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# Guidelines for the Validity Period of Type Test(s) Conducted on Major Electrical Equipment in Power Transmission System



**GOVERNMENT OF INDIA  
MINISTRY OF POWER  
CENTRAL ELECTRICITY AUTHORITY**

**MAY 2020**



# **GUIDELINES FOR THE VALIDITY PERIOD OF TYPE TEST(S) CONDUCTED ON MAJOR ELECTRICAL EQUIPMENT IN POWER TRANSMISSION**

**BY**

**POWER SYSTEM ENGINEERING & TECHNOLOGY DEVELOPMENT  
CENTRAL ELECTRICITY AUTHORITY**

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Central Electricity Authority  
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New Delhi

MAY 2020

## **1. Back ground:**

Prior to commercialization, any equipment passes through product development stage, which requires various testing to achieve desired functionalities of the equipment. Once, the equipment design is finalized, it is subjected to type tests before going for commercial production. Type tests are generally performed on any equipment conforming to relevant National/ International standards to validate the design and to demonstrate its functional requirement meeting the intended application and reliable performance during its service life. These tests are also called ‘Proof Tests’ or ‘Design Validation Tests’. Such tests are not required to be performed on each unit of the equipment but are performed on representative design of the equipment. Moreover, successfully type tested equipment does not guarantee that there will be no failure of the equipment as the equipment is likely to encounter various types of electrical, mechanical, thermal and environmental stresses during its service life which may not match exactly with the conditions simulated during testing.

*[Note: The word “equipment” used in the document refers to all items listed in the Table covered under 2(h)]*

National/ International standards does not specify any period for validity of type test results. Ideally, repetition of type tests on the equipment is not desirable so long as there is no change in basic design/ technology, mechanical construction including physical dimensions (e.g. unit spacing, total height, shed diameter, arcing distance, shed profile, and creepage distance etc. of an insulator), material, functionality of the equipment, performance

characteristic and manufacturing process. The change in design includes change in voltage stress, thermal stress, mechanical stress, current density, flux density, degree of protection etc. The change in materials includes enclosure material (magnetic, non-magnetic etc.), transformer core material (grades of CRGO, Amorphous, mu metal), insulating material (solid, liquid, gaseous), electronic parts (processor, memory, principal/ main relays etc.) etc. If relevant standard (IS/IEC) of the equipment is revised/amended, fresh type test is warranted even if equipment has not changed in design/ material etc. provided there is change in test procedure/ method/ criteria or test levels in the revised standard. However, many of the equipment involves manual intervention during manufacturing process and comprises of a number of bought out items. The quality of workmanship and the quality of components/ materials used in manufacturing of the equipment may change/ deteriorate over the years affecting overall quality, reliability and performance during service life of the equipment. Therefore, some utilities insists for repetition of type tests after a reasonable period of time to ensure that equipment quality, performance and reliability of the equipment is being maintained. The frequency of repetition of type tests by Indian utilities, even if the equipment has remained essentially the same (in terms of basic design, construction, material and manufacturing process etc.) has become a matter of concern as it varies from utility to utility. Few utilities even do not accept type tests conducted on equipment of same rating /specifications and demand for repetition of type test(s). Sometimes testing time exceeds the entire production time e.g. over voltage cycling test for capacitors etc.. Facilities for some of the type tests for some

equipment are not available in India for which these equipment are being sent abroad for testing.

In view of the increasing grievances of the manufacturers regarding type test requirements mandated by the utilities in their specifications and requests from many utilities, Central Electricity Authority (CEA) had organized a meeting with all major stakeholders on 10.09.2018 to deliberate and standardize the duration of validity of type tests conducted on transmission system equipment. All manufacturers and utilities had emphasized the need of uniform guidelines in this regard across the utilities in the country as this is unnecessarily leading to wastage of national resources, time & money and increasing burden on manufacturer and cost to the end consumers. Therefore, there is need to address such issues and develop uniform practice /guidelines relating to period of validity of type test reports of major electrical equipment in Power transmission system for the benefits of end users, utilities and manufacturers in the country considering the cost/complexity associated with frequent type testing of the equipment.

## **2. Broad Guidelines**

- a) Type tests on indigenous equipment, for which testing facility is available in India, should have been conducted in any independent laboratories approved by Government or accredited by National Accreditation Body of the Country, like Central Power Research Institute (CPRI), Electrical Research and Development Association (ERDA) etc.

- b) Type tests on indigenous equipment, for which testing facility is not available in India, should have been conducted in a laboratory of foreign Country accredited by National Accreditation Body of that Country.
- c) Type tests on imported equipment should have been conducted in an Indian laboratory or foreign laboratory accredited by National Accreditation Body of respective Country.
- d) The type tests conducted in-house by manufacturers shall also be acceptable provided the lab is accredited by National Accreditation Body of the Country and the tests have been witnessed by a representative of NABL accredited laboratory/ Power Utility.
- e) The result of all type tests shall be recorded properly in Type Test Reports (TTRs) containing sufficient information like the ratings, the relevant drawings, model number, test circuit, calculations (if any), photos and compliance to the relevant standards (IS/IEC) etc. The relevant clauses of the standards (IS/IEC) according to which type tests have been conducted and acceptance criteria/values need to be brought out clearly in the report.
- f) All the testing equipment used for type testing should have been duly calibrated and the valid calibration reports should form part of the Type test reports.

- g) The equipment shall be supplied from the same manufacturing works, where from the sample unit was manufactured and successfully type tested as per relevant standard (IS/IEC).
- h) Validity period of type tests conducted on the equipment i.e. the period for which Type Test Reports (TTRs) shall remain valid and acceptable to user/ utility provided no major change has been introduced in the basic design/ technology/ material/ mechanical construction/ functionalities of the equipment/ performance characteristic/ manufacturing process of the equipment, shall be as follows:

Sl. No.	Name of Equipment	Periodicity (in years)
i.	Power Transformer	5
ii.	Distribution Transformers (33 kV and below)	5
iii.	Shunt Reactor	5
iv.	OLTC	10
v.	Power transformer Bushing / Reactor Bushing	7
vi.	Transformer/reactor fittings and Accessories	10

vii.	Circuit Breaker	10
viii.	Isolator	10
ix.	Lightening Arrester	10
x.	Wave Trap	10
xi.	Instrument Transformers	7
xii.	LV and MV Switchgear	10
xiii.	GIS & Hybrid Switchgear	10
xiv.	Cables and associated joints	10
xv.	Capacitor	10
xvi.	Relays	7
xvii.	Energy Meter (including smart meters and ABT meters)	5
xviii.	Battery and Battery Charger	7
xix.	Conductors and earth wire	10
xx.	High Temperature (HT) / High Temperature Low Sag Conductor (HTLS) conductor	7
xxi.	Insulators (Porcelain/ Glass)	10
xxii.	Composite Insulator	5



xxiii.	PLCC/ FO cable / OPGW	5
xxiv.	Transmission Line insulator hardware fittings, and accessories for conductor & ground wire	7

*Note 1: The type tests reports shall be valid as on the last date of submission of bid.*

*Note 2: The period of validity of Short Circuit test (a special test) conducted on transformer shall be as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations.*

*Note 3: Type test reports of 220kV voltage class equipment shall be valid for 230kV voltage class equipment as the highest system voltage is same in both cases provided Basic Insulation Level is same.*

- i) The type tests of the equipment shall be repeated during its validity period, if there is change in technology or basic design or generic materials employed or manufacturing process or combination of any of above. However, minor changes, which have no effect on functionality & reliability of the equipment, may not require repetition of type tests. Minor changes do not include change in electrical stress, thermal stress, mechanical stress, change in construction, change in dielectric material, impregnating oil, thickness of electrode & internal fuse design

in a capacitor, enclosure materials (magnetic, non-magnetic like stainless steel, Aluminum) etc.

- j) If relevant standard (IS/IEC) of the equipment is revised or amended, fresh type test is warranted even if equipment has not changed in design/ material etc. However fresh type testing will be limited to only those tests for which test procedure/ method, any technical requirement or test levels have been changed in the revised standards. In such cases, enough time should be given to manufacturer to comply with revised provision in standards.
- k) The utilities should co-relate the need of repeating type test(s) to changes in design/technology and may emphasize/ insist for stage inspection to check workmanship, manufacturing process and to ensure quality of the component/ material used in the manufacturing of the equipment.
- l) The change in the make of component(s) of the equipment shall not be the criteria for repetition of type tests provided that the component of new make has been successfully type tested and its use shall not affect the, functionality, performance & reliability of the equipment. The type test reports of the component of new make shall be submitted.
- m) Utilities, if so desires, may repeat the type tests, at their own cost even if valid TTRs have already been provided by the bidder/manufacturer. However, the utilities should refrain from making it a regular practice. The utility must clearly

specify which type tests would be repeated in the event of award of the contract and quotation for such tests should be invited separately in the price bid. In such case utility shall provide extra time for repetition of such type tests.

- n) The philosophy of extending type test results of the equipment is based on two primary factors: similar design and design with higher stresses (electrical, mechanical, thermal, and environmental). Validity of type test report of a equipment can be extended to the same equipment of similar design and/or lower design stress provided relevant standard (IS/IEC) permits.
- o) It is practically impossible to subject all possible arrangements of the GIS (for a particular switching scheme corresponding to a specified voltage level) to type tests as various arrangements are possible using same combination of equipment depending on layout arrangement and space availability. The performance of any particular arrangement shall be substantiated from type test results obtained on representative assemblies or sub-assemblies. The user shall check to ensure that tested sub-assemblies can be a representative form of the user's arrangement and meet his desired requirement/objective.
- p) For capacitors, the successful completion of each type test is also valid for units having the same rated voltage and lower output (KVAR), provided that they do not differ in any way (i.e.



design, construction, material, and production process etc.) that may influence the properties to be checked by the test.

- q) Repetition of short circuit test on transformer is not required due to change in make and type of bushings and/or make of OLTC provided bushings and OLTC of supplied make have same or better rating and have been successfully type tested as per relevant IS/ IEC.
- r) The utility shall not reject the transformer for supply against the contract, if the Short Circuit (SC) tests was conducted on the subject transformer as per relevant standard (IS/IEC) and it has successfully passed the SC tests and other type tests as per relevant standards.

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भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

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दिनांक : 11.05.2020

To,

As per attached list.

**विषय /SUB.-:Guidelines for the Validity Period of Type Test(s) conducted on Major Electrical Equipment in Power Transmission System - reg.**

Ideally, repetition of type tests on the product is not desirable so long as there is no change in basic design / technology, mechanical construction, material, functionality of the product, performance characteristic and manufacturing process. However, the frequency of repetition of type tests by Indian utilities, even if the product has remained essentially the same (in terms of basic design, construction, material and manufacturing process) has become a matter of concern as it varies from utility to utility. Few utilities also do not accept type tests conducted on products of same rating /specifications and demand for repetition of type tests.

In view of the increasing grievances of the manufacturers regarding type test requirements mandated by the utilities in their specifications and requests from many utilities & manufacturers, Central Electricity Authority (CEA) had organized a meeting with all major stakeholders on 10.09.2018 to deliberate and standardize the duration of validity of type tests conducted on transmission system equipment. All manufacturers and utilities had emphasized the need of a uniform guidelines in this regard across the utilities in the country as this is unnecessarily leading to wastage of National resources, time & money and increasing burden on manufacturer and cost to the end consumers. Therefore, there is need to address such issues and develop uniform practice /guidelines for the benefits of end users, utilities and manufacturers in the country considering the cost/ complexity associated with frequent type testing of the equipment

In view of above, after consultation with various utilities, manufacturers, testing agencies, IEEMA and other stakeholders, **Guidelines for the Validity Period of Type Test(s) conducted on Major Electrical Equipment in Power Transmission System** has been prepared. These guidelines are available at CEA website at the link: [http://cea.nic.in/reports/others/ps/psetd/Approved\\_Type\\_test\\_validity\\_guidelines.pdf](http://cea.nic.in/reports/others/ps/psetd/Approved_Type_test_validity_guidelines.pdf) for information and necessary action please.

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उप-निदेशक/ Deputy Director



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