

ASME QME-1–2012
(Revision of ASME QME-1–2007)

Qualification of Active Mechanical Equipment Used in Nuclear Facilities

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

ASME QME-1-2012
(Revision of ASME QME-1-2007)

Qualification of Active Mechanical Equipment Used in Nuclear Facilities

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: April 24, 2013

The next edition of this Standard is scheduled for publication in 2018.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME QME Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at <http://cstools.asme.org/> as they are issued.

Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

The Committee Pages can be found at <http://cstools.asme.org/>. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting "Errata" in the "Publication Information" section.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assumes any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,
in an electronic retrieval system or otherwise,
without the prior written permission of the publisher.

The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

Copyright © 2013 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.

CONTENTS

Foreword	vi
Committee Roster	vii
Organization of QME-1	viii
Summary of Changes	x
Section QR General Requirements	1
QR-1000 Scope	1
QR-2000 Purpose	1
QR-3000 References	1
QR-4000 Definitions	1
QR-5000 Qualification Principles	3
QR-6000 Qualification Specification	4
QR-7000 Qualification Program	4
QR-8000 Documentation	6
Nonmandatory Appendices to Section QR	
QR-A Seismic Qualification of Active Mechanical Equipment	7
QR-A1000 Scope	7
QR-A2000 Purpose	7
QR-A3000 References	7
QR-A4000 Definitions	7
QR-A5000 Earthquake Environment and Equipment Response	9
QR-A6000 Seismic Qualification Requirements	11
QR-A7000 Qualification Methods	15
QR-A8000 Documentation	22
Appendix QR-A Tables	
QR-A6210-1 Damping Values: Percent of Critical Damping	12
QR-A7422-1 Reduction Factors	20
QR-B Guide for Qualification of Nonmetallic Parts	24
QR-B1000 Scope	24
QR-B2000 Purpose	24
QR-B3000 References	24
QR-B4000 Definitions	24
QR-B5000 Requirements	24
QR-B6000 Methods of Qualification	26
QR-B7000 Documentation	29
Section QDR Qualification of Dynamic Restraints	30
QDR-1000 Scope	30
QDR-2000 Purpose	30
QDR-3000 Definitions	30
QDR-4000 Qualification Principles and Philosophy	30
QDR-5000 Functional Specification	33
QDR-6000 Qualification Program	33
QDR-7000 Documentation Requirements	38
Nonmandatory Appendices to Section QDR	
QDR-A Functional Specification for Dynamic Restraints	40
QDR-A1000 Scope	40
QDR-A2000 Purpose	40

QDR-A3000	References	40
QDR-A4000	Definitions	40
QDR-A5000	Functional Specification Contents	40
QDR-A6000	Filing Requirements	42
QDR-B	Restraint Similarity	43
QDR-B1000	Scope	43
QDR-B2000	Examples of Design Similarity	43
QDR-C	Typical Values of Restraint Functional Parameters	44
QDR-C1000	Scope	44
QDR-C2000	Functional Parameters	44
QDR-C3000	Aging and Service Condition Simulation Qualification Program	44
Section QP	Qualification of Active Pump Assemblies	45
	Introduction	45
QP-1000	Scope	45
QP-2000	Purpose	45
QP-3000	References	45
QP-4000	Definitions	46
QP-5000	Qualification Principles and Philosophy	46
QP-6000	Qualification Specification	46
QP-7000	Qualification Program	48
QP-8000	Documentation	50
Nonmandatory Appendices to Section QP		
QP-A	Pump Specification Checklist	51
QP-A1000	Scope	51
QP-A2000	Applicable Documents, Codes, and Standards	51
QP-A3000	Design and Construction Requirements	51
QP-A4000	Structural, Seismic, and Environmental Qualification Requirements	51
QP-A5000	Material and Manufacturing Requirements	51
QP-A6000	Testing Requirements	51
QP-A7000	Documentation, Instructions, and Limitations	52
QP-B	Pump Shaft-Seal System Specification Checklist	53
QP-B1000	Scope	53
QP-B2000	Applicable Documents, Codes, and Standards	53
QP-B3000	Design and Construction Requirements	53
QP-B4000	Structural, Seismic, and Environmental Qualification Requirements	53
QP-B5000	Materials and Manufacturing Requirements	53
QP-B6000	Testing Requirements	53
QP-B7000	Documentation, Instructions, and Limitations	53
QP-C	Pump Turbine Driver Specification Checklist	54
QP-C1000	Scope	54
QP-C2000	Applicable Documents, Codes, and Standards	54
QP-C3000	Design and Construction Requirements	54
QP-C4000	Structural, Seismic, and Environmental Qualification Requirements	54
QP-C5000	Material and Manufacturing Requirements	54
QP-C6000	Testing Requirements	54
QP-C7000	Documentation, Instructions, and Limitations	54
QP-D	Pump Similarity Checklist	55
QP-D1000	Scope	55
QP-D2000	Pump Design	55
QP-D3000	Process Design	55
QP-E	Guidelines for Shaft-Seal System Material and Design Consideration	56
QP-E1000	Scope	56

QP-E2000	Purpose	56
QP-E3000	Definitions	56
QP-E4000	Material Considerations	56
QP-E5000	Design Considerations	56
Appendix QP-E Tables		
QP-E4200-1	Shaft-Seal System Specification	57
QP-E5300-1	Limits for Unbalanced Seals	58
Section QV	Functional Qualification Requirements for Active Valve Assemblies for Nuclear Facilities	59
QV-1000	Scope	59
QV-2000	Purpose	59
QV-3000	References	59
QV-4000	Definitions	59
QV-5000	Qualification Principles and Philosophy	60
QV-6000	Qualification Specification	60
QV-7000	Qualification Program	60
QV-8000	Documentation Requirements	69
Section QV Table		
QV-7300-1	Valve Assembly Qualification Requirement Matrix	61
Mandatory Appendix to Section QV		
QV-I	Qualification Specification for Active Valves	71
QV-I1000	Scope	71
QV-I2000	Purpose	71
QV-I3000	References	71
QV-I4000	Definitions	71
QV-I5000	Functional Specification Contents	71
QV-I6000	Actuator Requirements	72
QV-I7000	Self-Operated Check Valve Characteristics	72
QV-I8000	Pressure Relief Valve Characteristics	72
Section QVG	Guide to Section QV: Determination of Valve Assembly Performance Characteristics	73
QVG-1000	Scope	73
QVG-2000	Introduction	73
QVG-3000	References	73
QVG-4000	Definitions	74
QVG-5000	Valve Assembly Performance Characteristic Requirements	74
QVG-6000	General Considerations	74
QVG-7000	Power-Actuated Valve Assembly Considerations	77
QVG-8000	Valve Considerations	78