ASME PCC-1–2019

(Revision of ASME PCC-1–2013)

Guidelines for Pressure Boundary Bolted Flange Joint Assembly

AN AMERICAN NATIONAL STANDARD

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Two Park Avenue • New York, NY • 10016 USA

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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 non-nuclear 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, Guidelines for Pressure Boundary Bolted Flange Joint Assembly, provides guidance and is applicable to both new and in-service 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. If it is determined that repairs are required, 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.

The first edition of ASME PCC-1 was approved for publication in 2000. The 2010 revision was approved by the American National Standards Institute (ANSI) as an American National Standard on January 14, 2010. The 2013 revision 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. This 2019 revision contains a number of updates. The most notable of these updates are 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." This revision was approved by ANSI as an American National Standard on January 17, 2019.

ASME PRESSURE TECHNOLOGY POST CONSTRUCTION COMMITTEE

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

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CORRESPONDENCE WITH THE PCC COMMITTEE

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, PCC Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
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 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-1–2019
SUMMARY OF CHANGES

Following approval by the ASME PCC Committee and ASME, and after public review, ASME PCC-1–2019 was approved by the American National Standards Institute on January 17, 2019.

ASME PCC-1–2019 includes the following changes identified by a margin note, **(19)**.

Page	*Location*	*Change*
1	1	First paragraph editorially revised
1	4	(1) Subparagraphs (a), (a)(2), (b), (c), and (c)(1) revised
		(2) Tables 1M and 1 deleted and subsequent tables redesignated
3	7	(1) Second paragraph and subparas. (b) and (d) revised
		(2) Subparagraphs (e) and (f) deleted and subpara. (g) redesignated as (e)
3	8.2	(1) Revised
		(2) Footnote 6 added and subsequent footnotes redesignated
4	9.1	Editorially revised
4	10	Note deleted
8	Table 2	Formerly Table 3, Notes editorially revised
9	12	Revised in its entirety
9	13	Final paragraph revised
10	14.2	Subparagraph (f) and third paragraph following subpara. (p) revised
11	Table 3.1	Formerly Table 4.1, General Note added
13	15	Third and final paragraphs revised
14	15.1	Revised in its entirety
14	16.2	Revised
14	16.3	Revised
14	16.4	Revised
15	16.5	Revised
17	16.6	Address of AWS updated
17	16.7	Revised
17	16.8	Revised
17	16.10	Revised
17	16.11	Revised
17	16.12	Revised
17	16.13	Added and subsequent paragraphs redesignated
17	16.15	Formerly 16.14, revised
17	16.16	Formerly 16.15, revised
21	A-1.2	Definition of *senior bolting assembler* moved for alphabetical order
22	A-1.3.1	Revised

Page	*Location*	*Change*
22	A-1.3.2	Revised
22	A-1.3.3	Revised
22	A-1.3.5	Revised
29	A-2.4	Editorially revised
29	A-2.4.1	Subparagraph (a)(2) revised
32	A-4.3.1	Subparagraph (c) revised
33	A-5.3.4	Revised
36	B-3	Added
38	D-1	(1) Revised
		(2) Footnote 1 revised
39	Figure D-1	Revised
42	Figure D-5	Revised
45	F-1	Note revised
46	Table F-1	Revised
49	Figure F-3	General Notes editorially revised to numbered Notes
50	F-1.5	Subparagraphs (a) and (b) revised
51	Figure F-6	General Notes (a) and (b) revised
52	Figure F-7	Pass 1a and Pass 1b revised
53	Figure F-8	Pass 1a and Pass 1b revised
54	Figure F-9	Pass 1a and Pass 1b revised
56	Figure F-11	Pass 1a and Pass 1b revised
58	Appendix G	Deleted
59	Appendix H	Revised in its entirety
64	Appendix K	Paragraph following nomenclature revised
66	M-1.3	Revised
66	Table M-1	(1) Title and Notes (1) and (2) revised
		(2) Note (3) added
67	M-1.6	Revised
67	M-2.1.2	Subparagraph (e) added
67	M-2.3.2	(1) Revised
		(2) Footnote 1 added
67	M-2.5	Revised in its entirety
68	M-2.9.2	Revised
68	M-2.10.2	Revised
68	Table M-2	(1) Note (1) deleted and subsequent Notes redesignated
		(2) Notes (2) and (3) [formerly (3) and (4)] revised
		(3) Note (4) added
70	Table M-5	Revised
71	N-2	Subparagraph (k)(5) revised in its entirety
73	O-1.1	Second paragraph added
73	O-1.3	T_i added to nomenclature
74	O-3.2	(1) Two paragraphs following eq. (O-2) added
		(2) Third paragraph following eq. (O-2), and eq. (O-3) revised
74	O-4.1	(1) Subparagraph (c) revised

Page	*Location*	*Change*
		(2) Tables O-1M through O-7 redesignated as Tables O-4.1-1M through O-4.1-7
77	Table O-3.2-1M	Added
78	Table O-3.2-1	Added
75	O-4.2	(1) Numerator in eq. (O-8) revised
		(2) Tables O-8 and O-9 redesignated as Tables O-4.2-1 and O-4.2-2
76	O-4.3	Revised
81	Table O-4.1-3	Formerly Table O-3, title revised
84	Table O-4.1-7	Formerly Table O-7, title revised
85	Table O-4.2-1	Formerly Table O-8, title revised
86	Table O-4.2-2	Formerly Table O-9, title revised
93	Table P-1	Revised
96	Appendix Q	Added

GUIDELINES FOR PRESSURE BOUNDARY BOLTED FLANGE JOINT ASSEMBLY

(19) 1 SCOPE

These guidelines for bolted flange joint assemblies (BFJAs) apply principally to pressure-boundary flanged joints with ring-type gaskets that are entirely within the circle enclosed by the bolt holes and with no contact outside this circle.[1] These guidelines may be selectively applied to other joint geometries. By selection of those features suitable to the specific service or need, these guidelines may be used to develop effective joint assembly procedures for the broad range of sizes and service conditions normally encountered in industry.

Users are cautioned that the guidelines contained in ASME PCC-1 have been developed generically and are recommended for general applications. They 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 practices and judgment 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 guideline 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 document (see Appendix P).

2 INTRODUCTION

A BFJA is a complex mechanical device; therefore, BFJAs that provide leak-free service are the result of many selections/activities having been made/performed within a relatively narrow band of acceptable limits. One of the activities essential to leak-free performance is the joint assembly process. The guidelines outlined in this document cover the assembly elements essential for a high level of leak-tightness integrity of otherwise properly designed/constructed BFJAs. It is recommended that written procedures, incorporating the features of these guidelines that are deemed suitable to the specific application under consideration, be developed for use by the joint assemblers. Alternative features and methods for specific applications may be used subject to endorsement by the user.

NOTE: Within the context of this Guideline, the term “user” includes the user and their authorized agent, as recorded in either the contract documents or the written assembly procedures (see para. 14.1).

3 TRAINING AND QUALIFICATION OF BOLTED JOINT ASSEMBLY PERSONNEL

It is recommended that the user provide, or arrange to have provided, as appropriate, essential training and qualification in accordance with Appendix A of the bolted joint assembly personnel who will be expected to follow procedures developed from this Guideline.

See section F-2 of Appendix F for comments on accepting flange joint assembly procedures not currently listed in these guidelines.

The qualification of assemblers in accordance with Appendix A may be considered portable subject to the guidance in para. A-5.3.5.

4 CLEANING AND EXAMINATION OF FLANGE AND FASTENER CONTACT SURFACES (19)

Before assembly is started, clean and examine flange and fastener contact surfaces as described in this section.

With one exception, remove all indications of the previous gasket installation from the gasket contact surfaces; use approved solvents and/or soft-wire brushes, if required, for cleaning to prevent surface contamination and damage to existing surface finish. Avoid using carbon steel brushes on stainless steel flanges.

The exception based on experience is residual flexible graphite that may remain in the surface finish grooves when either a flexible graphite clad or a spiral-wound gasket with flexible graphite filler is to be used as the replacement gasket.

(a) Examine the gasket contact surfaces of both mating joint flanges for compliance with recommended surface finish (see Appendix C) and for damage to surface finish such as scratches, nicks, gouges, and burrs. Indications running radially across the facing are of particular concern. Refer to sections D-2 and D-3 of Appendix D for guidelines covering recommended limits on gasket contact surface imperfections and their locations.

(1) It is recommended that surface-finish comparator gages be available to joint assembly personnel.

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