ASME PCC-1–2010
(Revision of ASME PCC-1–2000)

# Guidelines for Pressure Boundary Bolted Flange Joint Assembly

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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SETTING THE STANDARD



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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this document. Interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.



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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 possibly 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. *Guidelines for Pressure Boundary Bolted Flange Joint Assembly* (PCC-1) provides guidance and is applicable to both new and in-service bolted flange joint assemblies. The *Inspection Planning Using Risk-Based Methods* Standard (PCC-3) 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 the *Fitness-For-Service* Standard (API 579-1/ASME FFS-1). If it is determined that repairs are required, guidance on repair procedures is provided in the appropriate portion of the *Repair of Pressure Equipment and Piping* Standard (PCC-2). To provide all stakeholders involved in pressure equipment with a guide to identify publications related to pressure equipment integrity, a *Guide to Life Cycle Management of Pressure Equipment Integrity* has been prepared (PTB-2).

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 NB-23, and with jurisdictional requirements.

The first edition of ASME PCC-1, *Guidelines for Pressure Boundary Bolted Flange Joint Assembly*, was approved for publication in 2000. This revision was approved by ANSI as an American National Standard on January 14, 2010.

# 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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# GUIDELINES FOR PRESSURE BOUNDARY BOLTED FLANGE JOINT ASSEMBLY

## 1 SCOPE

The bolted flange joint assembly (BFJA) guidelines described in this document apply 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] 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.

Guidance on troubleshooting BFJAs not providing leak-tight performance is also provided in this document (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 or his designated agent.

## 3 TRAINING, QUALIFICATION, AND CERTIFICATION OF JOINT ASSEMBLY PERSONNEL

It is recommended that the user or his designated agent provide, or arrange to have provided, as appropriate, essential training and qualification testing of the joint assembly personnel who will be expected to follow procedures developed from this Guideline. Notes regarding qualifying flanged joint assemblers are provided in Appendix A.

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

## 4 CLEANING AND EXAMINATION OF FLANGE AND FASTENER CONTACT SURFACES

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 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 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.

*(2)* Report any questionable imperfections for appropriate disposition. If weld repair of imperfections is deemed to be required, see ASME PCC-2, Article 3.5 for repair considerations. Appendix C provides recommended final surface finishes.

*(b)* When working with problematic or critical service [see Note (1) of Table 3] flanges of large diameter with leak histories or suspect fabrication, it is recommended to check gasket contact surfaces of both joint flanges for flatness, both radially and circumferentially. This may be accomplished in many cases using a machinist's straight edge and feeler gages, but using a securely mounted run-out gage or field machining equipment capable of

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