

ASME PCC-1–2022
(Revision of ASME PCC-1–2019)

Pressure Boundary Bolted Flange Joint Assembly

AN AMERICAN NATIONAL STANDARD



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**The American Society of
Mechanical Engineers**

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FOREWORD

ASME formed an Ad Hoc Task Group on Post Construction in 1993 in response to an increased need for recognized and generally accepted engineering standards for the inspection and maintenance of pressure equipment after it has been placed in service. At the recommendation of this task group, the Board on Pressure Technology Codes and Standards (BPTCS) formed the Post Construction Committee (PCC) in 1995. The scope of this committee was to develop and maintain standards addressing common issues and technologies related to post-construction activities and to work with other consensus committees in the development of separate, product-specific codes and standards addressing issues encountered after initial construction for equipment and piping covered by Pressure Technology Codes and Standards. The BPTCS covers nonnuclear boilers, pressure vessels (including heat exchangers), piping and piping components, pipelines, and storage tanks.

The PCC selects standards to be developed based on identified needs and the availability of volunteers. The PCC formed the Subcommittee on Inspection Planning and the Subcommittee on Flaw Evaluation in 1995. In 1998, a task group under the PCC began preparation of Guidelines for Pressure Boundary Bolted Flange Joint Assembly, and in 1999 the Subcommittee on Repair and Testing was formed. Other topics are under consideration and may be developed into future guideline documents.

The subcommittees were charged with preparing standards dealing with several aspects of the in-service inspection and maintenance of pressure equipment and piping. ASME PCC-1, Pressure Boundary Bolted Flange Joint Assembly, is the standard for bolted flange joint assemblies. ASME PCC-3, Inspection Planning Using Risk-Based Methods, provides guidance on the preparation of a risk-based inspection plan. Imperfections found at any stage of assembly, installation, inspection, operation, or maintenance are then evaluated, when appropriate, using the procedures provided in API 579-1/ASME FFS-1, Fitness-for-Service. Guidance on repair procedures is provided in the appropriate portion of ASME PCC-2, Repair of Pressure Equipment and Piping. To provide all stakeholders involved in pressure equipment with a guide to identify publications related to pressure equipment integrity, ASME PTB-2, Guide to Life Cycle Management of Pressure Equipment Integrity, has been prepared.

None of these documents are Codes. They provide recognized and generally accepted good practices that may be used in conjunction with post-construction codes, such as API 510, API 570, and NBBI NB-23, and with jurisdictional requirements.

This Standard uses the words “shall,” “should,” and “may” as follows:

- (a) “Shall” is used to denote a requirement.
- (b) “Should” is used to denote a recommendation.
- (c) “May” is used to denote permission, which is neither a requirement nor a recommendation.

The first edition of ASME PCC-1 was approved for publication in 2000. The 2010 edition was approved by the American National Standards Institute (ANSI) as an American National Standard on January 14, 2010. The 2013 edition included many updates and a major new Appendix A titled “Training and Qualification of Bolted Joint Assembly Personnel” and was approved by ANSI as an American National Standard on August 12, 2013. The 2019 edition contained a number of updates. The most notable of these updates were the removal of the reference torque tables (Tables 1M and 1) for similar tables in Appendix O introducing the Target Torque Index and the insertion of a new Appendix Q titled “Considerations for the Use of Powered Equipment.” ASME PCC-1–2019 was approved by ANSI as an American National Standard on January 17, 2019.

This 2022 edition is a major revision of ASME PCC-1. Requirements and recommendations have replaced the guidelines of previous editions. “Guidelines for” has been deleted from the title. The main text and many of the appendices have been revised in their entirety. ASME PCC-1–2022 was approved by ANSI as an American National Standard on August 18, 2022.

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(The following is the roster of the Committee at the time of approval of this Standard.)

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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:

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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 PCC 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 PCC 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 PCC 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.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

Attending Committee Meetings. The PCC 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 PCC Standards Committee.

ASME PCC-1-2022

SUMMARY OF CHANGES

Following approval by the ASME PCC Committee and ASME, and after public review, ASME PCC-1-2022 was approved by the American National Standards Institute on August 18, 2022.

In ASME PCC-1-2022, “Guidelines for” has been deleted from the title. The main text has been revised in its entirety. Appendices A through Q have been redesignated as “Nonmandatory.” All figures, tables, and forms have been redesignated based on their parent paragraph. Cross-references have been updated. In addition, ASME PCC-1-2022 includes the following changes, identified by a margin note, **(22)**.

<i>Page</i>	<i>Location</i>	<i>Change</i>
10	Mandatory Appendix I	Added
15	Nonmandatory Appendix A	Revised in its entirety
24	Nonmandatory Appendix B	Definitions moved to Mandatory Appendix I
25	Nonmandatory Appendix C	(1) “Contact surface” revised to “seating surface” throughout (2) In Table C-1, “Gasket Seating Surface Finish” column editorially revised
26	Nonmandatory Appendix D	(1) Title revised (2) Sections D-1 through D-3 revised
31	Nonmandatory Appendix E	Revised in its entirety
34	Nonmandatory Appendix F	Revised in its entirety
48	Nonmandatory Appendix G	Revised in its entirety
49	Table H-1M	Note (2) revised
51	Nonmandatory Appendix I	Deleted
52	Nonmandatory Appendix J	Revised in its entirety
56	Nonmandatory Appendix K	Revised in its entirety
59	M-1.1	Last paragraph revised
61	M-2.10	Added and former para. M-2.10 redesignated as M-2.11
64	N-1	Revised
65	N-4	Added
66	O-1.1	Revised
66	O-1.3	Definitions of $G_{I.D.}$ and $G_{O.D.}$ revised
67	O-2	Subparagraphs (b) through (d) revised
67	O-3.1	First sentence revised
67	O-3.2	Second and third paragraphs and eq. (O-3) revised
68	O-4.1	Revised
68	O-4.2	First paragraph and footnotes revised
69	O-4.3	Revised
69	O-5.1	Revised
71	Table O-3.2-1M	In General Note (b), cross-reference revised
72	Table O-3.2-1	In General Note (b), cross-reference revised
82	Nonmandatory Appendix P	Revised in its entirety

<i>Page</i>	<i>Location</i>	<i>Change</i>
96	Q-5	Added and former section Q-5 redesignated as Q-6
99	Nonmandatory Appendix R	Added

PRESSURE BOUNDARY BOLTED FLANGE JOINT ASSEMBLY

1 SCOPE

This Standard covering bolted flange joint assemblies (BFJAs) applies to pressure-boundary flange joints with ring-type gaskets that are entirely within the circle enclosed by the bolt holes and with no contact outside this circle.¹ The principles of this Standard may be selectively applied to other joint geometries. By selecting those features suitable to the specific service or need, this Standard may be used to develop effective joint assembly procedures for the broad range of sizes and service conditions normally encountered in industry.

Users [see [para. 2\(b\)](#)] of this Standard are cautioned that the content contained in ASME PCC-1 has been developed generically and may not necessarily be suitable for all applications. Precautionary considerations are provided in some cases but should not be considered as all-inclusive. Sound engineering judgment and practices should be used to determine the applicability of a specific method or part of a method to a specific application. Each joint assembly procedure should be subject to an appropriate review by qualified personnel. While this Standard covers joint assembly within the scope of ASME Pressure Technology Codes and Standards, it may be used on equipment constructed in accordance with other codes and standards.

Guidance on troubleshooting BFJAs not providing leak-tight performance is also provided in this Standard (see [Nonmandatory Appendix P](#)).

2 INTRODUCTION

(a) *Intent.* A BFJA is a complex mechanical device; therefore, BFJAs that provide leak-free service result from many selections and activities having been made and performed within a relatively narrow band of acceptable limits. One of the activities essential to leak-free performance is the joint assembly process. The content outlined in this Standard covers the assembly elements essential for a high level of leak-tightness integrity of otherwise properly designed and constructed BFJAs. Users should develop written assembly procedures based on the owner's requirements, incorporating the

features contained herein that are deemed suitable to the specific application under consideration. Alternative features and methods for specific applications may be used subject to endorsement by the owner.

(b) *User.* The user is defined as any entity that applies the provisions of this Standard. The user could be the owner, owner's representative, manufacturer, fabricator, erector, or other contract personnel. The specific assignment of responsibilities among these entities is outside the scope of this Standard. As a result, this Standard is silent when assigning specific provisions to a single entity.

(c) *Owner and Representative.* Within the context of this Standard, "owner" and "representative" are defined as follows:

owner: the person, partnership, organization, or business responsible for the leak tightness of BFJAs on their pressure equipment.

representative: a person, partnership, organization, or business designated by the owner to carry out selected responsibilities on the owner's behalf.

(d) Responsibilities

(1) *Owner.* The owner is responsible for establishing the requirements for assembly, examination, inspection, and testing of BFJAs on their pressure equipment. The owner may designate a representative to carry out selected responsibilities in establishing such requirements; however, the owner retains ultimate responsibility for the actions of the representative.

NOTE: Within the context of this Standard, the term "owner" includes the owner and the owner's representative, as recorded in either the contract documents or the written assembly procedures [see [para. 13\(a\)](#)].

(2) *Assembler.* The assembler (see [Mandatory Appendix I](#)) of piping, pipelines, or equipment containing BFJAs is responsible for providing workmanship in conformance to the requirements of the assembly procedure.

(e) *Organization of This Standard.* The main body of this Standard covers the following topic areas associated with the BFJA assembly process:

- (1) scope and introduction
- (2) training and qualification of bolted joint assembly personnel
- (3) cleaning of gasket seating surfaces of flanges

¹ Rules for the design of bolted flanges with ring-type gaskets are covered in ASME Boiler and Pressure Vessel Code (ASME BPVC), Section VIII, Division 1, Mandatory Appendix 2. See also ASME BPVC, Section VIII, Division 1, Nonmandatory Appendix S for supplementary considerations for bolted flanges that are helpful to the designer of Mandatory Appendix 2 flanges.