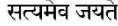




**DRAFT GUIDELINES
FOR THE VALIDITY
PERIOD OF TYPE
TEST(s) CONDUCTED
ON MAJOR
ELECTRICAL &
MECHANICAL
EQUIPMENT IN
THERMAL POWER
SECTOR**



DRAFT GUIDELINES FOR THE VALIDITY PERIOD OF TYPE TEST(S) CONDUCTED ON MAJOR ELECTRO - MECHANICAL EQUIPMENT IN THERMAL POWER SECTOR

BY

**THERMAL ENGINEERING & TECHNOLOGY DEVELOPMENT
(TE&TD) DIVISION**

Government of India

Ministry of Power

Central Electricity Authority

New Delhi

December 2021

1. Background

Several manufacturers and utilities had emphasized the need of uniform guidelines pertaining to testing procedures in the country as this is unnecessarily leading to wastage of national resources, time & money and increasing burden on manufacturer & testing facilities and cost to the end consumers. Therefore, there is a need to address such issues and develop uniform practice/ guidelines relating to the period of validity of Type Test reports of major Electro-Mechanical (E&M) Equipment in Power Sector for the benefit of end users, utilities and manufacturers in the country considering the end objective of Type Testing of the Equipment.

In view of above, Ministry of Power (MoP) had desired the Standardization of Test Protocols for E&M Equipment used in Power Sector. Accordingly, Central Electricity Authority (CEA) had constituted a Committee with members from CEA, Power Sector Utilities, Manufacturers, etc. vide CEA OM dated 01.11.2021 (enclosed as **Annexure-I**) to deliberate on the subject matter. The major decisions taken during the series of meetings (02.11.2021, 05.11.2021 and 30.11.2021) held by the Committee were to standardize the duration of validity of Type Tests conducted on various E&M equipment and preparation of Model Quality Assurance Plan (MQAP) of major E&M equipment in the entire power sector.

Further five Sub-Groups were constituted for framing the guidelines for validity of Type Test(s) and preparation of MQAP of major E&M Equipment pertaining to different sub-sectors of Power Sector, viz. Hydro Generation, Thermal Generation, Renewable Energy, Transmission and Distribution comprising representatives of Central Power PSUs, State Power PSUs and Private Power utilities.

After detailed discussions amongst the Committee and sub-group members and inputs provided by the manufacturers/ vendors/ utilities, etc. this document has been prepared containing draft guidelines for Type Test validity period of major Electro-Mechanical Equipment in Thermal power sector.

2. Purpose of uniform Guidelines for Validity Period of Type Test(s)

This document details the guidelines for validity period of Type Tests in respect of

Thermal Power Sector (TPS) including general requirements to be met by all other sub-sectors of Power sector viz. Hydro, Renewable (Solar/ Wind, etc.), Transmission and Distribution. The purpose of publication of these guidelines is enlisted below:

- i. **To reduce the repeatability of tests, wherever possible.** Specifying validity period of Type Test would ensure that the equipment need not be tested again and again unnecessarily if 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. This would help in saving cost as well as time of all the stakeholders involved (i.e. manufacturers/ vendors/ utilities, etc. and in turn the end consumer as well).
- ii. **To avoid overloading of testing facilities.** It is often observed that certain testing facilities are overburdened due to non-optimal utilization of testing facilities spread across the country. Specifying the validity of Type Test(s) would reduce frequency of tests on similar equipment and hence reduce burden on the existing laboratories.
- iii. To avoid discrepancy in validity period of Type Test(s) being accepted or followed by various manufacturers or utilities and **set uniform guidelines for all equipment manufacturers and procurers across the country.**

3. General Guidelines applicable for all Sub-Sectors

- a) Type Tests on indigenous equipment, for which testing facility is available in India, should be conducted in any of the 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) The Type Test(s) 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 an authorized third party/ Power Utility.

- c) Type Tests on imported equipment should be conducted in an Indian laboratory or foreign laboratory accredited by National Accreditation Body of respective Country.
- d) Type Tests on indigenous equipment, for which testing facility is not available in India, should be conducted in a laboratory of foreign Country accredited by National Accreditation Body of that Country.
- e) The result of all Type Test(s) shall be recorded properly in Type Test Reports (TTRs) containing sufficient information like the ratings, the relevant design criteria/ parameters and drawings, model number, test circuit, calculations (if any), photos and compliance to the relevant standards (IS/ IEC/ equivalent & above). The relevant clauses of the standards (IS/ IEC/ equivalent & above) according to which Type Test(s) 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, from where the sample unit was manufactured and successfully Type Tested as per relevant standards (IS/ IEC/ equivalent & above) or at the works of Parent organization in case of technology transfer/ Joint Venture (JV)/ own manufacturing plant etc. for the initial period of 03 years from the date of establishment of manufacturing plant.
- h) Validity period of Type Test(s) 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 given in Table 1.

- i) The Type Test(s) of the equipment shall be revalidated 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 the 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, Aluminium) etc.
- j) If relevant standard (IS/ IEC/ equivalent & above) 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 change in the make of component(s) of the equipment shall not be the criteria for repetition of Type Test(s) 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.
- l) Utilities, if so desire, may repeat the Type Test(s), 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 Test(s) 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 Test(s).

- m) The philosophy of extending Type Test(s) 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 an equipment can be extended to the same equipment of similar design and/or lower design stress provided relevant standard (IS/ IEC/ equivalent & above) permits.
- n) 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 Test(s) 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.
- o) 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.
- p) 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/ equivalent & above.
- q) 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/ equivalent & above) and it has successfully passed the SC tests and other Type Test(s) as per relevant standards.

4. Guidelines specifically applicable to Thermal Power Sector

- a) The following is list of major E&M equipment of Thermal Power Sector along

with their corresponding Type Test periodicity:

Table 1: List of Equipment for Type Test validity of Major E&M equipment of Thermal Power Sector:

<u>List of major electrical equipment :</u>		
S.N.	Name of Equipment	Periodicity of Type Test (in years)
1.	Power Transformer (GT, ST, UT, ICT)	5 (10 for UT)
2.	LT Auxiliary Oil filled Transformer	5
3.	Dry type Transformers	5
4.	Shunt Reactor	5
5.	OLTC	10
6.	Power transformer Bushing /Reactor Bushing	7
7.	Transformer/reactor fittings and Accessories	10
8.	HT Motors	5
9.	LT Motors	5
10.	DC Motors	5
11.	Circuit Breaker	10
12.	Isolator	10
13.	Lightening Arrester	10
14.	Wave Trap	10
15.	Instrument Transformers	7
16.	Dry Cast Resin CT, PT, NGT,CVT and CBCT	7
17.	Power Contactors	10
18.	Control Transformers	10
19.	LV and MV Switchgear	10
20.	GIS & Hybrid Switchgear	10

21.	Isolated Phase Bus Duct	7
22.	Segregated Phase Bus Duct	7
23.	LT-Sandwich Bus Duct	10
24.	Neutral Grounding Resistor	10
25.	Transformer-Insulating Oil	5
26.	Lighting & Welding Transformer	10
27.	EHV Cables	10
28.	HT, LT and Control Cables and associated joints	10
29.	DC Cables	10
30.	Cable Termination Kit & Straight Through Jointing Kit	10
31.	GI Cable Trays and GI Cable Tray Flexible Support System	10
32.	Capacitor	10
33.	Numerical Relays	7
34.	Energy Meter (including smart meters and ABT meters)	5
35.	Battery and Battery Charger (Lead-Acid & Ni-Cd) including Battery Health Monitoring System	7
36.	Substation Automation System	5
37.	Control & Relay Panel	5
38.	DG Set	5
39.	Lighting Fixtures	10
40.	Lighting Mast	10
41.	VFD System	5
42.	IN-Line Magnetic Separator/ Suspended Magnet	5
43.	Metal Detector	5
44.	Electro-hydrothruster (EHT) Brake/ EHT Rail Clamps	5
45.	Actuators (Without Integral Starter)	5
46.	Geared Motor	10
47.	Belt Weigher	7
48.	Weigh Bridge	7

49.	Heavy Duty Limit Switches	5
50.	Aviation Light	5
51.	ESP-TR Set	10
52.	ESP-Panel Type Hopper Heater	5
53.	Conductors and earth wire	10
54.	High Temperature (HT)/ High Temperature Low Sag Conductor (HTLS) conductor	7
55.	Insulators (Porcelain/ Glass)	10
56.	Composite Insulator	5
57.	PLCC/ FO cable / OPGW	5
58.	Transmission Line insulator hardware fittings, and accessories for conductor & ground wire	7
59.	Excitation system	5

Note(s) :

1. The type tests reports shall be valid as on the last date of submission of bid.
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.
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.
4. In case there is a change in design in any equipment before the specified period, the new equipment design shall be validated by carrying out various type tests.

5. In case only type test reports are submitted, the following confirmation shall be submitted by the bidder/ OEM.

- a. .No change in the Design after the type tests.
- b. No change in the material/ sourcing.
- c. No change in the manufacturing process.

List of major mechanical equipment :

S.N.	Name of Equipment	Test(s)	Periodicity of Type Test (in years)
1.	Butterfly Valves (Water Application)	Life Cycle Test (Proof of Design Test) as per AWWA C 504 / C-516	5 Years
2.	GRP (Glass Reinforced Pipes)	UV Test	Once for each product type
3.	3 LPE Coated MS Pipes	Adhesion Test, Impact Test Indentation Test, Elongation Test, Cathodic Disbondment Test, Degree of Cure for Epoxy, Long Duration test- Heat aging, Light aging and Coating Resistivity	5 Years Once for each product type/ size/ design
4.	Metallic Expansion Joint	Life Cycle test for 10 ⁴ Cycle Meridional yield, Rupture test Squirm test	5 Years
5.	Rubber Expansion Joint in Condenser Inlet and Outlet	Life Cycle test, Burst test	5 Years Once for each product type/ size/ design
6	PVC Drift Eliminators	Ultra Violet Rays Resistance Test for 500 Hours & then Izod Impact Test, ASTM B 256 / ASTM G 155-1	5 Years

			Once for each product type/ size/ design
7.	PVC Fills	Ultra Violet Rays Resistance Test for 500 Hours & then Izod Impact Test, ASTM B 256/ ASTM G 155-1	5 Years Once for each product type/ size/ design
8.	FRP Blades	Structural Stability Test	5 Years Once for each product type/ size/ design
9.	Carbon Fiber Shafts	Torsional Test	5 Years Once for each product type/ size/ design
10.	Dual Plate Check Valve	Life Cycle Test – 10^5 cycles	5 Years Once for each product type/ size/ design
11.	Main Turbine Oil Centrifuge	Particle size impurities test on one oil centrifuge	5 years
12.	Drive turbine oil centrifuge	Particle size impurities test on one oil centrifuge	5 years
13.	Boiler Feed Pump	On one BFP - Thermal shock test - Visual Cavitation Test - Pressure Pulsation test - Axial thrust measurement - Complete strip down test	a. One for each size/ type/ model in each project Performance test, NPSH test, Strip

		- Pressure drop test on one strainer of each type & size On one BFP and One BP - Dry running test NPSH (R) test	Test at shop, and b. 5 years Pressure drop test on one strainer size/ type/ model
14.	Condensate Extraction Pump	- NPSH (R) test - Pressure drop test on one CEP Suction strainer	a. One for each size/ type/ model in each project, and b. 5 years Pressure drop test on one strainer size/ type/ model
15.	Drip Pump	Cavitation Test, NPSH Test	One for each size/ type/ model in each project
16.	Boiler Circulating Pump	Measurement of performance parameters like unit functioning at pump temperature and pressure, hot standstill and start up test etc.	One for each size/ type/ model in each project
17.	Light Resin Bound Mineral Wool	Thermal Conductivity Test	One year
18.	Fireproof Door	Flame Proof Test	5 years
19.	ID Fan	Measurement of performance parameters like flow, pressure, power, efficiency etc	One for each size/ type/ model in each project

20.	FD Fan	Measurement of performance parameters like flow, pressure, power, efficiency etc	One for each size/ type/ model in each project
21.	PA Fan	Measurement of performance parameters like flow, pressure, power, efficiency etc	One for each size/ type/ model in each project
22.	Seal Air Fan	Measurement of performance parameters like flow, pressure, power, efficiency etc	One for each size/ type/ model in each project
23.	Dampers/ Gates	Leak Tightness Test	One for each size/ type/ model in each project
24.	Gravimetric Coal Feeder	Weighing Accuracy	One for each size/ type/ model in each project
25.	CW Pump	Performance test	One for each size/ type/ model in each project

Note(s) :

1. The type tests reports shall be valid as on the last date of submission of bid.
2. In case there is a change in design in any equipment before the specified period, the new equipment design shall be validated by carrying out various type tests.
3. In case only type test reports are submitted, the following confirmation shall be submitted by the bidder/ OEM.
 - a. .No change in the Design after the type tests.
 - b. No change in the material/ sourcing.
 - c. No change in the manufacturing process.

List of major C&I Equipment :

S.N.	Name of Equipment	Test(s)	Periodicity of Type Tests (in years)
1.	Control valve	CV test	Once for each product type/ size/ design
2.	UPS	Surge withstand capability	5 years
		Dry Heat test	
		Damp Heat test	
		Vibration test	
		Electrostatic discharge tests	
		Radio frequency immunity	
		Electromagnetic Field immunity	
		Degree of protection	
		Fuse Clearing Capability	
		Short Circuit current capability	
3.	PA System	Amplifier	10 years
		Microphones	
		Loud Speaker	
4.	Transducers	All Type Test	10 years
5.	Electronic Transmitters	All Type Test	10 years
6.	Dust emission Monitor	Degree of protection	10 years
7.		Conductor	10 years

	Instrument cable/ Control Cable	Resistance test-	
		Diameter test	
		Tin Coating test (Persulphate test)	
		Insulation	
		Loss of mass-	
		Ageing in air ovens**	
		TS elongation before and after ageing	
		Heat Shock	
		Hot deformation	
		Shrinkage	
		Bleeding & blooming	
		Inner sheath	
		Loss of mass-	
		Heat Shock	
		Cold bend/cold impact test	
		Hot deformation	
		Shrinkage	
		Outer Sheath	
		Loss of mass-	
		Ageing in air ovens**	
		TS elongation before and after ageing	
		Heat Shock	
		Hot deformation	
		Shrinkage	
		Bleeding & blooming	
		Colour fastness to water	
		Cold bend/cold impact test	
		Oxygen index	
		Smoke Density Test	

		Acid gas generation test	
		Fillers	
		Oxygen index test	
		Acid gas generation test	
		AL-MYLAR shield	
		Continuity test	
		Shield thickness	
		Overlap Test	
		Over all cable	
		Flammability Test	
		Swedish Chimney Test	
		Noise interference	
		Dimensional checks	
		Cross talk	
		Mutual capacitance	
		HV test	
		Drain wire continuity	
8.	Power supply	Surge withstand capability	10 years
		Dry Heat test	
		Damp Heat test	
		Vibration test	
		Electrostatic discharge tests	
		Radio frequency immunity	
		Electromagnetic Field immunity	
		Degree of protection	
9.	Battery	Ni-Cd Batteries	10 years
		Lead Acid Plante Batteries	
10.	LIE	ree of protection	10 years
11.	Flue gas analysers	ree of protection	10 years

12.	Master Clock	ctional Test	10 years
13.	Junction boxes	ree of protection	10 years
14.	Flow nozzle	Calibration	10 years
15.	Electronic measuring instruments	All Type Test	10 years
16.	DDCMIS	Surge withstand capability	10 years
		Dry Heat test	
		Damp Heat test	
		Vibration test	
		Electrostatic discharge tests	
		Radio frequency immunity	
		Electromagnetic Field immunity	
17.	PLC		10 years

Note(s) :

1. The type tests reports shall be valid as on the last date of submission of bid.
2. In case there is a change in design in any equipment before the specified period, the new equipment design shall be validated by carrying out various type tests.
3. In case only type test reports are submitted, the following confirmation shall be submitted by the bidder/ OEM.
 - a. .No change in the Design after the type tests.
 - b. No change in the material/ sourcing.
 - c. No change in the manufacturing process.

- b) The latest CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations shall be also complied with for ensuring the minimum technical requirements for construction of Thermal-Electric Generating Stations.
- c) Bought-out equipment have not been included in the above list since their Test Certificates (TCs) establishing the requirement of purchaser upon review shall be acceptable to the purchaser and these need not be tested again.
- d) Any equipment not covered in the list shall be subject to the terms of mutual agreement between supplier and purchaser.

ANNEXURE I

CEA OM DATED 01/11/2021 REGARDING CONSTITUTION OF COMMITTEE FOR STANDARDIZATION OF TEST PROTOCOLS FOR ELECTRO-MECHANICAL EQUIPMENT IN POWER SECTOR



भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
जल विद्युत अभियांत्रिकी व हीरोमिनी विकास प्रभाग
Hydro Engg. & Technology Dev. Division
सेवा भवन, बंग. के. पुरम-1, नई दिल्ली-110066
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वेबसाइट/Website: www.cea.nic.in

No. 10/3/HE&TD/2021/

Date: 01.10.2021

OFFICIAL MEMORANDUM

Subject: Constitution of Committee for Standardization of Test Protocols for Electro-Mechanical equipment in Power Sector-reg.

As Hon'ble Union Minister of Power has desired to standardize Test Protocols for Electro-Mechanical equipment in Power Sector, a Committee is hereby constituted consisting of the following members:

1.	Member (GO&D & Hydro), CEA	Chairman
2.	Chief Engineer (TE&TD), CEA	Member
3.	Chief Engineer (PSE&TD), CEA	Member
4.	Chief Engineer (DPT), CEA	Member
5.	Chief Engineer (RTD), CEA	Member
6.	Representative of CPRI	Member
7.	Representative of NTPC	Member
8.	Representative of PGCIL	Member
9.	Representative of NHPC	Member
10.	Representative of BHEL	Member
11.	Representative of SECI	Member
12.	Representative of DISCOM	Member
13.	Chief Engineer (HE&TD), CEA	Member & Convener

Further, the Committee may co-opt any other member, if required.

The **Terms of Reference (ToR)** of the Committee shall be as given below:

- 1) Standardization of Type Tests, Routine Tests, Field Acceptance Tests, etc.
- 2) The possibility of using CEA Regulations as part of Test Protocols.
- 3) Incorporation of outcome at Sl. No. 1 in CEA Regulations for making it enforceable.
- 4) Any other issue/ agenda with the consensus of the Committee.

The Committee shall submit a Report within 01 week from the date of receipt of this order.

This issues with the approval of the Competent Authority.


(Sonam Srivastava)
Asstt. Director

File No.CEA-HY-17-145/1/2018-HETD Division

To :

1. Chairman, CEA
2. Member (GO&D and Hydro), CEA
3. Chairman & Managing Director, NTPC Limited, NTPC Bhawan, SCOPE Complex, Institutional Area, Lodhi Road, New Delhi - 110003 - with a request to nominate a representative of NTPC (not below the rank of ED/GM)
4. Chairman & Managing Director, PGCIL, Power Grid Corporate Office, Saudamini, Plot No.2, Sector 29, Near IFFCO Chowk, Gurgaon (Haryana) - 122001 - with a request to nominate a representative of PGCIL (not below the rank of ED/GM)
5. Chairman & Managing Director, NHPC Ltd., NHPC Office Complex, Sector-33, Faridabad - 121003 (Haryana) - with a request to nominate a representative of NHPC (not below the rank of ED/GM)
6. Managing Director, SECI, 6th Floor, Plate-B, NBCC Office Block Tower-2, East Kidwai Nagar, Kidwai Nagar, New Delhi, Delhi 110023- with a request to nominate a representative of SECI (not below the rank of ED/GM)
7. Chairman & Managing Director, Bharat Heavy Electricals Limited, BHEL HOUSE, Siri Fort, New Delhi-110049 - with a request to nominate a representative of BHEL (not below the rank of ED/GM)
8. Chief Engineer (TE&TD), CEA
9. Chief Engineer (DPT), CEA - with a request to co-opt a representative from any DISCOM
10. Chief Engineer (PSE&TD), CEA
11. Chief Engineer (RTD), CEA - with a request to co-opt members from RE Sector (not below the rank of ED/GM)
12. Chief Engineer (HE&TD), CEA
13. DG, CPRI, Central Power Research Institute, Prof.Sir C.V.Raman Road, Post Box No: 8066, SadaShiva Nagar (p.o), Bengaluru, 560080