

Australian/New Zealand Standard™

Polyethylene (PE) pipes for pressure applications



AS/NZS 4130:2018

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee PL-006, Polyolefin Pipe Systems. It was approved on behalf of the Council of Standards Australia on 19 September 2018 and by the New Zealand Standards Approval Board on 5 September 2018.
This Standard was published on 5 December 2018.

The following are represented on Committee PL-006:

Association of Accredited Certification Bodies
Australian Building Codes Board
Australian Industry Group
Energy Networks Australia
Engineers Australia
New Zealand Employers and Manufacturers Association (Central)
Plastics Industry Pipe Association of Australia
Plastics New Zealand
Plumbing Products Industry Group
Water New Zealand
Water Services Association of Australia

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.saiglobal.com or Standards New Zealand web site at www.standards.govt.nz and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of Standards Australia or the New Zealand Standards Executive at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS 4130:2017.

Australian/New Zealand Standard™

Polyethylene (PE) pipes for pressure applications

Originated in Australia in part as AS K119—1962.
Originated in New Zealand in part as NZS 1189—1953.
Jointly revised and redesignated as AS/NZS 4130:2003.
Previous edition 2009.
This edition 2018.

COPYRIGHT

© Standards Australia Limited

© The Crown in right of New Zealand, administered by the New Zealand Standards Executive

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, PO Box 1473, Wellington 6140.

ISBN 978 1 76072 288 3

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee PL-006, Polyolefin Pipe Systems, to supersede AS/NZS 4130:2009, *Polyethylene (PE) pipes for pressure applications*.

The objective of this document is to provide a standard specification for manufacturers and purchasers of polyethylene pipes used for pressure applications.

This revision deletes the separate Series 2 gas pipes dimension Table 3, and amalgamates the Series 2 pipes into the Series 1 dimension Table 2.

The various tables are correspondingly renumbered throughout the Standard. For clarity, the terminology Series 3 has been retained.

Installation requirements are covered by AS/NZS 2033, Installation of polyethylene pipe systems and AS/NZS 4645, Gas distribution networks.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard. Other notes are for information only.

The terms ‘normative’ and ‘informative’ are used in a Standard to define the application of the appendices or annexes to which they apply. A ‘normative’ appendix or annex is an integral part of a Standard, whereas an ‘informative’ appendix or annex is only for information and guidance.

CONTENTS

	<i>Page</i>
FOREWORD.....	4
1 SCOPE AND APPLICATION	5
2 NORMATIVE REFERENCES	5
3 DEFINITIONS.....	6
4 NOTATION.....	7
5 OVERALL SERVICE (DESIGN) COEFFICIENT	7
6 CLASSIFICATION.....	8
7 COMPOSITION.....	13
8 COLOUR	14
9 GENERAL REQUIREMENTS	15
10 PERFORMANCE REQUIREMENTS	16
11 MARKING	17
APPENDICES	
A DEMONSTRATION OF CONFORMANCE TO THIS STANDARD	20
B CALCULATION OF MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP) AT 20°C FOR SERIES 1 WATER AND SEWAGE PIPES	23
C DESIGN FACTORS	24
D DIMENSIONAL REQUIREMENTS OF PIPES FOR SPECIAL APPLICATIONS..	25
E BIBLIOGRAPHY	26

FOREWORD

This Standard covers two series of pipe dimensions. Series 1 for general pressure and fuel gas applications and Series 3 fuel gas applications (nominal inside diameter series).

HDS values for the Series 1 water pipes ($C = 1.25$) are given in the table below.

Pipes made from similar polyethylene compounds from different manufacturers may need to be evaluated to ensure compatibility in welding and similar operations (refer to AS/NZS 2033).

Resistance to rapid crack propagation (RCP) has not been included as a requirement in this Standard. RCP is a potential failure mode in thick wall pipes carrying compressible fluids and operating at high stresses and low temperatures.

Wall thicknesses for the specified pipes have been calculated from equations that take into account the hydrostatic design stress (HDS) of the material and the working pressure and diameter of the pipe. In the interest of serviceability of the pipe and irrespective of the calculated minimum wall thickness, this Standard does not provide for a wall thickness of less than 1.6 mm.

HDS VALUES FOR SERIES 1 ($C = 1.25$)

Compound	Series 1 HDS (MPa)
PE 80	6.3
PE 100	8.0

By convention, plastics pipe systems are often designed on the basis of 50 year extrapolated test data. This is established international practice but is not intended to imply the service life of pressure pipe is limited to 50 years. For correctly manufactured and installed systems, the actual life cannot be predicted, but can logically be expected to be well in excess of 100 years before major rehabilitation is required.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Polyethylene (PE) pipes for pressure applications

1 SCOPE AND APPLICATION**1.1 Scope**

This Standard specifies requirements for polyethylene pipes for the conveyance of fluids under pressure. Such fluids include, but are not restricted to, water, recycled or reclaimed water, wastewater, slurries, compressed air, and fuel gas. Fuel gas includes natural gas, liquefied petroleum gas (LPG) in the vapour phase and LPG/air mixtures.

Pipes that do not contain carbon black, in conformance with this Standard, are not intended for extended exposure in direct sunlight.

1.2 Application

Pipes intended for the transmission of fuel gas are hereinafter referred to as 'gas pipes' and shall be operated up to a MAOP of 1050 kPa gauge.

The test requirements specified in this Standard may be achieved by alternative test methods if such methods can be shown to provide equal or greater accuracy than those specified herein. In all cases of dispute, the methods specified in this Standard shall be considered the reference test methods.

1.3 Demonstration of conformance to this Standard

Appendix A sets out the means by which conformance with this Standard shall be demonstrated by a manufacturer for the purpose of product certification.

2 NORMATIVE REFERENCES

The following documents are indispensable for the application of this Standard.

NOTE: Documents referenced for informative purposes are listed in the Bibliography in Appendix E.

AS

- 1199 Sampling procedures for inspection by attributes
- 1199.1 Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
- 1462 Methods of test for plastics pipes and fittings
- 1462.24 Part 24: Determination of resistance to crack propagation—Test methods for slow crack growth in notched pipes (notch test)

AS/NZS

- 1462 Methods of test for plastics pipes and fittings
- 1462.1 Part 1: Method for determining the dimensions of pipes and fittings
- 1462.4 Part 4: Method of determining reversion UPVC pipes
- 1462.6 Part 6: Thermoplastics pipes, fittings and assemblies for the transport of fluids under pressure—Resistance to internal pressure
- 1462.26 Part 26: Determination of weathering resistance of plastics pipes for external storage
- 1462.28 Part 28: Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds

AS/NZS

2566 Buried flexible pipes

2566.1 Part 1: Structural design

3500 Plumbing and Drainage

3500.0 Part 0: Glossary of terms

4020 Testing of products for use in contact with drinking water

4131 Polyethylene (PE) compounds for pressure pipes and fittings

ISO

11357 Plastics—Differential scanning calorimetry (DSC)

11357-6 Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)

17025 General requirements for the competence of testing and calibration laboratories

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 3500.0, AS/NZS 4131, and those below apply.

3.1 Brittle failure

The type of failure of the material in pipe form during pressure testing, where the pipe exhibits no plastic deformation visible to the naked eye (normal or corrected vision).

3.2 Co-extruded 'jacket' pipes

A pipe comprising two layers, where the layers are bonded simultaneously in a die head as part of the extrusion process.

3.3 Ductile mode

The type of failure of the material in pipe form during pressure testing, where the pipe exhibits plastic deformation visible to the naked eye (normal or corrected vision).

3.4 Fuel gas

Any fuel that is supplied through pipes or in containers and is a gas at a temperature of +15°C and an absolute pressure of 101.325 kPa.

3.5 Hoop stress

The stress in a pipe or fitting under pressure acting tangentially to the perimeter of a transverse section.

3.6 Hydrostatic design stress (HDS)

Hoop stress due to internal hydrostatic pressure, which can be applied continuously at a specified temperature, and which is obtained by the application of a design factor to the minimum required strength (MRS).

3.7 Maximum allowable operating pressure (MAOP)

The maximum pressure that can be sustained, with a design factor, by the type or class of pipe for its estimated useful life under the anticipated operating conditions.

3.8 Nominal working pressure

Maximum pressure that can be sustained by the class of pipe for its estimated useful life under the expected working conditions.

3.9 Out-of-roundness (ovality)

The difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-section of the pipe.

3.10 Pipe material temperature

Average temperature estimated as applying through the full wall thickness.

3.11 Shall

Indicates that a statement is mandatory.

3.12 Should

Indicates a recommendation.

3.13 Standard dimension ratio (SDR)

A nominal ratio of the pipe outside diameter to its wall thickness.

4 NOTATION

The following apply to this Standard:

D_m = mean outside diameter, in millimetres

D_N = nominal size, in millimetres

D_I = mean inside diameter, in millimetres

C = overall service (design) coefficient

HDS = MRS/C

σ_{LPL} = lower prediction limit

MRS = minimum required strength, in megapascals

PN = nominal working pressure designated in bar but normally referenced in MPa

(that is $\frac{PN \text{ (in bar)}}{10} = \text{MPa}$)

SDR = standard dimension ratio

T = wall thickness, in millimetres

$T_{\max.}$ = maximum wall thickness, in millimetres

$T_{\min.}$ = minimum wall thickness, in millimetres

5 OVERALL SERVICE (DESIGN) COEFFICIENT

The service (design) coefficient (C), used to determine the nominal pressure rating (PN) for Series 1 pipes, is 1.25. Calculation of maximum allowable operating pressure (MAOP) for Series 1 water pipes with increased design coefficient shall be in accordance with Appendix B.

NOTES:

- 1 Advisory information on the selection of design factors for water pipes is given in Appendix C.
- 2 For Series 1 and Series 3 fuel gas pipes refer to AS/NZS 4645.3.

6 CLASSIFICATION

Series 1 water pipes are classified in terms of the nominal pressure rating (PN). The number used to describe PN is 10 times the value of the maximum allowable operating pressure (MAOP) at 20°C based on $C = 1.25$ and given in megapascals.

The classifications for Series 1 pipes shall be as follows:

PN 3.2 Nominal working pressure of 0.32 MPa

PN 4 Nominal working pressure of 0.40 MPa

PN 6.3 Nominal working pressure of 0.63 MPa

PN 8 Nominal working pressure of 0.80 MPa

PN 10 Nominal working pressure of 1.00 MPa

PN 12.5 Nominal working pressure of 1.25 MPa

PN 16 Nominal working pressure of 1.60 MPa

PN 20 Nominal working pressure of 2.00 MPa

PN 25 Nominal working pressure of 2.50 MPa

Series 1 and Series 3 fuel gas pipes shall be classified according to SDR.

Standard dimension ratios for Series 1 pipes made from PE 80 and PE 100 compounds shall be as given in Table 1.

Series 1 pipe dimensions shall be as given in Table 2, and Series 3 in Table 3.

TABLE 1
STANDARD DIMENSION RATIOS (SDRs) FOR SERIES 1 PIPES

Compound	PN 3.2	PN 4	PN 6.3	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25
PE 80	41	33	21	17	13.6	11	9	7.4	—
PE 100	—	41	26	21	17	13.6	11	9	7.4