

ASME PVHO-2-2019
(Revision of ASME PVHO-2-2016)

Safety Standard for Pressure Vessels for Human Occupancy: In-Service Guidelines

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: January 24, 2020

The next edition of this Standard is scheduled for publication in 2022.

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CONTENTS

| | |
|--|----------|
| Foreword | v |
| Committee Roster | vi |
| Correspondence With the PVHO Committee | ix |
| Summary of Changes | xi |
| Section 1 General | 1 |
| 1-1 Introduction and Scope | 1 |
| 1-2 Responsibilities and Jurisdictional Considerations | 1 |
| 1-3 In-Service Evaluations, Repairs, and Modification of PVHOs | 1 |
| 1-4 PVHO and PVHO Systems Documentation | 2 |
| 1-5 Owner’s Manual | 2 |
| 1-6 Maintenance Requirements | 3 |
| 1-7 Checklists and Logs | 3 |
| Section 2 Viewports | 5 |
| 2-1 Responsibilities | 5 |
| 2-2 Factors Affecting Service Life | 5 |
| 2-3 Handling of PVHO Windows | 6 |
| 2-4 Operational and Maintenance Inspections of PVHO Viewports | 7 |
| 2-5 Categories of Damage | 9 |
| 2-6 Repair of Damaged PVHO Windows | 9 |
| 2-7 Mechanical Property Testing | 11 |
| 2-8 Testing Requirements for Increasing the 40,000-hr Design Life | 13 |
| Mandatory Appendices | |
| I Definitions | 24 |
| II Reference Standards and Specifications | 27 |
| III Quality Assurance Program for Repair of Severely Damaged Windows | 28 |
| IV Additional Window Repair Requirements and Forms | 31 |
| V Partial List of Harmful Substances and Acceptable Products | 38 |
| VI Mechanical Testing Computations and Forms | 40 |
| Nonmandatory Appendices | |
| A Checklists and Logs for PVHO Operation | 44 |
| B Operation of Submersible Craft | 45 |
| Tables | |
| 2-4.1-1 Periodic Inspection Requirements | 14 |
| 2-4.1.1-1 Limits for Blemishes or Flaws on Standard Window Geometry Surfaces | 15 |
| 2-4.1.1-2 Limits for Blemishes or Flaws on All Other Standard Window Geometry Surfaces | 17 |

| | | |
|------------------|--|----|
| 2-4.1.1-3 | Limits on Chipping of Sharp Edges on Standard Window Geometries | 18 |
| 2-4.3-1 | Maximum Intervals for Maintenance Viewport Inspection | 18 |
| 2-4.3-2 | Maximum Intervals for Refurbishment | 18 |
| IV-1-1 | Specified Values of Physical Properties for Spot Casting Repairs (To Be Verified by Testing of Specimens Taken From Test Castings of the Same Slurry Batch Used in Repair) | 32 |
| IV-1-2(a) | Annealing Schedule for Acrylic Windows Part A: Minimum Heating Times for Elevated Temperature Annealing of Acrylic | 33 |
| IV-1-2(b) | Annealing Schedule for Acrylic Windows Part B: Maximum Cooling Rates for Acrylic Subjected to Elevated Annealing Temperatures | 34 |
| VI-6-1 | Example Evaluation — Mandatory Appendix VI | 41 |
| Forms | | |
| VM-1 | Viewport Inspection | 19 |
| VM-2 | Acrylic Window Repair Certification for Severely Damaged Windows | 20 |
| VM-3 | Acrylic Window Repair Certification for Slightly Damaged Windows Repaired by the User (or the User's Authorized Agent) | 22 |
| VT-1 | Pressure Testing Report for Increasing Window Service Life Beyond the 4,000-hr Design Life | 23 |
| IV-1-1 | Material Testing Certification for Repair by Spot Casting | 35 |
| IV-1-2 | Annealing Process Certification | 36 |
| IV-5-1 | Pressure Testing Certification | 37 |
| VI-1 | Material Testing Results for Continued Service | 42 |
| VI-2 | Material Testing Evaluation for Continued Service | 43 |

FOREWORD

In 1998 a PVHO Task Group was formed to investigate the need for In-Service Rules and Guidelines for Pressure Vessels for Human Occupancy. Simultaneously, a Sub Task Group was formed to investigate the issue of acrylic window design life versus service life. The design life is based on the PVHO window being exposed to the maximum allowable working pressure (MAWP), at the maximum rated temperature, for the maximum number of (design) cycles, in an outdoor weathering environment. The majority of PVHOs are not operated to such extremes, and service life may indeed be longer than design life. Conversely, if a window is not properly cared for (i.e., becomes exposed, either operationally or nonoperationally, to other detrimental factors that are not, and cannot be, factored into the design life), then the actual service life could be much shorter than the design life. Thus, the recommendation was made that design life and service life be addressed as two different subjects. In 1999 the In-Service Task Group became a PVHO subcommittee, with the most immediate task being the establishment of in-service criteria for PVHO windows and viewports.

This Standard provides the necessary in-service criteria to supplement Section 2, Viewports, of ASME PVHO-1, which applies to new construction only. By comparison, this Standard applies to all ASME PVHO-1 acrylic windows, regardless of their date of manufacture. This Standard consists of both technical criteria and guidelines. They are intended to provide guidance to the user and/or the jurisdictional authority in regard to the establishment of potential service life, and the necessary care, inspection, and repair during that service life—depending on the actual service conditions to which the PVHO and windows have been, or will be, exposed.

Finally, this Standard was prepared as a “stand-alone” document. All forms additional to those normally supplied with the window in accordance with ASME PVHO-1, which may be necessary throughout the service life of the window, are provided herein. Similarly, all necessary ASME PVHO-1 technical data applicable to service and repair (if required) are also provided in this Standard.

The 2019 edition of ASME PVHO-2 further develops and clarifies the in-service guidelines for PVHOs. The requirements for in-service pressure testing gauge calibration have been updated. Nonmandatory Appendix A, covering checklists and logs for PVHO operation, has been deleted, and the text under this appendix has been integrated into the general requirements of Section 1. New testing criteria for increasing the 40,000-hr design life of acrylic windows have been incorporated under Section 2. Additionally, new forms have been added, and some of the existing forms have been updated.

Sections on the following topics are in development and may be included in future editions: quality assurance for PVHO manufacturers, piping systems, medical hyperbaric systems, diving systems, and submersibles.

Previous editions of this Standard were issued in 2003, 2012, and 2016. The 2019 edition of this Standard was approved by the American National Standards Institute as an American National Standard on December 4, 2019.

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, PVHO Standards Committee
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<http://go.asme.org/Inquiry>

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

Interpretations. Upon request, the PVHO Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the PVHO Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/interpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the PVHO Standards Committee at the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

- Subject: Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
- Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.
- Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
- Proposed Reply(ies): Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
- Background Information: Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

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Attending Committee Meetings. The PVHO Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the PVHO Standards Committee.

ASME PVHO-2-2019 SUMMARY OF CHANGES

Following approval by the ASME PVHO Committee and ASME, and after public review, ASME PVHO-2-2019 was approved by the American National Standards Institute on December 4, 2019.

ASME PVHO-2-2019 includes the following changes identified by a margin note, **(19)**.

| <i>Page</i> | <i>Location</i> | <i>Change</i> |
|-------------|-------------------------|---|
| 2 | 1-3.4 | Added |
| 3 | 1-7 | Added, from former Nonmandatory Appendix A |
| 6 | 2-2.4 | Revised |
| 7 | 2-4.3 | Last paragraph revised |
| 8 | 2-4.8 | Last sentence revised |
| 11 | 2-6.8 | Subparagraph (a) revised |
| 13 | 2-8 | Added |
| 15 | Table 2-4.1.1-1 | (1) Title revised (2) General Note (g) added |
| 17 | Table 2-4.1.1-2 | (1) Title revised (2) General Note (g) added |
| 18 | Table 2-4.1.1-3 | (1) Title revised (2) General Note (c) added |
| 19 | Form VM-1 | Former Form VP-1 redesignated, and “Window service life expended” line deleted |
| 20 | Form VM-2 | Former Form VP-2 revised in its entirety |
| 22 | Form VM-3 | Former Form VP-3 revised in its entirety |
| 23 | Form VT-1 | Added |
| 36 | Form IV-1-2 | “Window markings” line added |
| 37 | Form IV-5-1 | “Window Identification” line replaced with “Window markings” line |
| 40 | VI-6 | First value in third paragraph revised |
| 41 | Table VI-6-1 | Title revised |
| 42 | Form VI-1 | (1) Title revised (2) “Window markings” line added (3) “Test specimens are original submittal” line deleted |
| 43 | Form VI-2 | Revised in its entirety |
| 44 | Nonmandatory Appendix A | Text moved to subsection 1-7 |

SPECIAL NOTE: ASME PVHO-2 Cases are no longer published with the edition.

Section 1

General

1-1 INTRODUCTION AND SCOPE

(a) This Standard provides technical requirements and guidelines for the operation and maintenance of PVHOs and PVHO systems that were designed, constructed, tested, and certified in accordance with ASME PVHO-1, Safety Standard for Pressure Vessels for Human Occupancy.

(b) This Standard provides technical criteria for the user to establish the serviceability of a PVHO acrylic window under its specific environmental service conditions. Windows in protected environments as well as those in severe environments are addressed. Judicious use of this Standard will allow the user and/or the jurisdictional authority to determine when a PVHO acrylic window requires replacement.

1-2 RESPONSIBILITIES AND JURISDICTIONAL CONSIDERATIONS

1-2.1 User's Responsibilities

The PVHO and PVHO systems user shall provide the designer with information regarding the service conditions that the PVHO and PVHO systems may encounter during their service life. The user shall protect the PVHO and its systems from hazards, and ensure they are used within their design limitations. It is the user, and not the designer or fabricator, who is responsible for determining the safe service life in accordance with the technical criteria and guidelines herein. The user is responsible for retaining all documentation for each PVHO and its associated systems, and shall establish a program of periodic inspection to determine the need for repair or replacement of any part, in accordance with the requirements listed in this Standard. For window repair and replacement requirements, refer to [Section 2](#), Viewports.

1-2.2 Jurisdictional Considerations

The operation of each PVHO is typically governed under specific rules of the jurisdiction in which it is operated. (Examples include, but are not necessarily limited to, the state, the U.S. Food and Drug Administration, and the U.S. Coast Guard.) This Safety Standard is intended to complement the jurisdictional requirements (i.e., to provide guidance to both users and jurisdictional autho-

rities in regard to in-service requirements for the PVHO, acrylic windows, and PVHO systems). The responsibility for compliance with jurisdictional in-service requirements, which may become invoked as a result of the technical criteria and guidelines as set forth herein, lies with the user.

1-3 IN-SERVICE EVALUATIONS, REPAIRS, AND MODIFICATION OF PVHOs

1-3.1 In-Service PVHO Evaluation and Testing

The owner shall be responsible for performing periodic pressure testing of the PVHO pressure boundary, pressurized systems, and PVHO operational systems. Test pressures shall be at maximum operating pressure and not exceed the maximum allowable working pressure of the components/systems being tested. These tests shall be performed and documented at a periodicity established by the user, manufacturer, and/or applicable jurisdiction.

Pressure testing shall be performed on any valve, fitting, and/or piping/tubing that penetrate the PVHO pressure boundary following reassembly or replacement. The test boundary shall include the first stop valve both upstream and downstream of the reassembled or replaced component.

Pressure testing after pressure vessel or piping weld repairs shall be a hydrostatic or pneumatic test and shall follow the applicable pressure vessel or system component code or standard.

New pressure boundary components (i.e., valve, piping, and windows) shall be hydrostatically or pneumatically tested in accordance with the applicable pressure vessel or system component code or standard.

1-3.2 PVHO Windows and Viewports

The owner shall be responsible for ensuring that in-service viewport evaluations, window replacements, and inspections are performed in accordance with this Standard.

(a) PVHO acrylic windows shall be evaluated and, if necessary, repaired per [subsections 2-4](#) through [2-6](#) of this Standard.