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(Revision of IEEE Std 334-1974)

IEEE Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations

Sponsor

**Nuclear Power Engineering Committee
of the
IEEE Power Engineering Society**

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Abstract: Methods and requirements for qualifying continuous duty Class 1E motors for use in nuclear power generating stations are provided. The methods are used for qualifying motors, extending the qualification, and updating the qualification if the motor's design or specified service conditions are modified. The requirements include the principles, procedures, and methods of qualification as they relate to continuous duty Class 1E polyphase squirrel cage ac motors.

Keywords: Class 1E motors, harsh environment, mild environment, nuclear power generating station, qualification, seismic

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Introduction

(This introduction is not part of IEEE Std 334-1994, IEEE Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations.)

The basic requirements for qualifying Class 1E equipment for nuclear power generating stations are described in IEEE Std 323-1983, IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations. It requires that the qualification of Class 1E electric equipment include the demonstration of the capability of the equipment, or the components thereof, to meet their performance specifications under normal environments and under those conditions that cause, and are caused by, the design events for the station. IEEE Std 334-1994 defines requirements that are adequate for qualifying Class 1E equipment located in all areas of the nuclear power generating station, including harsh and mild environmental areas. At this time, it appears that the seismic event is the only design basis event with potential for common cause failure in otherwise mild environments; however, other environmental service conditions may also be contributors.

This revised IEEE standard provides a strong continuity to IEEE Std 334-1974 while attempting to more fully define the procedures by which Class 1E motors can be qualified. It has been restructured so that the parentage of IEEE Std 323-1983 is more readily apparent. Furthermore, this standard has been clarified and simplified based on experience in using IEEE Std 334-1974.

The intent of this document is to provide guidance for the development of tests or analytical data that are adequate to demonstrate the capability of continuous duty Class 1E electric motors to perform their safety function. It discusses the qualification requirements of Class 1E electric motors and their service conditions pertinent to nuclear power generating stations. It gives guidelines to ensure uniformity in reporting data and to permit direct comparison of required and test values of all significant parameters.

This standard addresses continuous duty motors. Motors that power motor-operated valves are not included within the scope of this standard (they are the subject of IEEE Std 382-1985, IEEE Standard for Qualification for Actuators for Power Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants).

The end result of the qualification process defined by this standard is documented evidence that the qualified motor can perform the intended safety function after service for a period of time or operating history (e.g., qualified life) and exposure to the applicable design basis event(s).

The realization of the projected qualified life usually requires a joint effort by the manufacturer and the user. The manufacturer is responsible for the design and production of the equipment. In order to support the qualification of the equipment, the manufacturer must provide and maintain documentation showing that it is capable of meeting specified performance requirements in specified service conditions throughout its qualified life.

The documentation must also show that the equipment is capable of performing its safety function during and, if required, for a specified time after exposure to a DBE, which might occur at any time during the life of the equipment. In order to satisfy this latter requirement, the manufacturers of the motor and the driven equipment shall be consulted to provide guidance on the proper application, handling, storage, installation, and maintenance of the equipment. The maintenance guidance must include identification of components and materials (e.g., bearings, lubricants, etc.) whose long-term characteristics are such that replacement or refurbishment is required in order to achieve the full qualified life. The user is responsible for identifying the application of the specifically requested Class 1E equipment and components. The user must specify service conditions and the safety-related performance requirements. The qualification program, for the connection between the motor and the incoming power cables is usually achieved separate from the qualification of the motor. Where the user requires inclusion of this interface in the qualification, specific requirements should be defined to the manufacturer.

The user is responsible for proper application, handling, storage, installation, and maintenance in accordance with the guidance provided by the manufacturer.

Whenever these traditional roles are altered or supported by intermediate organizations, such as commercial grade dedication service organizations or users that establish qualifications independent of the manufacturer, the responsibilities for meeting the requirements of the standard must be established to ensure the proper design, manufacture, application, handling, installation, operation and maintenance of motors supplied for service remain consistent with the motor design for which qualification has been established.

This document presents specific procedures and criteria applicable to qualification of motors to the criteria described in IEEE Std 323-1983. Adherence to this standard alone may not assure public health and safety because it is the integrated performance of the structures, fluid systems, instrumentation systems, and electrical systems of the station that limits the consequence of accidents. Each user is responsible for assuring that this standard, if used, is pertinent to his or her application.

This revision of this document was prepared by a Working Group of Subcommittee 2 (Equipment Qualification) of the Nuclear Power Engineering Committee. The members of the Working Group were as follows:

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The final conditions for approval of this standard were met on March 28, 1994. This standard was conditionally approved by the IEEE Standards Board on March 17, 1994, with the following membership:

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IEEE Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations

1. Scope and purpose

1.1 Scope

This document describes the methods and requirements for qualifying continuous duty Class 1E motors for use in nuclear power generating stations. The requirements presented include the principles, procedures, and methods of qualification as they relate to continuous duty Class 1E polyphase squirrel cage ac motors. Other types of ac motors and dc motors may use techniques from this document, as applicable, in combination with basic qualification techniques from IEEE Std 323-1983.¹ Compliance with this document meets the requirements of IEEE Std 323-1983 as applied to Class 1E continuous duty motors.

The methods described shall be used for qualifying motors, extending the qualification, and updating the qualification if the motor's design of specified service conditions is modified. Other IEEE and industry documents presenting qualification methods for specific components within the motor and dealing with parts of the qualification program may be used, as applicable, to supplement this document. References are made within this document to applicable standards that provide guidance.

1.2 Purpose

The purpose of this document is to provide specific direction for the implementation of the requirements of IEEE Std 323-1983 as they apply to the specific features of continuous duty Class 1E motor qualification.

¹Information on references can be found in clause 2.