
Work in Progress IEEE Standard PC37.98

**“Standard for Seismic Testing of Class 1E Protective
Relays and Auxiliaries for Nuclear Facilities”**

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Gothenburg, Sweden

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(NPEC and PSRC Joint Working Group SC-2.6 and I10)

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Jointly Sponsored Standard

- Nuclear Power Engineering Committee (NPEC) / SC-2/Working Group 2.6
- Power System Relay Committee (PSRC)/ Relaying Practices - I Subcommittee/ Working Group I10

Work in Progress IEEE PC37.98 Project Overview/Detail - Joint Working Group

Joint Working Group Formed April 2008

NPEC Sub-Committee 2 – Qualification WG- 2.6	PSRC WG-I – Relaying Practices WG-I10
Suresh Channarasappa – Co-Chair, Westinghouse Electric Company	Marie Nemier – Co-Chair, QualTech NP
Melanie Brown , Southern Nuclear Company	Roy Ball , ABB
Tom Koshy , USNRC	Jeff Burnworth , Basler Electric
Dan Mikow , QualTech NP	Mario Ranieri , Electro Switch
Arnold Offner , Phoenix Contact	
Sheila Ray , USNRC	

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Project Overview/Detail

- Working Group Meetings held:
 - Initial Project Status Presented to SC2 – 11/12/08
 - WG Kick Off (Teleconference) Meeting – 12/3/08
 - WG SC2.6/I10 Regular Meetings: 5
 - WG SC2.6/I10 Teleconference Meetings: 12

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Project Overview/Detail

- This project will update IEEE Std C37.98-1987 (R1996).
 - *The standard has not been updated since 1987 and while the overall test methods have not changed, there have been upgrades in the equipment available. There is also a need to expand the standard to address the testing of digital and multifunction relays.*
- PAR approved: 27-MAR-2008.
- PAR expires: 31-DEC-2012
- Amendment to Change PAR is being Processed to Change Title, Scope and Purpose to Provide Clarity: 4-Jan-2011

Work in Progress IEEE PC37.98 Title

- Based on discussions joint working group decided to seek a PAR revision to support a change in PC37.98 title to better meet user needs.
- **Old Title:** Standard Seismic Testing of Relays
- **New Title:** Standard for Seismic Testing of Class IE Protective Relays and Auxiliaries for Nuclear Facilities.
- Change in Title would require a change in **Scope and Purpose**

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Scope

- **New Scope:** This standard specifies test methods and conditions to be used in the seismic testing of protective relays and auxiliaries such as test and control switches, terminal blocks and indicating lamps for use in nuclear facilities. This standard covers relays used in nuclear facilities, but may also be applied to any area in which the seismic response of relays is a design consideration. The prerequisites for the seismic test are defined in IEEE C37.105.
- **Old Scope:** This standard specifies the procedures to be used in the seismic testing of relays used in power system facilities. The standard is concerned with the determination of the seismic fragility level of relays and also gives recommendations for proof testing.

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Purpose - New

- The purpose of this standard is to establish test methods and conditions for determining the seismic capability and to demonstrate seismic qualification of protective relays and auxiliaries. **These test methods are divided into three main categories, as described in IEEE 344; fragility, proof and generic testing.**

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Purpose – New (Continued)

- To define the specific conditions for seismic testing of protective relays the following parameters shall be specified
 - a) The settings and electrical inputs to the protective relay and auxiliaries, and other pertinent information as detailed in this standard required to define its condition during the test.
 - b) The unintentional change in state, contact chatter, deviation in operating conditions, tolerances, or other change in performance of the relay that constitutes failure.
 - c) The seismic levels (required response spectra) to be imposed during the test.

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Purpose – New (Continued)

- This standard provides guidance to establish the test parameters listed above, determine seismic capacity and to demonstrate the ability of protective relays and auxiliaries to perform their safety function during and or after the specified seismic motion. In addition, this standard provides the documentation requirements necessary to demonstrate seismic qualification of protective relays and auxiliaries.

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Purpose - Old

- The purpose of this standard is to establish procedures to employ what has been called fragility testing in IEEE Std 344-2004. To define the conditions for fragility testing of relays, parameters in three separate areas must be specified. In general, they are
 - a) The electrical settings and inputs to the relay, and other information to define its conditions during the test.
 - b) The change in state, deviation in operating characteristics or tolerances, or other change of performance of the relay that constitutes failure.
 - c) The seismic vibration environment to be imposed during the test.

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Purpose –Old (Continued)

- Since it is not possible to define the conditions for every conceivable application for all relays, those parameters, which in practice encompass the majority of applications, have been specified in this standard. When the application of the relay is other than as specified under any of (a), (b), and (c), or if it is not practical to apply existing results of fragility tests to that new application, then proof testing must be performed for that new case. The use of these capability data will assist in the selection of relays. One number will be used to catalog the seismic capability of a relay. The capability data will help designers of generating stations, substations, and various other power system installations to incorporate the seismic capabilities of the relays into the overall design of these facilities.

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- Clause 1: Overview
 - Scope and Purpose as noted previously
- Clause 2: Normative references
 - Made needed changes to update References
- Clause 3: Definitions
 - Added Definition of Relay Capacity Level
 - Deleted Standard Response Spectrum Definition
 - Corrected ZPA definition to be consistent with IEEE 344

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- Clause 4: Test Preparation
 - Reorganized this clause for Clarity. This clause contains following Sub Clauses:
 - ❖ Clause 4.1 Laboratory conditions (Formerly Environmental Conditions)
 - ❖ Clause 4.2 Selection and preparation of samples (Moved from Clause 5.1)
 - ❖ Clause 4.3 Method of mounting
 - ❖ Clause 4.4 Instrumentation

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- Clause 5: Test setup (formerly Test Condition)
 - Reorganized this clause for Clarity. This clause contains following Sub Clauses:
 - ❖ Clause 5.1 State of the protective and auxiliary relay under test (Previous Title: State of the relay under test)
 - ❖ Clause 5.2 Protective and auxiliary relay output (Previous Title: Relay Output)
 - ❖ Clause 5.3 Adjust of relay during test (Previous Title: Maintenance and adjustment of relay during test)

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- Clause 6: Test methods and acceptance criteria (formerly Test Methods)
 - Reorganized this clause to identify acceptable test methods and acceptance criteria. Moved test response spectra details to Annex B (Normative) and deleted multi-frequency standard response details as it was not needed. This clause contain following sub clauses:
 - ❖ Clause 6.1 Fragility testing
 - ❖ Clause 6.2 Proof testing
 - ❖ Clause 6.3 Generic testing
 - ❖ Clause 6.4 Test acceptance criteria

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- Clause 7: Documentation
 - This clause contain following sub clauses:
 - ❖ Clause 7.1 General
 - ❖ Clause 7.2 Test plan and specifications (added this clause)
 - ❖ Clause 7.3 Test report

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- Clause 8: Generalization of test results
 - Revised this clause for clarity
- Annex A (Informative) Applicable IEC standards [Added]
- Annex B (Normative) Fragility test [Added]
 - This relevant information moved from Section 6 (Fragility Test Spectra, etc). This Annex contains following sub clauses:
 - ❖ B.1 Introduction
 - ❖ B.2 Seismic test spectra and requirements
 - ❖ B.2 Application of fragility test levels.

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QUESTIONS/COMMENTS/SUGGESTIONS