The American Society of
Mechanical Engineers

AN AMERICAN NATIONAL STANDARD

GUIDELINES FOR PRESSURE BOUNDARY BOLTED FLANGE JOINT ASSEMBLY

ASME PCC-1—2000

Date of Issuance: February 28, 2001

There will be no addenda issued to this 2000 edition. The next edition of this Standard is scheduled for publication in 2003.

ASME will issue written replies to inquiries concerning interpretations of technical aspects of this Standard.

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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. The *Inspection Planning Standard* provides guidance on the preparation of a risk-based inspection plan. Defects that are identified are then evaluated, when appropriate, using the procedures provided in the *Flaw Evaluation Standard*. Finally, if it is determined that repairs are required, guidance on repair procedures is provided in the appropriate *Repair of Pressure Equipment and Piping Standard*. These documents are in various stages of preparation.

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. ASME PCC-1–2000 was approved by ANSI as an American National Standard on November 15, 2000.

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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 the process industries.

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 consistent leak-tight performance 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.

3 QUALIFICATION

The user or his designated agent should provide, or arrange to have provided, as appropriate, essential training and qualification testing of the joint assemblers who will be expected to follow procedures developed from this Guideline. Qualification of the selected joint assembly procedure may be appropriate for critical applications.

Appendix A provides some notes on qualifying flanged joint assemblers.

Appendix B provides a recommended flanged joint assembly procedure qualification test.

4 EXAMINATION OF "WORKING" SURFACES

Clean and examine all "working" surfaces before assembly is started.

(a) Examine the gasket contact surfaces of both joint flanges for appropriate 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. Report any questionable imperfections for appropriate disposition.

(b) Check gasket contact surfaces of both joint flanges for flatness, both radially and circumferentially. Report any questionable results.

Appendix D provides a recommendation for flatness tolerance.

(c) Examine bolt[2] and nut threads and washer faces of nuts for damage such as rust, corrosion, and burrs; replace questionable parts. If separate washers[3] are scored or cupped from previous use, replace with new through-hardened washers (surface-hardened washers are not suitable). Previously used bolts should be thoroughly cleaned (such as wire brushing) before being reused.

(d) Examine nut-bearing surfaces of flanges for scores, burrs, etc.; remove protrusions, spot-face if required.

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[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-2 for supplementary design considerations for bolted flanges, the implementation of which is recommended for custom flanges designed in accordance with Mandatory Appendix 2.

[2] "Bolt" as used herein is an all-inclusive term for any type of threaded fastener that may be used in a pressure-boundary BFJA such as a bolt, stud, studbolt, cap screw, etc.

[3] Use of washers is optional. However, it is generally recognized that the use of through-hardened steel washers will improve the translation of torque input into residual bolt stretch. See Notes on indicator bolt specification sheets, Figs. 1 and 2, for a through-hardened washer specification.