are always same.</p> <p><u>M/s GE T&D :</u> Manufacture can provide double insulator. However, joint shall not be applicable on the porcelain.</p>	<p>The comment of M/s APPSIL is accepted as it is a typographical correction.</p> <p>This comment is not accepted. If manufacture wants to provide same Creepage of both insulators, they can increase creepage of Interrupting chamber Insulator which is as per the specification. The decided creepage of support insulator is of standard 25mm/kV, it cannot be reduced.</p> <p>Specification already mentioned to reduce joints for leakage of SF6 gas, comment is not accepted.</p>
12.	<p>Clause No. 5.1.1.3 TERMINAL CONNECTORS</p>	<p><u>M/s APPSIL:</u> Request you to kindly provide readable document no - ETI/PSI/P/11030 Mod C for our reference/review. The drawing provided at the last page of this specifications is not readable. Since the material of terminal connector & terminal pad of CB are both of aluminum, bimetallic strip is not required. Need a copy of this document for our reference & records, since the copy attached as page-38 of the specification is not readable.</p>	<p>A readable copy has been attached in the specification.</p>
13.	<p>Clause no. 5.1.1.4(i), The main, fixed and moving contacts of the Circuit Breaker shall have ample cross-section and contact pressure for carrying the rated current and short time current without excessive Temperature rise, pitting and welding. Arcing tips shall be made up of cupro-tungsten alloy or any other suitable material.</p>	<p><u>M/s APPSIL:</u> Arcing tips shall be made up of cupro copper-tungsten alloy or any other suitable material. We propose to correct the typo error in this clause.</p> <p><u>M/s Siemens:</u> Arcing tips shall be made up of Copper-Tungsten alloy or any other suitable material. We understand cupro-tungsten alloy is a typographical error in the specifications.</p>	<p>The comments is accepted for replacing the word 'Cupro' with Copper.</p>
14.	<p>Clause no. 5.1.2.1,</p>	<p><u>M/s APPSIL:</u></p>	<p>In the specification it</p>

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	<p>The Circuit Breaker shall be operated by a motor charged spring stored energy mechanism. Both opening and closing operations shall be done by the stored energy of spring (s). The motor shall be so rated that the time required for fully charging the closing spring is not more than 15 seconds. The closing action of the CB shall charge the opening spring so that the Circuit Breaker is ready for opening any time thereafter. The spring shall be of robust design, using Tested steel as per IS: 7906 or IS: 7907 (1976) or latest or with equivalent International Standard. The ends of the compression springs if used shall be flattened to enable proper fixing and shall minimize the possibility of misalignment.</p>	<p>The Circuit Breaker shall be operated by a motor charged spring stored energy mechanism. Both opening and closing operations shall be done by the stored energy of spring (s). The motor shall be so rated that the time required for fully charging the closing spring is not more than 15 seconds. The closing action of the CB shall charge the opening spring so that the Circuit Breaker is ready for opening any time thereafter. The spring shall be of robust design, using Tested steel as per IS: 7906 or IS: 7907 (1976) or latest or with equivalent International Standard. The ends of the compression springs if used shall be flattened to enable proper fixing and shall minimize the possibility of misalignment. We are following international standards highlighted in clause no - 2.1 (xi) & (xii).</p>	<p>has been mentioned as</p> <p>The spring shall be of robust design, using Tested steel as per IS: 7906 or IS: 7907 (1976) or latest (If any other equivalent international standard is being referred by manufacturer, a comparison of parameters is to be submitted by manufacturer to RDSO for consideration of other standard).</p>
15.	<p>Clause no. 5.1.2.9, An operation counter having five digit recording mechanism for the number of tripping operation shall be provided at a suitable location so as to be conveniently read by the operator standing on the ground.</p>	<p><u>M/s APPSIL:</u> An operation counter having five digit recording mechanism for the number of tripping operation shall be provided at a suitable location so as to be conveniently read by the operator standing on the ground/platform. We propose to add wording - "platform" in-line with clause no - 5.1.2.5 of this specification.</p>	<p>Comment is accepted in view of the submitted justification.</p>
16.	<p>Clause no. 5.1.2.12, Separate auxiliary contact from pressure switches shall be made available for tele-signalling the alarm condition from the alarm pressure switch and the trip and Lock out condition from the Lock out pressure switch.</p>	<p><u>M/s APPSIL:</u> Separate auxiliary contact from pressure switches shall be made available for tele-signalling the alarm condition from the alarm pressure switch and the trip and Lock out condition from the Lock out pressure switch. Meaning of wordings - "tele" is not clear, and hence we propose to alter this clause.</p>	<p>Comment is not accepted.</p> <p>Word 'tele' is normally used for the remote locations</p>
17.	<p>Clause no. 5.1.2.14, In the event of 110V battery supply voltage dropping below 85V±3V which is the minimum voltage prescribed for operation of tripping coil to trip the Circuit Breaker, the Circuit Breaker should trip automatically at 85V ± 3V by means of a suitable arrangement like Capacitive</p>	<p><u>M/s APPSIL:</u> In the event of 110V battery supply voltage dropping below 85V±3V which is the minimum voltage prescribed for operation of tripping coil to trip the Circuit Breaker, the Circuit Breaker should trip automatically at 85V±3V by means of a suitable arrangement like Capacitive trip Device (CTD), under voltage relay, etc. CTD (capacitor tripping device) is used to</p>	<p>Comment is not accepted. Manufacturer should provide the CTD as per the requirement of the specification.</p>

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	trip Device (CTD).	trip the CB in the event of failure of DC supply. In order to meet the requirement of this clause, we propose to add wording - "under voltage relay", so that the CB can be tripped in the event of under voltage of the control supply < 85V±3 Volts.	
18.	Clause no. 5.1.2.18, The entry of all Cables into the Cubical shall be only through suitable Cable Glands which shall not allow ingress of Vermin, Insects etc. into the cubicle. The Cable Gland shall be supplied with the Circuit Breaker. Five Cable Glands shall be provided of which three shall be of 16.5 mm outside diameter while the balance two Glands shall be for cable of 14 mm outside diameter.	<u>M/s APPSIL:</u> The entry of all Cables into the Cubical shall be only through suitable Cable Glands which shall not allow ingress of Vermin, Insects etc. into the cubicle. The Cable Gland shall be supplied with the Circuit Breaker. Five Cable Glands shall be provided of which three shall be of suitable for cable of 16.5 mm outside diameter while the balance two Glands shall be suitable for cable of 14 mm outside diameter. We propose to alter this clause in order to avoid confusion regarding the diameters mentioned, and make the clause precise in its meaning. <u>M/s GE T&D:</u> Suitable Glands as per manufacture design shall be provided for successful operation of circuit breaker.	Comment is accepted in view of the submitted justification. Glands of required size can be supplied. Comment is not accepted.
19.	Clause no. 5.1.2.19, The Wiring inside the Cubical shall be with 1100 V grade PVC insulated single core cable conforming to IS: 694 (2010 or latest) or IS:1554 (Pt.I- 1988 or latest), with stranded copper conductors of adequate cross- section (with min 2.5 sq.mm strand copper) so proportioned as to reduce voltage drop and I ² R losses to minimum.	<u>M/s GE T&D:</u> The wiring inside the cubical shall be 1.5 sq. mm thickness.	Comment is not accepted. Any justified reason not submitted for reducing the size of required cross section of the wire.
20.	Clause no. 5.1.2.20, The Terminal end of all wires shall be provided with numbered interlock type ferrules which shall be of PVC or other durable material with markings (numbers) either engraved or punched so as to be indelible. The ferrules shall be of white color with lettering thereon black. All wiring shall be properly supported and suitably protected to avoid rubbing against any metallic part.	<u>M/s APPSIL:</u> The Terminal end of all wires shall be provided with numbered interlock-type ferrules which shall be of PVC or other durable material with markings (numbers) either engraved or punched or printed so as to be indelible. The ferrules shall be of white color with lettering thereon black. All wiring shall be properly supported and suitably protected to avoid rubbing against any metallic part. We propose to alter this clause as per the current industrial practices. <u>M/s GE T&D:</u> The terminal end of all wires shall be	Interlock type ferrules can be provided, the comment is not accepted. For printed ferrules, the comment is accepted as printed with non delible ink.

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	<p>provided with numbered type.</p>		
21.	<p>Clause no. 5.1.2.22, The following gauges/switches shall be provided for monitoring the pressure/density of SF6 gas. The pressure gauge shall have no oil to avoid leakage. The gauges shall be so positioned as to clearly and conveniently readable from ground/platform (1500mm to 2000 mm from ground/platform). The density (s) monitor and pressure gauges shall be common for all the poles of the breaker and these shall indicate and actuate for any loss of pressure in the Circuit Breaker.</p> <p>(i) An accurate pressure gauge of adequate range.</p> <p>(ii) Gas density temperature compensated pressure switch(es)</p>	<p><u>M/s APPSIL:</u> The following gauges/switches shall be provided for monitoring the pressure/density of SF6 gas. The pressure gauge shall have no oil to avoid leakage. The gauges shall be so positioned as to clearly and conveniently readable from ground/platform (1500mm to 2000 mm from ground/platform). The density (s) monitor and pressure gauges shall be common for all the poles of the breaker (up to 145 kV CB) and shall be individual for all the poles of the breaker (for 245 kV CB) and these shall indicate and actuate for any loss of pressure in the Circuit Breaker. Density monitor is mounted on the poles of CB (not in operating mechanism cubicle as mentioned in clause 9.1.iii). Hence, it becomes unsafe to maintain distance of 1500 mm to 2000 mm from the bottom of the pole to ground/platform. Further, 72.5 kV & 145 kV CBs are mechanically gang operated CBs and hence have a common density monitor for all 3 poles, while 245 kV CB is single pole operated CB and hence it has an individual density monitor for each pole.</p>	<p>Comment is accepted in view of the submitted justifications.</p>
22.	<p>Clause no. 5.1.2.23, For earthing of the operating mechanism, two earthing terminals of adequate capacity to carry the rated short circuit current shall be provided with 17.5 + 0.5/-0.0 mm Diameter stud/hole for fixing the earthing flat.</p>	<p><u>M/s APPSIL:</u> For earthing of the operating mechanism, two of adequate capacity to carry the rated short circuit current shall be provided with 17.5 + 0.5/-0.0 mm Diameter stud/hole for fixing the earthing flat. As per IS 3043 clause no 22.1.2, two earthing terminals are required only where auxiliary supply voltage is more than 240 V AC. For offered CBs, the maximum supply voltage of auxiliaries is 240 V AC. Hence, one earthing terminal is sufficient for cabinets of offered CBs.</p> <p><u>M/s GE T&D:</u> For earthing of the operating mechanism, two of adequate capacity to carry the rated short circuit current shall be provided with M12 Tapped hole or 14 Dia. plain hole +0.5/-0.0 mm Diameter stud/hole for fixing the earthing flat.</p>	<p>Comment is not accepted.</p> <p>Double Earthing is always required.</p> <p>The dimension of "17.5 + 0.5/-0.0 mm Diameter" is mentioned in other equipment also. It need not to be changed considering the uniformity in the TSS equipments.</p>

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23.	<p>Clause no. 6.3, For earthing at least 2 legs of the steel supporting frame shall be provided with Stud/Hole type of adequate capacity to carry the rated short circuit current safely. The earthing shall be provided with 50 x 8 mm MS flat. The Terminal shall be provided with 17.5 + 0.5/-0.0 mm diameter stud/hole for fixing the earthing flat.</p>	<p><u>M/s APPSIL:</u> For earthing at least 2 legs of the steel supporting frame shall be provided with Stud/Hole type of adequate capacity to carry the rated short circuit current safely. The earthing shall be provided with 50 x 8 mm MS flat. The Terminal shall be provided with 17.5 + 0.5/-0.0 mm diameter stud/hole for fixing the earthing flat. Supply of earthing flat is in the scope of substation erected, (i.e. EPC) and hence this line has to be removed. The manufacturer can to provide suitable holes/provisions in the product to connect to substation earthing risers.</p>	<p>Comment is accepted for clarity in the specification as MS flats are not in the scope of CB manufacturers.</p>
24.	<p>Clause 8.1, <u>GALVANIZING:</u> The Operating Mechanism Cubical and Steel Supporting Frame shall be Hot Dip Galvanized in accordance with RDSO Specification No. ETI/OHE/13 (4/84) with A & C Slip No.1 to 4 and the weight of zinc coating shall not be less than 1000 gm/m².</p>	<p><u>M/s GE T&D:</u> As per standard specification followed for central and state utilities for standard application Zinc coating is 610gm/m² and for heavily polluted environment its 900gms/m².</p>	<p>Comment is not accepted. Galvanization is to be provided as per the refereed RDSO specification.</p>
25.	<p>Clause No. 8.2, If the Vendor/Manufacturer is not able to Hot Dip Galvanize the operating mechanism cubicle and the Steel Supporting frame as per Clause 8.1, it shall be painted conforming to RDSO's Specification No. M&C/PCN/110/2006 (Reaffirmed-2013) or latest for polyurethane based aluminum paint (three packs) and specification no. M&C/PCN/102/2009 with RDSO Amdt. No. 1B or latest for epoxy-based zinc phosphate primer (two packs).</p>	<p><u>M/s APPSIL:</u> If the Vendor/Manufacturer is not able to Hot Dip Galvanize the operating mechanism cubicle and the Steel Supporting frame as per Clause 8.1, it shall be painted conforming to RDSO's Specification No. M&C/PCN/110/2006 (Reaffirmed-2013) or latest for polyurethane based aluminum paint (three packs) and specification no. M&C/PCN/102/2009 with RDSO Amdt. No. 1B or latest M&C/PCN/102/2020 for epoxy-based zinc phosphate primer (two packs). Making the correction as mentioned in clause no - 2.1 (xx) of this specification.</p>	<p>Comment is accepted in view of the submitted justifications.</p>
26.	<p>Clause No.9.1, (i) SF6 Gas Pressure Gauge (ii) Temperature compensated gas density pressure switch(es)</p>	<p><u>M/s APPSIL:</u> We wish to clarify that the offered SF6 gas density monitor has inbuilt pressure guage. Hence, supply of separate pressure gauge is not required. This is just a clarification pertaining to offered CBs.</p>	<p>Noted.</p>
27.	<p>Clause No.9.1 (iii)Provision for replenishment of SF6 gas,</p>	<p><u>M/s APPSIL:</u> Provision for replenishment of SF6 gas, preferably in the Operating Mechanism</p>	<p>Specification mention preferably requirement, not</p>

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	preferably in the operating Mechanism Cubicle.	Cubicle. Provision for replenishment of SF6 gas shall be on poles of CB (not in operating mechanism cubicle)	mandatory. No need to be changed.
28.	Clause No.9.1 (vi) Stay put Local/Remote selector switch.	M/s APPSIL: Stay put or spring-loaded type Local/Remote selector switch. Adding IEC 62155 in this clause, as mentioned in clause no - 5.1.2.3 of the specs.	In the clause no. 9.1 (vi) and Clause no. 5.1.2.3 of the final draft specification, the stay put type has been mentioned only considering the supply made by approved manufactures. So, comment of Spring loaded type is not accepted. Mentioning of IEC62155, in the comment is not linked.
29.	Clause No.9.1 (ix) Interlocking device (as required)	M/s APPSIL: Interlocking device (as required) This requirement is clear & not applicable for offered CBs.	Comment is not accepted to remove this clause. If user asks for interlocking, manufacturer has to be provided. Already, in the specification (as required) is mentioned.
30.	Clause No.9.1 (xv) Lock out device	M/s APPSIL: Lock out device This requirement is clear & not applicable for offered CBs.	Comment is not accepted. In the clause no. 5.1.2.12 of the existing specification it already clarified that "If the drop in the pressure continues, the temperature compensated Lock out pressure switch shall get actuated to cause the Circuit Breaker to trip and get locked in the tripped condition." Thus it is required.
31.	Clause No.9.1 (xvi) Capacitor Trip Device (CTD) and under Voltage Relay	M/s SIEMENS: Capacitor Trip Device (CTD) Under voltage relay is a part of Control relay panel (CRP) and hence, it shall be provided by the CRP manufacturer.	In the Final Draft specification, the requirement of only Capacitor Trip Device (CTD) has been mentioned and it is to be provided by the CB manufacturer.
32.	Clause No. 10.1.2, <u>PROCEDURE FOR OFFERING PROTOTYPE</u> Prior to giving a call to the Purchaser/Director General	M/s GE T&D: We should request you to amend the clause by incorporating the below comments. "Transportation cost to visit the	The existing clause in the specification is self-explanatory.

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<p>(Traction Installation), Research Designs and Standards Organization, Lucknow (DG(TI),RDSO, Lucknow) for inspection and testing of the prototype, the Vendor/ manufacturer shall submit a detailed test schedule of proto type testing indicating the name of the test with internal test report (Test report of Routine Test) and the number of days required to complete all the tests at one stretch.</p> <p>The schedule shall also indicate the venue of each of the test. Once the schedule is approved, the test shall invariably be done accordingly.</p> <p>However, during the process of type testing or even later, the Purchaser/DG/TI/RDSO, Lucknow reserves the right to conduct any additional test(s), besides those specified herein, on any equipment so as to test the equipment/ item to his satisfaction or for gaining additional information and knowledge. In case any dispute or disagreement arises between the Vendor/manufacturer and the representative of Purchaser/ DG /TI/ RDSO, Lucknow during the process of testing as regards the procedure for type tests and for the interpretation and acceptability of the results of type tests. It shall be brought to the notice of the DG/TI/ RDSO, Lucknow, whose decision shall be final and binding. Only after the prototype of the equipment is manufactured and ready in all respects, shall the Vendor/manufacturer give the actual call for the inspection and testing with at least 15 days" notice for the purpose.</p>	<p>manufacture factory for prototype offering shall be born by RDSO" which includes TO & Fro charges, lodging & boarding and local conveyance charges.</p>	<p>No change is required in the specification.</p>
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33.	Clause No. 10.2 (xi) Measurement of Radio Interference Voltage Level	<u>M/s SIEMENS:</u> Measurement of Radio Interference Voltage Level (Wherever applicable). As per IEC 62271-100, table 11, radio interference voltage test is only applicable for circuit breaker greater than & equal to 245kV.	As per IS/IEC: 62271-100:2008 (Reaffirmed 2017) Table, 11, Radio interference voltage test is applicable for $Ur \geq 123$ kV. Accordingly, the specification has been modified.
34.	Clause No. 10.2.1.1, The Test shall be conducted in accordance with Clause 6.101 of IS/IEC 62271-100 (2008) or latest but the number of operations shall be 5000 of 55kV, 66kV, 100kV, 110kV, 132kV and 220kV instead of 2000 specified therein. For this purpose, Circuit Breaker shall be tested in accordance with Table XIII of BIS/IEC 62271-100 or latest. However, the sequence shall be repeated 2.5 times to complete 5000 operations.	<u>M/s APPSIL:</u> The Test shall be conducted in accordance with Clause 6.101 6.101.2.1 to 6.101.2.3 of IS/IEC 62271-100 (2008) or latest but the number of operations shall be 5000 of 55kV, 66kV, 100kV, 110kV, 132kV and 220kV instead of 2000 specified therein. For this purpose, Circuit Breaker shall be tested in accordance with Table XIII of BIS/IEC 62271-100 or latest. However, the sequence shall be repeated 2.5 times to complete 5000 operations. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	Comment is accepted for update of para in line with IEC.
35.	Clause No. 10.2.1.2 (v) Measurement of Insulation Resistance of auxiliary and motor circuits with 500V Insulation Resistance Tester. Clause No.10.2.1.4 (v) Measurement of Insulation Resistance of auxiliary and motor circuits with 500V Insulation Resistance Tester.	<u>M/s APPSIL:</u> IR test is not applicable for circuit breaker as per IEC 62271-100 standards. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	As per the RDSO specification, IR test is defined in this Para on the Auxiliary and Motor Circuit not on the Breaker Main contacts. No change is required in this Para.
36.	Clause No. 10.2.1.4 (ii) Dielectric Tests on control and auxiliary circuit (110 V dc) by applying 2 kV (rms) for 1 minutes after disconnecting the motor.	<u>M/s APPSIL:</u> Dielectric Tests on control and auxiliary circuit (110 V dc) by applying 2 kV (rms) for 1 minutes 1 kV for 1 second after disconnecting the motor. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	Comment is not accepted. Para 6.10.6 of IS/IEC 62271-1, specifies to conduct this test i.e. 2 kV (rms) for 1 minutes on Auxiliary Circuit. Thus, this test can be conducted.
37.	Clause No. 10.2.1.4 (viii) The tightness of gas sealing arrangement shall be measured by Tests conducted on either a complete Circuit Breaker or on subassemblies in combination with tightness co-ordination chart	<u>M/s APPSIL:</u> The tightness of gas sealing arrangement shall be measured by Tests conducted on either a complete Circuit Breaker or on subassemblies in combination with tightness co-ordination chart as provided in the Appendix "EE" of as per provision given in BIS/IEC 62271-100 or latest to	The content "Appendix EE of BIS/IEC 62271-100" has been replaced by "Annex E of IS/IEC 62271-1: 2007 (reaffirmed: 2018)" as the "Tightness

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	as provided in the Appendix "EE" of BIS/IEC 62271-100 or latest to ascertain total system leakage rate and time between refilling of SF6 Gas. Drop in pressure shall not be used to detect the leakage rate of the SF6 Gas as it will not indicate the correct readings.	ascertain total system leakage rate and time between refilling of SF6 Gas. Drop in pressure shall not be used to detect the leakage rate of the SF6 Gas as it will not indicate the correct readings. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	(information, example and guidance)" chart is mentioned in this standard. Accordingly, the Para has been modified.
38.	Clause No. 10.2.2.1, <u>On Main Contact:</u> The temperature rise Test on the main circuit (contacts) and Terminal Connectors shall be carried out as per clause 4.4.2 Table III of BIS/IEC62271-1(2007) or latest. Contact resistance of the main circuit shall be determined by DC Voltage Drop and recorded before and after this Test.	<u>M/s APPSIL:</u> The temperature rise Test on the main circuit (contacts) and Terminal Connectors shall be carried out as per clause 4.4.2 Table III of BIS/IEC62271-1(2007) or latest. Contact resistance of the main circuit shall be determined by DC Voltage Drop and recorded before and after this Test. Terminal connectors are not a part of the circuit breaker. They are accessories of the product. And hence there is no such provision in IS/IEC to test the CB along with terminal connector. Of course, temperature rise type test has to be successfully performed on the terminal connectors separately as per applicable standards.	Comment is accepted. In the specification it has been mentioned that the temperature rise test report of the connectors to be provided, if these are not tested along with the temperature rise test of the circuit breaker.
39.	Clause No. 10.2.3, <u>Dielectric Tests</u> Dielectric Tests shall be carried out generally in accordance with Clause 6.1 of BIS/IEC: 62271-1 (2007) or Latest. Humidity and air density correction factor if less than 1.0 shall not be applied. The Tests shall be carried out at minimum SF6 Gas pressure.	<u>M/s APPSIL:</u> Dielectric Tests shall be carried out generally in accordance with Clause 6.1 6.2 of BIS/IEC: 62271-1 (2008) or Latest. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	Instead of '6.1', '6.2' can be mentioned in the specification as in the IS/IEC: 62271-2007 (Reaffirmed 2018), Para 6.2 is of dielectric test.
40.	Clause No. 10.8.2, <u>Dielectric Tests on control and auxiliary circuits</u> The control and auxiliary circuits shall withstand 2000 V ac for one minute according to IEC: 61180-1 IEC: 61180:2016 or equivalent Indian Standard with latest. After disconnecting spring charging motor. The spring charging motor shall withstand 1500 V ac for one minute.	<u>M/s APPSIL:</u> The control and auxiliary circuits shall withstand 2000 V ac for one minute according to IEC: 61180-1 IEC: 61180:2016 or equivalent Indian Standard with latest 1000 V for 1 second as per clause no - 7.2 of IEC 62271-100 (2008) or latest. After disconnecting spring charging motor, the spring charging motor shall withstand 1500 V ac for one minute. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	Comment is not accepted. Para 6.10.6 of IS/IEC 62271-1, specifies to conduct this test i.e. 2 kV (rms) for 1 minutes on Auxiliary Circuit. Thus, this test can be conducted.
41.	Clause No. 10.8.5, (v) Cubical shall be dust and	<u>M/s APPSIL:</u>	IP 55 is a type test.

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	vermin proof conforming to IP 55 of IEC: 60529-2001/ IS: 13947(Part-1) 1993 or latest.	IP55 is a type test. This requirement is not applicable under this clause of routine testing and hence is required to be removed. We propose alteration as per clauses mentioned in IEC 62271-100 / IEC 62271-1 standards.	During the routine test report of the same can be provided para has been modified accordingly.
42.	Clause No. 10.8.5, (xiv) Verification of function of tripping device in the event of 110 V DC Supply failure or DC Voltage dropping below $85\text{ V} \pm 3\text{ V}$ in CTD of Circuit Breaker.	<u>M/s APPSIL:</u> Verification of function of tripping device in the event of 110 V DC Supply failure or DC Voltage dropping below $85\text{ V} \pm 3\text{ V}$ in CTD/ under voltage relay circuit of Circuit Breaker. CTD (capacitor tripping device) is used to trip the CB in the event of failure of DC supply. In order to meet the requirement of this clause, we propose to add wording - "under voltage relay", so that the CB can be tripped in the event of under voltage of the control supply $< 85\text{V} \pm 3\text{ Volts}$.	Comment is not accepted. Manufacturer have to provide CTD as per requirement of the specification.
43.	Clause No. 15.2, The Vendor shall furnish along with his offer, the cost of gas filling arrangement, evacuation plant for SF6 gas and cost of SF6 in 10 kg cylinder.	<u>M/s APPSIL:</u> The Vendor shall furnish along with his offer, the cost of gas filling arrangement, evacuation plant for SF6 gas and cost of SF6 in 10 kg suitable size cylinder. Specifying the size of cylinder in this clause is not required since different rating of CBs have different SF6 gas requirements. Hence, the purchaser can specify this requirement at the NIT stage.	Comment is not accepted, This para mention to provide the cost details with his offer, so a standard size is to be mentioned.
44.	Clause No. 18.1, The various components of each Circuit Breaker shall be securely packed in wooden crates/ boxes. General packing list, together with weight and overall dimensions of each packing case shall be furnished to purchaser for each Circuit Breaker indicating the following.	<u>M/s APPSIL:</u> The various components of each Circuit Breaker shall be securely packed in wooden or corrugated crates/boxes. General packing list, together with weight and overall dimensions of each packing case shall be furnished to purchaser for each Circuit Breaker indicating the following. We propose to add variants to this clause as per the current industrial practices.	Comment is not accepted considering the handling/outdoor storage aspects.
45.	Clause No. 18.4, Porcelain housing/ support insulator shall be supplied securely packed in wooden crates. Not more than two porcelain housing/ support insulators shall be packed in a crate in order to facilitate manual loading and unloading.	<u>M/s APPSIL:</u> Porcelain housing/ support poles shall be supplied securely packed in wooden or corrugated crates/ boxes . Not more than two three porcelain housing/ support poles shall be packed in a crate/ box in order to facilitate manual loading and unloading. We propose to add variants to this clause as per the current industrial practices.	Comment is not accepted considering the handling/outdoor storage aspects Other points are accepted as per the suggestions.
46.	Clause No. 4.2 (1), Minimum height of lowest live part of the CB from ground level	<u>M/s Siemens:</u> Please review the Minimum height of lowest live part of the CB from ground	As per clause no. 20914 (4) of ACTM, the Min. height of bus bar

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	(mm)-4500.	level (mm) for 66kV, as it is common for 145kV & 66kV.	is 4600 mm for 66kV, 100kV and 132kV, so no change is required in the specification.
47.	Clause No. 9.1(xvi), Capacitor Trip Device (CTD) and under Voltage Relay.	M/s Siemens: Under voltage Relay: not part of Circuit Breaker Manufacture. It need to supplied by CRP Manufacture & mounted inside the CRP.	In the Final Draft specification, the requirement of only Capacitor Trip Device (CTD) has been mentioned and it is to be provided by the CB manufacturer.
48.	Clause No. 10.1.3, Type test shall be carried out on Prototype unit of Circuit Breaker with relevant standards as modified or amplified by this specification where applicable at the works of the manufacturer or at any Government approved testing laboratory if testing is done in India. At the works of the manufacturer the testing shall be conducted in the presence of the authorized representative of the purchaser/DG (TI)/RDSO, Lucknow. However, for the tests in the any Government approved testing laboratory if testing is done in India, the presence of representative of the purchaser/DG (TI)/RDSO, Lucknow may be decided by the RDSO.	M/s Siemens: If the product is already type tested then the same type test reports shall be submitted by the manufacturer for RDSO review. As per new CEA guidelines type test validity of 10 years shall be accepted.	The procedure of Type Testing is govern by the RDSO ISO procedures, so comment is not accepted.