



NATIONAL TRANSMISSION & DESPATCH COMPANY  
GENERAL MANAGER (P&CM) NTDC

No. GMP&CM/NTDC/154/13-23

Chief Engineer Design (T/L) NTDC

No. 5287

Date 04/01/19

147-WAPDA House, Lahore

Dated: 03-01-2019

1. General Manager (D&E) Design NTDC, 522-WAPDA House, Lahore.
2. M/s NESPAK, Lahore.
3. M/s BARQAAB, Lahore.

**SUBJECT: Revised Type Test Policy.**

It is to notify that the existing type test policy has been revised and approved by the competent authority attached as Annex-1 for incorporation in upcoming bidding documents as this policy will supersede the previous one.

*MCT/L-102*  
*12/01/19*

*[Signature]*  
General Manager (P&CM) NTDC

CC:

DA/As Above

1. PS to Managing Director NTDC, 414-Wapda House, Lahore.
2. D.M.D (AD&M) NTDC, 413-Wapda House, Lahore.
3. Chief Information System, 221-Wapda House, Lahore with a request to publish the attached type test policy on NTDC's website.
4. Chief Engineer (MP&M) NTDC, 622-Wapda House, Lahore.
5. Chief Engineer (SS) NTDC, 143-Wapda House, Lahore.
- 6. Chief Engineer (T/Line) NTDC, 143-Wapda House, Lahore.
7. Chief Engineer (P&C) NTDC, Wapda House, Lahore.
8. Chief Engineer (Telecom.) NTDC, Wapda House, Lahore.

Master File

*RK'*  
*Pls provide copies*  
*to all D.M.s.*  
*[Signature]*  
*08/01/19*

## Type Test Requirements of NTDC

The following type test policy will be implemented for procurement purpose with immediate effect.

1. The bidder shall offer type tested equipment or if the equipment is not previously type tested as per NTDC type test policy, the type tests shall be carried out in line with this type test policy.
2. The type test policy covers the following equipment as per scope given in Annexure B. However, the equipment which are not mentioned in this type test policy shall be tested as per relevant NTDC specifications and IEC standards.

### Grid Station Equipment

- i. Circuit Breaker
- ii. Disconnecter
- iii. Potential Transformer/Capacitive Voltage Transformer/CCVT
- iv. Current Transformer
- v. Surge Arrester
- vi. Insulators (Disc & Post)
- vii. Hardware (Connectors and Strings)
- viii. GIS

### Transmission Line Equipment

- i. Conductor
- ii. Hardware and accessories
- iii. Spacer damper
- iv. Stock Bridge Vibration Damper
- v. Insulators

### Bushings (Transformer & Shunt Reactor)

Transformer & Shunt Reactor Bushings shall either be from M/s Trench Hefley (France/ Switzerland); M/s Passoni & Villa Italy; M/s F&G Germany & M/s ABB Sweden which have proven performance in NTDC system or pre-type tested transformer bushings from an equivalent manufacturer duly tested at any STL Lab (Annexure-A) as per IEC 60137 and NTDC Specification.

3. The Type Test reports shall remain valid for fifteen (15) years until;
  - i. The applicable standards have changed.
  - ii. The design has changed.
  - iii. The sub-contractors / suppliers have changed.
  - iv. Manufacturing Facility has changed.

02/01

4. The test performed at any other lab which are exclusively required to be performed at labs mentioned in Annex-A and Inspection report\*\* thereof shall not be acceptable except for the provision made in Annex-B (marked by \*).
5. The Type Test Reports shall include the complete information regarding outsourced components/ parts of the equipment type tested. The Report shall also include complete identification of the equipment along with drawings stamped by the concerned lab.
6. The following provisions have been made in this Policy with respect to bidding process:
  - i. The Bidder shall submit an unconditional Undertaking duly signed and stamped by bidder duly supported by manufacturer(s) in technical bid that in case of award of contract if submitted type test reports are not according to NTDC type test policy, he will carry out type tests as per NTDC Type Test Policy within the quoted Bid price and without affecting the delivery/ completion period as mentioned in the Bidding Documents. In case of failure to submit an Undertaking of type tests as per NTDC type test policy along with the bid or in response to post bid clarification:
    - a. In supply contract, bid shall be rejected.
    - b. In EPC contract, such manufacturer shall not be accepted and bidder will be bound to replace the same with acceptable manufacturer. In case of noncompliance, the bid shall be rejected.
  - ii. Within 30 days from signing of contract, the contractor shall submit schedule of type testing from lab.
  - iii. After award of contract, the bidder shall be required to perform requisite type tests before delivery of equipment without affecting the delivery/completion period as mentioned in the Bidding Document with in the quoted bid price. In case of delay or non-compliance of the said requirement, NTDC reserves the right to cancel the contract agreement including encashment of performance guarantee and initiate the process for blacklisting as per NTDC SOP for blacklisting.

**Note:**

- a) The manufacturers may avail this opportunity for carrying out type tests as per NTDC Policy. NTDC can also nominate its inspectors upon request provided that all such costs shall be borne by the manufacturer.
- b) NTDC reserves the right to change all or any parts of the type test policy at any time in the best interest of company.
- c) For the purpose of type testing, latest IEC and NTDC standards shall be applicable.

03/01

**Annexure-A**  
(List of Approved /STL member labs)

1. Centro Elettrotecnico Sperimentale Italiano S.p.A.  
Via Rubattino 54  
20134 Milano MI  
Italy
2. Institut  
"PrueffeldfuerelektrischeHochleistungstechnik" GmbH (IPH)  
LandsbergerAllee 378A  
D-12681 Berlin  
Germany
3. FGH Engineering & Test GmbH  
Hallenweg 40  
D-68219 Mannheim  
Germany
4. LME (Laboratoires des MatÃ©riels Electriques)  
Site des RenardiÃ©res  
EDF- R-&-D-LME  
Avenue des RenardiÃ©res  
77818 Moret-sur-Loing Cedex  
France.
5. Centre d'Essais Rhodanien De l'Appareillage  
CERDA  
ALSTOM Grid  
BP No. 1321  
130 Rue LÃ©on Blum  
69611 Villeurbanne Cedex  
France.
6. L2E VOLTA  
Schneider Electric Industries SAS  
38050 Grenoble Cedex 9  
France
7. Central Research Institute of Electric Power Industry (CRIEPI)  
2-6-1, Nagasaka  
Yokosuka-shi  
Kanagawa 240-0196  
Japan

8. Hitachi Ltd., High Voltage & High Power Testing Laboratory  
1-1, Kokubu-cho  
Hitachi-shi  
Ibaragi 316-8501  
Japan
9. MEIDENSHA CORPORATION High Power Testing Laboratory  
515, Kaminakamizo Higashimakado  
Numazu-shi  
Shizuoka 410-8588  
Japan
10. Mitsubishi Electric Corp. High Voltage & High Power Testing Laboratories  
8-1-1, Tsukaguchi-Honmachi  
Amagasaki-shi  
Hyogo 661-8661  
Japan
11. High Voltage and High Power Testing Laboratory Nissin Electric Co., Ltd  
47, Umezu-Takase-cho  
Ukyo-ku, Kyoto-shi  
Kyoto 615-8686  
Japan
12. Toshiba Corp. Hamakawasaki High Voltage and High Power Testing Laboratory  
2-1, Ukishima-cho  
Kawasaki-ku, Kawasaki-shi  
Kanagawa 210-0862  
Japan
13. DNV GL - Energy, Power TIC  
Utrechtseweg 310  
6812 AR Arnhem  
The Netherlands
14. DNV GL - Energy, Power TIC  
High Power and High Voltage Laboratories  
4379 County Line Road, Chalfont, PA 18914  
USA
15. ZkuĀjebnictvĀ~, a.s.(ZKU)  
PodnikatelskĀj 547  
190 11 Prague 9  
Czech Republic

03/01

16. High Power, high voltage Testing & Evaluation Division,  
12, Bulmosan-ro 10 beon-gil  
Seongsan-gu, Changwon-si  
Gyeongsangnam-do, 642-120  
South Korea
  
17. Power Apparatus Testing & Evaluation Division in Ansan office  
111, Hanggaul-ro  
Sangnok-gu, Ansan-si,  
Gyeonggi-do, 426-910  
South Korea
  
18. ABB Switzerland Ltd.  
High Voltage Products and Components, Dept. PGHV-X  
Fabrikstrasse 13, CH-5400 Baden  
Switzerland
  
19. High-Voltage Institute Kassel  
GE ALSTOM Grid GmbH  
Lilienthalstrasse 150  
D-34123 Kassel  
Germany
  
20. ABB AG  
CalorEmag Medium Voltage Products  
OberhausenerStrasse 33  
D-40832 Ratingen  
Germany
  
21. Siemens AG  
Nonnendammallee 104  
D-13629 Berlin  
Germany
  
22. Siemens AG  
Carl-Benz-Strasse 22  
D-60386 Frankfurt am Main  
Germany
  
23. PEHLA-Laboratory Regensburg  
Rathenastr. 2  
D-93055 Regensburg  
Germany
  
24. ABB AB High Power Laboratory  
LyviksvÄrngen 14  
SE-77180 Ludvika,  
Sweden.

03/01

25. STRI AB  
P.O Box 707  
77180 Ludvika,  
Sweden.
26. NEXANS Norway AS  
P.O. Box 42  
1751 Halden  
Norway
27. NEFI  
P.O. Box 108 Sentrum  
3701 Skien,  
Norway.
28. Powertech Laboratories Inc.  
12388 - 88th Avenue  
Surrey, British Columbia, V3W 7R7  
Canada
29. Eaton's Cooper Power Systems Division  
Thomas A. Edison Power Test Laboratories  
11131 Adams Road  
Franksville, WI 53126  
USA.
30. LAPEM-CFE  
Jefe Departamento Distribution  
CP 36630 Irapuato  
GTO Mexico
31. S&C Electric Company  
6601 N Ridge Boulevard  
Chicago, IL 60626  
USA
32. Eaton Corporation  
200 Westinghouse Circle  
Horseheads, NY 14845  
USA
33. Vagolyoutca 2-4  
H-1158 Budapest  
Hungary
34. KEMA Lab  
Chalfont, USA

03/01

35. Intertek Ausgrid Testing & Certificate Lab  
Australia

36. Kinectrics Lab  
800 Kipling Ave. Etobicoke, ON M8Z 5G5,  
Canada

37. Polotecnico Di Milano  
Piazza Leonardo da Vinci, 32, 20133 Milan  
Italy

38. SAG Frankfurt  
Pittlerstraße 44 63225 Langen,  
Germany

39. EGU HV Laboratory A.S  
Podnikatelska 267 190 11 Prague 9, Bechovice  
Czech Republic

40. Cerisi Laboratorio Italiano  
Gomma  
Italy



03/01

**Annexure-B**  
**(Scope of Type Testing)**

**A. G/s Equipment**

<b>132 kV CBs (P-193:2010)</b>	
<ol style="list-style-type: none"> <li>1. Dielectric tests.</li> <li>2. Measurement of the resistance of the main circuit.</li> <li>3. Temperature-Rise Test.</li> <li>4. Short-time withstand current and peak withstand current tests.</li> <li>5. Short-circuit current making and breaking tests.</li> <li>6. Critical current test. (if applicable)</li> <li>7. Earth fault test.</li> <li>8. Capacitive current switching tests. <ul style="list-style-type: none"> <li>- Line charging current breaking tests.</li> <li>- Cable charging current breaking test.</li> <li>- Capacitor bank switching tests. (if applicable)</li> </ul> </li> <li>9. Short-line fault test.</li> <li>10. Out of phase making &amp; breaking test.</li> <li>11. Electrical endurance tests (if applicable)</li> </ol>	Any lab as per Annex-A
<ol style="list-style-type: none"> <li>12. High Temperature test.</li> <li>13. Temperature rise test of control and auxiliary circuit.</li> <li>14. Radio Interference Voltage Test.</li> <li>15. Verification of Degree of Protection.</li> <li>16. Tightness test.</li> <li>17. Electromagnetic Compatibility (EMC) tests.</li> <li>18. Mechanical operation test at ambient temperature including extended mechanical endurance test.</li> <li>19. Static terminal load test.</li> </ol>	<p>i. Any Independent lab accredited by ISO/IEC 17025</p> <p>ii. Any lab as per Annex-A</p> <p>iii. Inspection reports issued by any STL Lab</p>
<b>220 kV and 500 kV CBs (P-171:2008)</b>	
<ol style="list-style-type: none"> <li>1. Dielectric Tests.</li> <li>2. Measurement of the resistance of the main circuit (contact resistance).</li> <li>3. Temperature rise test.</li> <li>4. Short-time withstand current and peak withstand current tests.</li> <li>5. Short circuit current making and breaking tests.</li> <li>6. Capacitive current switching tests: <ul style="list-style-type: none"> <li>- Line charging current breaking test</li> <li>- Cable charging current breaking test</li> <li>- Capacitor Bank Switching test (if applicable).</li> </ul> </li> <li>7. Critical current tests (if applicable).</li> <li>8. Short line fault tests.</li> <li>9. Out-of-phase making and breaking tests.</li> <li>10. Electrical endurance tests (if applicable)</li> <li>11. Single phase and double earth fault tests.</li> <li>12. Switching of shunt reactors</li> </ol>	Any lab as per Annex-A

03/07

<ol style="list-style-type: none"> <li>13. Low and high temperature tests.</li> <li>14. Additional test on control and auxiliary circuit.</li> <li>15. Test to prove operation under severe ice conditions (if applicable).</li> <li>16. Radio interference voltage (RIV) tests.</li> <li>17. Tightness tests.</li> <li>18. Electromagnetic compatibility (EMC) tests.</li> <li>19. Mechanical operation tests at ambient temperature.</li> <li>20. Verification of the degree of protection.</li> <li>21. Extended mechanical endurance tests.</li> <li>22. Humidity tests(if applicable)</li> <li>23. Static terminal load tests.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<p><b>Disconnecter, Earth Switch and Fast Earth Switch</b></p>	
<p><b>a) 132 kV (P-128:2011 &amp; P-223:2011)</b></p>	
<ol style="list-style-type: none"> <li>1. Short-time withstand current and peak withstand current tests.</li> <li>2. Short circuit making performance of earthing switches. (if applicable)</li> <li>3. Bus-transfer current switching test.</li> <li>4. Induced current switching test.</li> <li>5. Temperature-rise test (Continuous Current Test).</li> <li>6. Measurement of the resistance of main circuit including both contacts.</li> <li>7. Dielectric tests.</li> </ol>	<p>Any lab as per Annex-A</p>
<ol style="list-style-type: none"> <li>8. Radio Interference Voltage tests.</li> <li>9. Verification of Degree of protection.</li> <li>10. Operating and mechanical endurance tests.</li> <li>11. Test to verify the proper function of the position indicating device. (if applicable)</li> <li>12. Tightness test.</li> <li>13. Electromagnetic Compatibility (EMC) tests.</li> <li>14. Additional test on control and auxiliary circuits.</li> <li>15. Operation during application of rated mechanical Static terminal load</li> <li>16. Testing on Mechanical interlocking devices.</li> <li>17. Low and high temperature test.</li> <li>18. Extended mechanical endurance tests.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<p><b>b) 220 kV and 500 kV (IEC)</b></p>	
<ol style="list-style-type: none"> <li>1. Bus Transfer Current Switching tests.</li> <li>2. Bus Charging Switching tests.</li> <li>3. Induced Current Switching Tests.</li> <li>4. Test to prove Short-circuit Making performance of Earthing Switch (if applicable)</li> <li>5. Short time withstand current and peak withstand current tests.</li> <li>6. Temperature-rise test (Continuous Current Test).</li> <li>7. Measurement of the resistance of main circuit including both contacts.</li> </ol>	<p>Any lab as per Annex-A</p>

2/03/21

8. Dielectric tests.	
9. Verification of the degree of protection. 10. Electromagnetic Compatibility (EMC) tests Operating and extended mechanical endurance tests. 11. Radio Interference Voltage tests. 12. Tightness Test 13. Additional test on control and auxiliary circuits. 14. Static terminal load tests. 15. Testing on Mechanical interlocking devices. 16. Low and high temperature test. 17. Test to verify the proper function of the position indicating device (if applicable).	i. Any Independent lab accredited by ISO/IEC 17025  ii. Any lab as per Annex-A  iii. Inspection reports issued by any STL Lab
<b>Potential Transformer/Capacitive Voltage Transformer</b>	
<b>a) 132 kV PT (P-129:2011)</b>	
1. Temperature-Rise Test. 2. Measurement of the resistance of primary and secondary windings. 3. Lightning impulse withstand voltage test. 4. Short-circuit withstand capability test. 5. Wet test for outdoor type transformer* 6. Tests for accuracy* 7. Power frequency voltage withstand test at Primary & secondary windings, between sections and for earthed terminal* 8. Partial discharge measurement during induced voltage test*	Any lab as per Annex-A
9. Verification of Degree of Protection. 10. Electromagnetic Compatibility Tests. 11. Enclosure Tightness Test at ambient temperature. 12. Pressure Test for the enclosure. 13. Mechanical test. 14. Transmitted Overvoltage Measurement. 15. Measurement of Capacitance and dielectric dissipation Factor test.	i. Any Independent lab accredited by ISO/IEC 17025 ii. Any lab as per Annex-A iii. Inspection reports issued by any STL Lab
<b>b) Metering PT/CVT (P-206:2005) 132 kV, 220kV, 500 kV.</b>	
1. Short circuit withstand capability tests. 2. Temperature rise test. 3. Dielectric tests*. 4. Chopped Impulse voltage test on primary terminals (if applicable). 5. Tests for accuracy* 6. Wet test for outdoor type transformer* 7. Partial discharge measurement.*	Any lab as per Annex-A
8. Stray capacitance and stray conductance measurement between low voltage terminal and earth.	i. Any Independent lab accredited by ISO/IEC 17025

03/01

<ol style="list-style-type: none"> <li>9. High frequency capacitance and equivalent series resistance measurement.</li> <li>10. Determination of temperature coefficient.</li> <li>11. Transient response tests.</li> <li>12. Ferro resonance tests.</li> <li>13. Electromagnetic Compatibility Tests.</li> <li>14. Verification of Degree of Protection.</li> <li>15. Enclosure Tightness Test at ambient temperature.</li> <li>16. Pressure Test for the enclosure.</li> <li>17. Mechanical test.</li> <li>18. Measurement of Capacitance and dielectric dissipation Factor test.</li> </ol>	<ol style="list-style-type: none"> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<p><b>c) 220 kV, 500 kV Protection CVT/CCVT (NESPAK)</b></p>	
<ol style="list-style-type: none"> <li>1. Short circuit withstand capability tests.</li> <li>2. Temperature rise test.</li> <li>3. Dielectric Tests*.</li> <li>4. Chopped Impulse voltage test on primary terminals (if applicable).</li> <li>5. Tests for accuracy*</li> <li>6. Wet test for outdoor type transformer*</li> <li>7. Partial discharge measurement*.</li> </ol>	<p>Any lab as per Annex-A</p>
<ol style="list-style-type: none"> <li>8. Type test for carrier frequency accessories.</li> <li>9. Stray capacitance and stray conductance measurement between low voltage terminal and earth.</li> <li>10. High frequency capacitance and equivalent series resistance measurement.</li> <li>11. Determination of temperature coefficient.</li> <li>12. Transient response tests.</li> <li>13. Ferro resonance tests.</li> <li>14. Electromagnetic Compatibility Tests.</li> <li>15. Verification of Degree of Protection.</li> <li>16. Enclosure Tightness Test at ambient temperature.</li> <li>17. Pressure Test for the enclosure.</li> <li>18. Mechanical test.</li> <li>19. Measurement of Capacitance and dielectric dissipation Factor test.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<p><b>Current Transformer</b> Type testing of CT shall be carried out at any independent lab accredited by ISO/IEC 17025/STL Lab as per Annex-A and inspection report can be accepted if CT with same design, higher current rating, higher VA burden &amp; same voltage is type tested in line with this type test policy.</p>	
<p><b>a) 132 kV CTs(P-90:2012)</b></p>	
<ol style="list-style-type: none"> <li>1. Temperature-rise test.</li> <li>2. Measurement of the resistance of primary and secondary windings.</li> <li>3. Impulse Voltage withstand test on primary terminal.</li> <li>4. Short-time withstand current and peak withstand current tests.</li> <li>5. Tests for accuracy*</li> </ol>	<p>Any lab as per Annex-A</p>

12/03/04

<ol style="list-style-type: none"> <li>6. Wet test for outdoor type transformer.</li> <li>7. Power frequency voltage withstand test at Primary &amp; secondary windings and between sections.</li> <li>8. Partial discharge measurement.</li> </ol>	
<ol style="list-style-type: none"> <li>9. Inter-turn over voltage test.</li> <li>10. Measurement of capacitance and dielectric dissipation Factor test.</li> <li>11. Electromagnetic Compatibility Tests.</li> <li>12. Verification of Degree of Protection.</li> <li>13. Enclosure Tightness Test at ambient temperature.</li> <li>14. Pressure Test for the enclosure.</li> <li>15. Mechanical tests.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<p><b>b) Metering CTs (P-205:2005) 132 kV, 220kV, 500 kV</b></p>	
<ol style="list-style-type: none"> <li>1. Short -time current tests.</li> <li>2. Temperature - rise test &amp; measurement of resistances of windings.</li> <li>3. Impulse voltage tests on primary terminals.</li> <li>4. Tests for accuracy*</li> <li>5. Wet test for outdoor type transformers.</li> <li>6. Power Frequency</li> <li>7. Partial Discharge measurement.</li> </ol>	<p>Any lab as per Annex-A</p>
<ol style="list-style-type: none"> <li>8. Electromagnetic Compatibility Tests.</li> <li>9. Inter-turn over voltage test.</li> <li>10. Measurement of capacitance and dielectric dissipation factor.</li> <li>11. Verification of Degree of Protection.</li> <li>12. Enclosure Tightness Test at ambient temperature.</li> <li>13. Pressure Test for the enclosure.</li> <li>14. Mechanical tests.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. inspection reports issued by any STL Lab</li> </ol>
<p><b>c) 220 kV , 500 kV CTs (P-174:2008)</b></p>	
<ol style="list-style-type: none"> <li>1. Short time current tests.</li> <li>2. Temperature rise test &amp; measurement of resistance.</li> <li>3. Dielectric Tests.</li> <li>4. Chopped Impulse voltage test on primary terminals (if applicable).</li> <li>5. Tests for accuracy*</li> <li>6. Wet test for outdoor type transformers.</li> <li>7. Partial Discharge measurement.</li> </ol>	<p>Any lab as per Annex-A</p>
<ol style="list-style-type: none"> <li>8. Electromagnetic Compatibility Tests.</li> <li>9. Interturn Over voltage test.</li> <li>10. Measurement of capacitance and dielectric dissipation factor.</li> <li>11. Verification of Degree of Protection.</li> <li>12. Enclosure Tightness Test at ambient temperature.</li> <li>13. Pressure Test for the enclosure.</li> <li>14. Mechanical tests.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>

03/21

<b>Surge Arrester</b>	
<b>Scope of Type Test</b>	<b>Approved labs</b>
<b>a) Surge Arrester (P-181:2012)</b>	
<ol style="list-style-type: none"> <li>1. Insulation withstand tests on arrester housing                             <ol style="list-style-type: none"> <li>a. Lightning impulse voltage test</li> <li>b. Switching impulse voltage test</li> <li>c. Power frequency voltage test</li> </ol> </li> <li>2. Residual voltage tests;                             <ol style="list-style-type: none"> <li>a. Steep current impulse residual voltage test.</li> <li>b. Lightning impulse residual voltage test.</li> <li>c. Switching impulse residual voltage test.</li> </ol> </li> <li>3. Operating duty tests:                             <ol style="list-style-type: none"> <li>a. High current impulse operating duty test.</li> <li>b. Switching surge operating duty test.</li> </ol> </li> <li>4. Short circuit Test.</li> <li>5. Tests of arrester disconnectors (For arresters fitted with disconnectors).</li> <li>6. Seal leak rate test.</li> <li>7. Power frequency voltage verses time test.</li> <li>8. Bending moment test (For porcelain housed surge arresters for <math>U_m &gt; 52kV</math>).</li> <li>9. Environmental test (For porcelain housed surge arresters).</li> <li>10. Radio interference voltage (RIV) test?</li> <li>11. Test to verify long term stability under continuous operating voltage.</li> <li>12. Repetitive charge transfer withstand.</li> <li>13. Heat dissipation behavior verification of test sample.</li> <li>14. Test to verify dielectric withstand of internal components of an arrester.</li> <li>15. Test of internal grading components.</li> <li>16. Pollution housing test (if applicable)</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>

<b>Bushings (Transformer &amp; Shunt Reactor)<sup>1</sup></b>	
<b>Scope of Type Test</b>	<b>Approved labs</b>
<b>a) Bushing (IEC 60137 &amp; relevant NTDC Specification)</b>	
<ol style="list-style-type: none"> <li>1. Dry or wet power-frequency voltage withstand test.</li> <li>2. Dry lightning impulse voltage withstand test.</li> <li>3. Dry or wet switching impulse voltage withstand test.</li> <li>4. Thermal stability test.</li> <li>5. Temperature rise test.</li> <li>6. Verification of thermal short-time current withstand.</li> <li>7. Cantilever load withstand test.</li> <li>8. Tightness test on liquid-filled, compound-filled and liquid-insulated bushings.</li> </ol>	Any lab as per Annex-A

<sup>1</sup> Please refer to the criteria approved separately.

**Insulators**

<b>Scope of Type Test</b>	
<b>a) Post Insulators (IEC 60168 &amp; 60273)</b>	<b>Approved labs</b>
1. Mechanical test (Tensile, Bending, Compression, Torsion) 2. Impulse withstand voltage. 3. Power frequency withstand voltage. 4. Radio interference Voltage. 5. Artificial pollution test. 6. Test for deflection under load.	i. Any Independent lab accredited by ISO/IEC 17025  ii. Any lab as per Annex-A  iii. Inspection reports issued by any STL Lab
<b>Grid Station Hardware</b>	
<b>a) 132 kV, 220 kV, 500 kV Connectors (P-176:2011 &amp; relevant International Standards)</b>	
1. Corona Test. 2. Temperature Rise Test. 3. Short Circuit Test. 4. RIV Test. 5. Ageing/Heat Cycling Test.	Any lab as per Annex-A
6. Electrical Resistance Test. 7. Conductivity Test. 8. Corrosion Test. 9. Tensile strength Test. 10. Brinell hardness Test. 11. Material composition Test. 12. Tightening Torque Test. 13. Bending Test. 14. Mechanical Elongation Test. 15. Cantilever Test.	i. Any Independent lab accredited by ISO/IEC 17025  ii. Any lab as per Annex-A  iii. Inspection reports issued by any STL Lab
<b>b) Strings (P-187-2010) Suspension &amp; Tension</b>	
1. Heat Cycle Test 2. Corona Test	Any lab as per Annex-A
3. Mechanical Test 4. Resistance test conductor	i. Any Independent lab accredited by ISO/IEC 17025 ii. Any lab as per Annex-A iii. Inspection reports issued by any STL Lab

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<b>GIS Main Bus</b>	
<ol style="list-style-type: none"> <li>1. Dielectric Tests.</li> <li>2. Temperature-rise test.</li> <li>3. Measurement of the resistance of main circuit.</li> <li>4. Short time withstand current and peak withstand current tests.</li> </ol>	Any lab as per Annex-A
<ol style="list-style-type: none"> <li>5. Tightness Tests.</li> <li>6. Tests to prove the strength of enclosures.</li> <li>7. Tests on partitions.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<b>GIS Bushings</b>	
<ol style="list-style-type: none"> <li>1. Dielectric tests.</li> <li>2. Temperature-rise test.</li> <li>3. Measurement of the resistance of main circuit.</li> <li>4. Short time withstand current and peak withstand current tests.</li> </ol>	Any lab as per Annex-A
<ol style="list-style-type: none"> <li>5. Tightness tests.</li> <li>6. Radio Interference voltage tests.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<b>GIS Switchgear(on one line bay)</b>	
<ol style="list-style-type: none"> <li>1. Tests to verify the insulation level of the equipment including partial discharge tests and dielectric tests on auxiliary circuits.</li> <li>2. Tests to prove the temperature rise of any part of the equipment and measurement of resistance of the main circuits.</li> <li>3. Tests to prove the ability of the main and earthing circuits to carry the rated peak and the rated short-time withstand current.</li> <li>4. Tests to verify the making and breaking capacity of the included switching devices.</li> </ol>	Any lab as per Annex-A
<ol style="list-style-type: none"> <li>5. Tests to prove the radio interference voltage (RIV) level (if an outdoor bushing exists).</li> <li>6. Test to prove the satisfactory operation of the included switching devices.</li> <li>7. Tests to verify the protection of persons against contact with live parts and moving parts.</li> <li>8. Tests to verify the protection of the equipment against external effects due to weather and atmospheric agents applicable.</li> <li>9. Tests to assess the effects of arcing due to an internal fault.</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> </ol>



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<ol style="list-style-type: none"> <li>10. Tests to prove the thermal stability of solid insulation (if applicable).</li> <li>11. Tests to prove the satisfactory operation at limit temperature.</li> <li>12. Tests to prove the strength of enclosures.</li> <li>13. Corrosion test on earthing connections (if applicable).</li> <li>14. Gas tightness test (if applicable).</li> <li>15. Electromagnetic Compatibility test (if applicable).</li> <li>16. Additional test on control and auxiliary circuits (if applicable).</li> <li>17. Test on partitions (if applicable).</li> <li>18. Test to prove performance under thermal cycling and gas tightness test on insulators (if applicable).</li> </ol>	<ol style="list-style-type: none"> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
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Apart from above mentioned tests, the following major equipment of GIS shall be type tested in accordance with relevant IEC standards and this policy:

1. CT
2. PT/CVT
3. Circuit Breaker
4. Disconnectors
5. Earthing switch
6. Fast Earthing switch

**B. T/Line Material:**

Scope of Type Tests	Approved Labs
<b>Conductor</b>	
<ol style="list-style-type: none"> <li>1. Corona /RIV Test</li> <li>2. Creep Test</li> <li>3. Longitudinal Smoothness Test</li> <li>4. Stress – Strain Test</li> </ol>	Any lab as per Annexure-A
<ol style="list-style-type: none"> <li>5. Resistance test of complete conductor</li> <li>6. Tensile test of complete conductor</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>
<b>Hardware &amp; Accessories</b>	
<ol style="list-style-type: none"> <li>1. Corona/ RIV test</li> <li>2. Power arc test</li> <li>3. Heat cycle test</li> <li>4. Magnetic loss test</li> </ol>	Any lab as per Annexure-A
<ol style="list-style-type: none"> <li>5. Resistance test</li> <li>6. Galvanization test</li> <li>7. Resistance to conductor slippage test</li> <li>8. Mechanical tests</li> </ol>	<ol style="list-style-type: none"> <li>i. Any Independent lab accredited by ISO/IEC 17025</li> <li>ii. Any lab as per Annex-A</li> <li>iii. Inspection reports issued by any STL Lab</li> </ol>

Spacer Dampers	
1. Corona and RIV Test 2. Simulated Short Circuit Current Test 3. Flexibility test 4. Energy absorbing test 5. Simulated Oscillation Fatigue Test 6. Conical Fatigue Test 7. Characterization of the Elastic and Damping Properties	Any lab as per Annexure-A
8. Galvanization 9. Clamp slippage test at Ambient Temp. 10. Bolt Torque Test 11. Electrical Resistance Test 12. Elastomer Tests	i. Any Independent lab accredited by ISO/IEC 17025 ii. Any lab as per Annex-A iii. Inspection reports issued by any STL Lab
SB-Dampers	
1. Corona and RIV 2. Damper Performance 3. Vertical Fatigue (Damper Fatigue Test)	Any lab as per Annexure-A
4. Galvanization 5. Clamp Slippage Test at Ambient Temp. 6. Bolt Torque 7. Attachment of Weights to Messenger Cable 8. Attachment of Clamp to Messenger Cable	i. Any Independent lab accredited by ISO/IEC 17025 ii. Any lab as per Annex-A iii. Inspection reports issued by any STL Lab
Insulators (80, 100, 120, 160 kN)	
1. Low-frequency dry flashover test 2. Low-frequency wet flashover test 3. Critical Impulse flashover test 4. Radio-influence Voltage Test 5. Thermal-Mechanical Load Cycle Test 6. Steep Wave Front 7. Power Arc Test 8. Artificial Pollution Performance Test 9. Cement Expansion	Any lab as per Annexure-A
10. Galvanization 11. Cotter Key Test 12. Thermal Shock Test 13. Residual-Strength Test 14. Impact Test	i. Any Independent lab accredited by ISO/IEC 17025 ii. Any lab as per Annex-A iii. Inspection reports issued by any STL Lab

\* These test to be performed in STL lab. In case test facility is not available in STL lab, the same tests shall be performed in the presence of STL inspectors in any lab arranged by STL that complies with International test standards.

\*\* An inspection report records tests witnessed by STL Laboratory Inspector in a non-STL Laboratory/ facility that complies with International test standards.

**Note:**

1. Service condition mentioned in NTDC specification will prevail where the service conditions differ from IEC specification.
2. Only those Independent lab reports accredited by ISO/IEC 17025 & STL lab Inspection reports will be acceptable where tests were witnessed by NTDC representatives.

143  
B-36