ASME B31P-2023
(Revision of ASME B31P-2017)

Standard Heat Treatments for Piping

ASME Code for Pressure Piping, B31

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

In 2011, the B31 Standards Committee for Pressure Piping determined that more consistency was needed between the B31 Code Sections regarding preheat and postweld heat treatment (PWHT) rules. The B31 Fabrication & Examination Technical Committee decided that a B31 Standard covering these rules would be the best way to provide this consistency; a proposal was developed, which was accepted by the B31 Standards Committee and the BPTCS.

This Standard is intended to provide requirements for preheating and PWHT when mandated by the applicable Code Section or by the engineering design being used. While the Code Sections provide only preheat and PWHT rules for ferrous materials, this Standard may provide expanded rules and alternatives for a wider variety of materials, although all materials that may be possible to use may not be covered.

Under direction of ASME Standards and Certification, both U.S. Customary and SI units are provided.

Following approval by the B31 Committee and ASME, and after public review, ASME B31P-2017 was approved by the American National Standards Institute on November 15, 2017.

Following approval by the B31 Committee and ASME, and after public review, ASME B31P-2023 was approved by the American National Standards Institute on July 21, 2023.

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Code for Pressure Piping

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Revisions and Errata. The committee processes revisions to this Standard on a continuous basis 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 in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Standard.

(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number

(4) the editions of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

Interpretations. Upon request, the committee will issue an interpretation of any requirement of this Standard. An interpretation can be issued only in response to a request submitted through the online Interpretation Submittal Form at https://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic e-mail confirming receipt.

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 information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers can track the status of their requests at https://go.asme.org/Interpretations.

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Committee Meetings. The B31 Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at https://go.asme.org/B31committee.

ASME B31P-2023
SUMMARY OF CHANGES

Following approval by the ASME B31 Committee and ASME, and after public review, ASME B31P-2023 was approved by the American National Standards Institute on July 21, 2023.

The title of ASME B31P has been revised from "Standard Heat Treatments for Fabrication Processes" to "Standard Heat Treatments for Piping." In addition, ASME B31P-2023 includes the following changes identified by a margin note, **(23)**.

Page	*Location*	*Change*
1	1	Revised in its entirety
3	5.3	Subparagraph (d) revised
4	Table 5.1-1	Editorially revised
4	6.1.1	First and last sentences revised
5	Table 6.1.1-1	Revised
8	6.2	Subparagraph (b) revised
8	6.3.1	First paragraph revised
9	7.1.3	Added
9	8	First paragraph revised
10	A-2	Revised
21	B-5.6	In subparas. (a) and (b)(2), cross-references to Forms updated
22	Form B-5.6-1	(1) Former Form 1 redesignated (2) In Item 19, cross-reference updated
25	Form B-5.6-2	(1) Former Form 2 redesignated (2) In Item 1, cross-reference updated

STANDARD HEAT TREATMENTS FOR PIPING

(23) ## 1 INTRODUCTION

1.1 Scope

This Standard provides requirements for heat treatment of piping and pipelines that meet the requirements of the ASME B31 Code Sections. These requirements apply to

(a) preheating

(b) postweld heat treatment (PWHT)

(c) postforming heat treatment (PFHT) required by the ASME B31 Code Sections for other fabricated assemblies, including forming operations such as bending

(d) heat treatments required by contract documents

1.2 General

The heat treatments addressed in this Standard include weld preheating, PWHT, PFHT, and heat treatment to enhance material properties resulting from fabrication. Preheating is generally required on hardenable steels to reduce local hardness or to reduce the occurrence of hydrogen cracking. Preheat is typically required based on both hardenability (as indicated by the P-Number) and thickness at the weld. A minimum temperature for all materials prior to initiating a weld is expected to be needed to reduce the possibility of condensation. It should be noted that preheat is not considered a heat treatment, but it is a requirement of the ASME B31 Code Sections.

PWHT is generally required on hardenable steels to temper any hardened areas or to reduce residual stress in the weldment. PFHT may be used to address reduction of the properties within the bend after hot bending or to address the effects of strain after cold bending (the additional strain may cause a degradation of creep rupture properties when the operation is at high temperatures). In some cases of PWHT, PFHT, or material heat treatments, non-standard heat treatment may be required by the contract specification, e.g., an austenitizing heat treatment or a solution heat treatment.

This Standard is intended to provide consistent code heat treatment rules. It may be incorporated by reference in a code, or it can become a basis for code or contract requirements.

Appendices provide more-specific controls that may be needed or desired for specific applications. These specific controls are not mandatory unless specified.

Appendices are also included that outline alternative methods to exempt PWHT of welds when PWHT is difficult or impossible. The alternatives are required to be addressed within Welding Procedure Specifications (WPS) qualified in accordance with the industry standard specified by the referencing code, specification, or standard.

1.3 Exclusions

The requirements for the heat treatments done in accordance with material or product specifications are not addressed within this Standard. Such heat treatments are governed by those specifications.

1.4 Units of Measure

Either U.S. Customary or SI (metric) units may be used with this Standard. Local customary units may also be used to demonstrate compliance with this Standard. One system of units should be used consistently for requirements applying to a specific installation.

This Standard states values in both U.S. Customary and SI units. Within the text, the SI units are shown in parentheses; within tables, the SI units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system of units should be used independently of the other.

When necessary to convert from one system of units to another, conversion should be made by rounding the values to the number of significant digits of implied precision in the starting value but to not less than four significant digits for use in calculations.

2 GLOSSARY

creep strength enhanced ferritic (CSEF) steel: steel in which the microstructure, consisting of lower transformation products, e.g., martensite or bainite, is stabilized by controlled precipitation of temper-resistant carbides, carbonitrides, and/or nitrides.

heat treatments:

annealing, full: heating a metal to a temperature above the transformation temperature range and holding it above that range for a proper period of time, followed by cooling to below that range.

austenitizing: heat treatment where a partial or complete phase transformation to austenite occurs.