

ASME B31G-2012
(Revision of ASME B31G-2009)

Manual for Determining the Remaining Strength of Corroded Pipelines

**Supplement to ASME B31 Code for
Pressure Piping**

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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CONTENTS

Foreword	iv
Committee Roster	v
Correspondence With the B31 Committee	vi
Summary of Changes	vii
1 Introduction	1
2 Evaluation Methods	6
3 Tables of Allowable Length of Corrosion	8
Figures	
1.12-1 Corrosion Pit Interaction Distances	5
1.13-1 Helically Oriented Corrosion Pattern	5
2.1-1 Corrosion Parameters Used in Analysis	7
Tables	
3-1 Values of <i>L</i> for Pipe Sizes ≥ NPS 2 and < NPS 6	9
3-1M Values of <i>L</i> for Pipe Sizes ≥ 60 mm and < 168 mm O.D.	9
3-2 Values of <i>L</i> for Pipe Sizes ≥ NPS 6 and < NPS 10	10
3-2M Values of <i>L</i> for Pipe Sizes ≥ 168 mm and < 273 mm O.D.	11
3-3 Values of <i>L</i> for Pipe Sizes ≥ NPS 10 and < NPS 16	12
3-3M Values of <i>L</i> for Pipe Sizes ≥ 273 mm and < 406 mm O.D.	13
3-4 Values of <i>L</i> for Pipe Sizes ≥ NPS 16 and < NPS 20	14
3-4M Values of <i>L</i> for Pipe Sizes ≥ 406 mm and < 508 mm O.D.	15
3-5 Values of <i>L</i> for Pipe Sizes ≥ NPS 20 and < NPS 24	16
3-5M Values of <i>L</i> for Pipe Sizes ≥ 508 mm and < 610 mm O.D.	17
3-6 Values of <i>L</i> for Pipe Sizes ≥ NPS 24 and < NPS 30	18
3-6M Values of <i>L</i> for Pipe Sizes ≥ 610 mm and < 762 mm O.D.	19
3-7 Values of <i>L</i> for Pipe Sizes ≥ NPS 30 and < NPS 36	20
3-7M Values of <i>L</i> for Pipe Sizes ≥ 762 mm and < 914 mm O.D.	21
3-8 Values of <i>L</i> for Pipe Sizes ≥ NPS 36 and < NPS 42	22
3-8M Values of <i>L</i> for Pipe Sizes ≥ 914 mm and < 1 066 mm O.D.	23
3-9 Values of <i>L</i> for Pipe Sizes ≥ NPS 42 and < NPS 48	24
3-9M Values of <i>L</i> for Pipe Sizes ≥ 1 066 mm and < 1 219 mm O.D.	27
3-10 Values of <i>L</i> for Pipe Sizes ≥ NPS 48 and < NPS 52	30
3-10M Values of <i>L</i> for Pipe Sizes ≥ 1 219 mm and < 1 320 mm O.D.	33
3-11 Values of <i>L</i> for Pipe Sizes ≥ NPS 52 and < NPS 56	36
3-11M Values of <i>L</i> for Pipe Sizes ≥ 1 320 mm and < 1 422 mm O.D.	39
3-12 Values of <i>L</i> for Pipe Sizes ≥ NPS 56 Through NPS 60	42
3-12M Values of <i>L</i> for Pipe Sizes ≥ 1 422 mm Through 1 524 mm O.D.	45

FOREWORD

It has been recognized within the pipeline industry that some sections of high-pressure pipelines, particularly those with long service histories, may experience corrosion. It has also been recognized, through theoretical analysis, scientific research and testing, and industry operating experience, that some amount of metal loss due to corrosion can be tolerated without impairing the ability of the pipeline to operate safely. In 1984, ASME published the first edition of the B31G Manual for Determining the Remaining Strength of Corroded Pipelines. The B31G document provided pipeline operators with a simplified evaluation method based on the results of analysis and tests. The application of B31G has enabled pipeline operators to reliably determine safe operating pressure levels for pipe affected by corrosion, and to determine whether repairs are necessary in order to continue operating safely.

B31G continued to be reissued by ASME with only minor revisions over time, although other corrosion evaluation methods had evolved since B31G's initial publication. A majority of these other methods are based on the same theoretical model from which the original B31G method was derived, but may offer some refinement in accuracy. Subsequently, an effort was undertaken to update the B31G document to recognize certain other corrosion evaluation methods that have proven sound and that have seen successful use in the pipeline industry. Incorporation of these other methods into a recognized Code document provides the pipeline operator or other user with a formalized framework within which to use such methodologies, as well as a wider range of codified technical options with which to make an evaluation. The 2009 revision of B31G reflected those objectives.

The 2012 edition of B31G was approved by the American National Standards Institute (ANSI) on September 20, 2012.

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Code for Pressure Piping

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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, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B31 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

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 for the purpose of providing 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, 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 B31 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 B31 Standards Committee.

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.
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. 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 this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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 B31 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B31 Standards Committee.

ASME B31G-2012

SUMMARY OF CHANGES

Following approval by the B31 Committee and ASME, and after public review, ASME B31G-2012 was approved by the American National Standards Institute on September 20, 2012.

Changes given below are identified on the pages by a margin note, **(12)**, placed next to the affected area.

<i>Page</i>	<i>Location</i>	<i>Change</i>
2	1.5	In the nomenclature, definition of P_F revised
7	2.3	First sentence revised
9	Table 3-1	In eighth column, second entry revised
	Table 3-1M	In eighth column, second entry revised
10	Table 3-2	In fifth column, second entry revised
11	Table 3-2M	In fifth column, second entry revised
14	Table 3-4	In second column, first entry revised
15	Table 3-4M	In second column, first entry revised
22	Table 3-8	In third column, first entry revised
23	Table 3-8M	In third column, first entry revised

SPECIAL NOTES:

The interpretations to ASME B31G are included in this edition as a separate section for the user's convenience.

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MANUAL FOR DETERMINING THE REMAINING STRENGTH OF CORRODED PIPELINES

1 INTRODUCTION

1.1 Scope

This document is intended solely for the purpose of providing guidance in the evaluation of metal loss in pressurized pipelines and piping systems. It is applicable to all pipelines and piping systems within the scope of the transportation pipeline codes that are part of ASME B31 Code for Pressure Piping, namely: ASME B31.4, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids; ASME B31.8, Gas Transmission and Distribution Piping Systems; ASME B31.11, Slurry Transportation Piping Systems; and ASME B31.12, Hydrogen Piping and Pipelines, Part PL. Where the term *pipeline* is used, it may also be read to apply to piping or pipe conforming to the acceptable applications and within the technical limitations discussed below.

1.2 Acceptable Applications

The application of this document is limited to the evaluation of wall loss in metal pipe within the following limitations:

- (a) metal loss in pipelines located belowground, aboveground, or offshore
- (b) metal loss due to external or internal corrosion
- (c) metal loss produced by grinding where used to completely remove mechanical damage, cracks, arc burns, manufacturing defects, or other defects from the pipe surface
- (d) metal loss in field bends, induction bends, and elbows
- (e) metal loss that incidentally affects longitudinal or helical electric seam welds or circumferential electric welds of sound quality and having ductile characteristics, provided workmanship flaws are not present in sufficiently close proximity to interact with the metal loss
- (f) metal loss of any depth with respect to the pipe wall, except that due consideration shall be given to the accuracy of measurements and effective corrosion rates when the depth of metal loss exceeds 80% of the actual pipe wall dimension
- (g) metal loss in new pipe where allowed by the applicable code of construction

(h) metal loss in pipe material having ductile fracture initiation characteristics [see paras. 1.7(e) and (f)] unless using a Level 3 assessment in accordance with paras. 2.2(b) and 2.4

(i) metal loss in pipe operating at temperatures above ambient within the range of operating temperature recognized by the governing standard, and provided material strength properties at temperature are considered

(j) metal loss in pipe operating at any level of allowable design hoop stress [see paras. 1.4(a) and (b) for additional considerations]

(k) metal loss in pipe where internal pressure is the primary loading [see paras. 1.4(c) and (d) for additional considerations]

1.3 Exclusions

This document does not apply to the following:

- (a) crack-like defects or mechanical surface damage not completely removed to a smooth contour by grinding
- (b) metal loss in indentations or buckles resulting in radial distortion of the pipe wall larger than 6% of the pipe outside diameter, unless a Level 3 assessment is performed in accordance with para. 2.4
- (c) grooving corrosion, selective corrosion, or preferential corrosion affecting pipe seams or girth welds
- (d) metal loss in fittings other than bends or elbows
- (e) metal loss affecting material having brittle fracture initiation characteristics [see paras. 1.7(e) and (f)] unless a Level 3 assessment is performed in accordance with para. 2.4
- (f) pipe operating at temperatures outside the range of operating temperature recognized by the governing standard or operating at temperatures in the creep range

1.4 Additional Considerations

The user is cautioned that additional considerations may apply in certain situations, described below.

(a) Pipe operating at low hoop stress levels due to internal pressure (e.g., less than 25% of SMYS) may be perforated by corrosion without inducing structural material failure. The methods and criteria provided herein do not address failure by perforation.

(b) Pipe affected by general corrosion of the pipe wall (i.e., corrosion-caused wall loss over the entire pipe surface) effectively operates at a greater hoop stress than