

EEMUA SUPPLEMENT TO ASME B31.3 - 1996 EDITION

PROCESS PIPING

PUBLICATION No. 153 : 1996

THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

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PROCESS PIPING

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45 Beech Street
London
EC2Y 8AD

Tel 0171 628 7878
Fax 0171 628 7862

e-mail sales@eemua.co.uk
website www.eemua.co.uk



THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

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ACKNOWLEDGEMENTS

The American Society of Mechanical Engineers (ASME)

This Supplement, except for Appendices SA and SB, follows the structure of the B31.3 Code using the same chapter and paragraph headings and numeration. Also, where appropriate, verbatim quotations from the B31.3 text are used to introduce some of the modifications made in the Supplement.

EEMUA is grateful to ASME for granting permission to base this Supplement on the B31.3 Code as described above.

The British Standards Institution (BSI)

Appendix SA, which details requirements for carbon, carbon-manganese and some low alloy steel piping for application at temperatures below 0°C, is based on BS 5500 : 1994, Appendix D. Figures SA(1) to SA(3) are also based on figures given in Appendix D. EEMUA is grateful to BSI for permitting the use of this material.

THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

EEMUA SUPPLEMENT TO ASME B31.3—1996 EDITION

PROCESS PIPING

PUBLICATION No. 153 : 1996

AMENDMENTS No. 1, MAY 1997

PREAMBLE

ASME B31.3a—1996 Addenda was issued on 1.10.96 and became effective on 1.4.97.

BS 5500 : 1997 was issued on 1.1.97 and became effective on 15.1.97. Appendix SA of the EEMUA Supplement, which deals with low temperature applications, is based on Annex D of the British Standard.

Set out below are the amendments to the EEMUA Supplement arising from the issue of the above. These are purely of an editorial nature — none of the technical changes affect the Supplement.

It should however be noted that B31.3a does contain important technical changes: reference should be made to that document.

AMENDMENTS

- 1/1 Pages v, 1, 39, 40, 49, 50 and 51. As appropriate, *substitute*:
‘BS 5500 : 1997’ for ‘BS 5500 : 1994’, and
‘Annex’ [D] for ‘Appendix’ [D].
- 1/2 Page 1, 3rd para., 1st line, and 4th para. After ‘Edition’ *add*:
‘and ASME B31.3a—1996 Addenda’.
- 1/3 Page 1, 6th para., 2nd & 3rd lines; and page 39, 1st & 2nd lines. *Delete* brackets and words therein, and *substitute*: ‘Issue 1, January 1997’.
- 1/4 Pages 49 to 51 footnotes. As appropriate, *substitute*:
‘D.1’ for ‘D.3(1)’
‘D.2’ for ‘D.3(2)’
‘D.3’ for ‘D.3(3)’ and
‘D.4’ for ‘D.3(4)’.

EEMUA
7th May, 1997

THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

EEMUA SUPPLEMENT TO ASME B31.3—1996 EDITION PROCESS PIPING PUBLICATION No. 153 : 1996

AMENDMENTS No. 2, MARCH 1998

PREAMBLE

ASME B31.3b—1997 Addenda was issued on 22.9.97 and became effective on 22.3.98.

BS 5500 : 1997, issued on 1.1.97, became effective on 15.1.97. Four Amendments have since been issued, the last on 15.1.98. Appendix SA of the EEMUA Supplement, which deals with low temperature applications, is based on Annex D of that British Standard.

Set out below are the amendments to the EEMUA Supplement arising from the issue of the latest Addenda/ Amendments of the base standards. These are purely of an editorial nature — none of the technical changes affect the Supplement.

It should however be noted that B31.3b does contain important technical changes: reference should be made to that document.

AMENDMENTS

- 2/1 Pages v, 1 and 39 as amended by EEMUA Amendments No 1, May 1997. As appropriate, after 'BS 5500 : 1997' *add*:

'(incorporating Amendments Nos 1 to 4)'
- 2/2 Page 1, 3rd para., 1st line, and 4th para., as amended by EEMUA Amendments No 1, May 1997. *Change* references to ASME B31.3 to:

'ASME B31.3—1996 Edition including B31.3a—1996 and B31.3b—1997 Addenda'.

EEMUA
23rd March, 1998

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FOREWORD

This Supplement relates to the use, in the United Kingdom, of American National Standard ASME B31.3, *Process Piping* (formerly *Chemical Plant and Petroleum Refinery Piping*).

United Kingdom practice has been to follow the requirements, in general, of ASME B31.3. This Supplement makes certain modifications to ASME B31.3 to allow for the use of British Standard Specifications and to cover situations where UK practice does not follow that of the USA. It also gives detailed requirements of UK practice for piping in carbon, carbon-manganese and some low alloy steels for application at temperatures below 0°C.

This Supplement shall be read in conjunction with ASME B31.3-1996 Edition which governs except as modified by this Supplement. It covers those modifications necessary to adapt ASME B31.3-1996 to meet the minimum requirements of EEMUA member companies.

Wherever 'B31.3' or 'the Code' is used in this Supplement it shall mean ASME B31.3-1996 Edition.

To assist in using this Supplement in conjunction with B31.3, the modifications are identified by the reference number of the clause of B31.3 affected.

Requirements for piping in carbon, carbon-manganese and some low alloy steels for application at temperatures below 0°C are based on BS 5500 : 1994 Appendix D (including all amendments up to and including Amendment No. 4, July 1996) to which reference may be made for information regarding the background and basis of such requirements. Figures SA(1), SA(2) and SA(3) are based on figures given in that Appendix.

Non-metallic piping is not covered by this Supplement; however see p. 19.

This Supplement requires that the materials, construction methods, workmanship, and examination and inspection practices for process piping shall be assessed and specified on a case-by-case basis to ensure the required level of integrity of the piping is achieved. The classification of Fluid Service into Categories D and M is therefore not appropriate — see amendments to 300(d) and Chap. VIII.

It is intended to keep this Supplement updated in line with revisions of B31.3 and of Appendix D of BS 5500.

British Standards and American National Standards are obtainable from Customer Services, BSI Standards, 389 Chiswick High Road, London W4 4AL, tel 0181 996-7000, fax -7001.

CHAPTER I: SCOPE AND DEFINITIONS

300 GENERAL STATEMENTS

300(a) *Identification*

Add at end:

This Section of the Code is to be read in conjunction with EEMUA Publication No. 153 : 1996, referred to herein as the 'EEMUA Supplement'.

300(b) *Responsibilities*

Delete last sentence of (I) and substitute:

The classification of Fluid Service into Categories D and M is therefore not appropriate — see amendments to 300(d) and to Chap. VIII.

300(d) *Determining Code Requirements*

Add at end of (I):

As required by the EEMUA Supplement, the materials, construction methods, workmanship, and examination and inspection practices shall be assessed and specified on a case-by-case basis to ensure the required level of integrity of the piping is achieved.

300.4 Status of Appendices

In Table 300.4 for Appendix M, under 'Status' change 'Guidance' to 'Not applicable'.

CHAPTER II: DESIGN

301 DESIGN CONDITIONS

301.1 General

Add:

The design of piping systems shall provide for the most severe condition of coincident loadings due to temperature, pressure and forces except as provided in 302.2.4. Where two or more distinct conditions occur they shall be separately evaluated using the appropriate design pressure, design temperature and loadings applicable to each case.

Note. The most severe condition is that which results in the greatest required component thickness and highest component rating.

301.2 Design Pressure

301.2.1 General

Delete sub-paras (a) and (b) and substitute:

(a) The design pressure of each component in a piping system shall, when the pressure

- (i) is not limited by a pressure relieving device, be not less than the maximum pressure which can be attained in service
- (ii) is limited by a pressure relieving device, be not less than the pressure which will exist in the piping system when the pressure relieving device starts to relieve; or the set pressure of the pressure relieving device, whichever is the greater.

The maximum difference in pressure between the inside and outside of any piping component or between chambers of a combination unit, e.g. a jacketed pipe, including the case of loss of external or internal pressure, shall be considered.

The value of the design pressure to be used shall include the static head, where applicable, unless this is taken into account separately.

It is recommended that piping subject to vacuum be designed for an external pressure of 1 bar unless a vacuum break valve or similar device is provided, in which case a lower external design pressure may be used.

(b) [Deleted]

301.3 Design Temperature

Delete first paragraph and substitute:

The design temperature, which is used to determine the appropriate design stress S for the selected material, shall be not less than the actual metal temperature expected in service coincident with the loading case under consideration.

The design temperature shall include an adequate margin to cover uncertainties in temperature prediction.

302 DESIGN CRITERIA**302.3.5(d) Allowable Displacement Stress Range S_A**

Delete opening paragraph and substitute:

Except in the case of carbon, carbon-manganese and some low alloy steel piping systems for application at temperatures below 0°C — see Appendix SA of the EEMUA Supplement — the computed displacement stress range S_E in a piping system (see 319.4.4) shall not exceed the allowable displacement stress range S_A (see 319.2.3 and 319.3.4) calculated by Eq. (1a):

306 FITTINGS, BENDS, MITERS, LAPS, AND BRANCH CONNECTIONS

Add to (a):

Unless otherwise agreed by the owner, fittings shall not be machined from bar stock.

308 FLANGES, BLANKS, FLANGE FACINGS, AND GASKETS**308.2 Specific Requirements for Flanges**

Add opening sentence:

Flanges shall not be machined from bar stock.

308.2.1 Slip-on Flanges

Delete sub-para. (a) and substitute:

Slip-on flanges shall be double welded as in Fig. 328.5.2B in all cases.

314 THREADED JOINTS**314.2.1 Taper-Threaded Joints**

Add:

(e) Pipe threads conforming to BS 21 may be used within the limitations of 314.1 and the pressure-temperature ratings permitted by the relevant British Standard.

319 PIPING FLEXIBILITY**319.2.3 Displacement Stress Range**

Add:

Note. The allowances for pressure and temperature variations contained in 302.2.4 are not applicable to the allowable displacement stress range S_d of 302.3.5(d).

321 PIPING SUPPORT**321.1.5 Threads**

Add:

The use of metric threads on pipe supporting elements is permitted.

322 SPECIFIC PIPING SYSTEMS**322.6 Pressure Relieving Systems**

Delete the first sentence and substitute:

Pressure relieving systems within the scope of this Code, unless otherwise governed by regulation or by the relevant application code, shall conform to the following requirements.

322.6.3 Pressure Relieving Devices

Add sub-paragraph to (a):

Alternatively, when using British Standards, safety valves shall be in accordance with BS 6759 and bursting disc devices in accordance with BS 2915. The set pressures and overpressure of safety valves, the maximum and minimum specified bursting pressures and the coincident temperatures of bursting disc devices, and the maximum pressure in the system during relieving conditions shall comply with the requirements of the relevant application code.

CHAPTER III: MATERIALS

323 GENERAL REQUIREMENTS

Add:

Notwithstanding anything to the contrary in the standards or specifications referenced in B31.3, the following restrictions shall apply:

(1) Chemical Composition (Ladle Analysis)

(a) Carbon and Carbon-Manganese Steels

Carbon	0.23% max. (pipe and plate)
Carbon	0.25% max. (forgings and castings)
Carbon equivalent $(CE)_1$	0.42% max.

where

$$(CE)_1 = C + \frac{Mn}{6}$$

It is recommended that the steelmaker be required to confirm that regular production checks show that the carbon equivalent $(CE)_2$ does not exceed 0.45% for wrought or forged components, or 0.50% for castings for assembly by fusion welding to either castings or wrought steel parts,

where

$$(CE)_2 = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15}$$

Note. If necessary in order to achieve minimum specified strengths, it is permissible to exceed the specified maximum manganese content, as given in the referenced standard or specification, up to a maximum of 1.60% provided the maximum permitted CE is not exceeded.

(b) Carbon-Molybdenum Steels

Carbon	0.23% max. (pipe and plate)
Carbon	0.25% max. (forgings and castings)

Residual elements:

Copper	0.25% max.
Nickel	0.30% max.
Tin	0.03% max.
Chromium	0.25% max.
TOTAL of residual elements shall not exceed	0.70%

(c) Chromium-Molybdenum Steels

Carbon:

- steels with less than 2% Cr (nominal):
 - 0.17% max. (pipe and plate)
 - 0.20% max. (forgings and castings)
- steels with 2% Cr (nominal) and above:
 - 0.15% max. (pipe and plate)
 - 0.15% max. (forgings and castings)

Residual elements:

Copper	0.30% max.
Nickel	0.40% max.
Tin	0.03% max.
TOTAL of residual elements shall not exceed 0.70%	

(d) Materials not satisfying the above criteria shall only be used if agreed by the owner.

(2) Heat Treatment

All forged and cast components complying with (1)(a), (1)(b) and (1)(c) above shall be normalised or normalised and tempered.

(3) Tensile Strength*(a) Carbon, carbon-manganese and carbon-molybdenum steels*

The actual tensile strength of any component shall not exceed the minimum required in the relevant material specification by more than 150 N/mm² (22 ksi).

For steels for application below 0°C, the maximum tensile strength shall not exceed the values given in Table SA(1) of Appendix SA of the EEMUA Supplement.

(b) Chromium-Molybdenum Steels

The actual tensile strength of any component shall not exceed the maximum in the relevant material specification. Where no such limit is imposed, the

following values shall apply:

	Maximum UTS	
	N/mm ²	ksi
1 ¼ Cr-½ Mo e.g. F11, P11	570	83
1 Cr-½ Mo e.g. F12, P12	570	83
2 ¼ Cr-1 Mo e.g. F22, P22	640	93
5 Cr-½ Mo e.g. F5, P5	600	87
9 Cr-1 Mo, e.g. F9, P9	620	90

323.2 Temperature Limitations

Add before existing text:

The temperature limitations for carbon, carbon-manganese and some low alloy steel materials for application below 0°C shall be in accordance with Appendix SA of the EEMUA Supplement. For other metallic materials and the high temperature limitations of those steels covered by Appendix SA, [the designer shall]

323.2.2 Lower Temperature Limits, Listed Materials

Add before existing text:

Except for carbon, carbon-manganese and some low alloy steels (see Appendix SA of the EEMUA Supplement) the following shall apply:

323.2.3 Temperature Limits, Unlisted Materials

Add before existing text:

Except for carbon, carbon-manganese and some low alloy steels for application below 0°C (see Appendix SA of the EEMUA Supplement) [an unlisted material]

323.3 Impact Testing Methods and Acceptance Criteria

323.3.1 General

Add before existing text:

Except for carbon, carbon-manganese and some low alloy steels (see Appendix SA of the EEMUA Supplement) [when impact testing]

CHAPTER V: FABRICATION, ASSEMBLY, AND ERECTION

328 WELDING

328.2.1 Qualification Requirements

Delete paragraph (a) and substitute:

(a) Except as modified herein, qualification of the welding procedures to be used and of the performance of welders and welding operators shall comply with the requirements of Section IX of the *ASME Boiler and Pressure Vessel Code* or, alternatively with the agreement of the owner, of BS EN 287 and BS EN 288 as appropriate. (See Appendix SA of the EEMUA Supplement for impact test requirements of carbon, carbon-manganese and some low alloy steels.)

Note. BS EN 287 Parts 1 and 2, and BS EN 288 Parts 3 and 4 have respectively superseded Parts 1 and 2 of BS 4871 and BS 4870 to which reference was made in previous editions of the EEMUA Supplement. Parts 1 and 2 of the British Standards have been withdrawn.

328.3.2 Weld Backing Material

Delete first sentence and substitute:

When the use of backing rings is agreed with the owner, they shall conform to the following.

328.3.3 Consumable Inserts

Add before existing text:

When agreed with the owner, [consumable inserts]

CHAPTER VI: INSPECTION, EXAMINATION, AND TESTING

340 INSPECTION

340.4 Qualifications of the Owner's Inspector

Delete (b) and substitute:

(b) The owner's Inspector shall have such technical qualifications and/or practical experience as would be appropriate for the proposed duties.

In (c), delete 'qualified' and substitute:

'competent'

341 EXAMINATION

341.3 Examination Requirements

341.3.1 General

Delete first paragraph and substitute:

The type and extent of the required examination shall be agreed with the owner to ensure the required level of integrity of the piping is achieved. Paragraphs 341.4.1, 341.4.2 and 341.4.3 are guidelines to be used when specifying the examination requirements that ensure the required level of integrity is achieved.

341.4.2 Examination — Category D Fluid Service

Change title to:

Examination — Non-critical Service

In the text change 'Category D fluid service' to 'Non-critical Service'.

343 EXAMINATION PROCEDURES

Add:

By agreement of the owner, appropriate British Standards may be substituted for the American Standard referred to in this paragraph.