Australian/New Zealand Standard™

Polyethylene (PE) pipes for pressure applications

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STANDARDS NEW ZEALAND
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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 28 February 2003 and on behalf of the Council of Standards New Zealand on 20 February 2003. It was published on 18 March 2003.

The following are represented on Committee PL-006:

Australian Gas Association
CSIRO Manufacturing and Infrastructure Technology
Certification Bodies (Australia)
Institution of Engineers
Master Plumbers, Gasfitters and Drainlayers New Zealand
New Zealand Water and Waste Association
Plastics Industry Pipe Association of Australia
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This Standard was issued in draft form for comment as DR 02522.

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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.
Previous edition AS/NZS 4130:2001.
Fourth edition 2003.

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Jointly published by Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 5102 4

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committees PL-006, Polyolefin Pipe Systems, to supersede AS 4130—2001, *Polyethylene (PE) pipes for pressure applications*, which is withdrawn.

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

This revision is based largely on the latest ISO and CEN documents. The notable exception is the inclusion of Series 3 gas pipes, which are included for reasons of compatibility with existing systems. Series 2 gas pipe dimensions are such as to ensure compatibility with existing systems that conform to the ISO 11922-1 size series. Series 1 pressure pipes are for general pressure applications and are compatible with the ISO 11922-1 size series dimensions.

For installation requirements, see AS 2033, *Installation of polyethylene pipe systems*; AS 3723, *Installation and maintenance of plastics pipe systems for gas*; and NZS 5258, *Code of practice for gas distribution*.

Changes in this revision include the introduction where possible of terminology and definitions adopted in ISO standards. The long-term hydrostatic strength of compounds is referred to as the Lower Prediction Limit (LPL) of the stress when evaluated in accordance with ISO 9080.

The range of pipe dimensions has been extended to cover likely demand for the foreseeable future and the range of standard pressure classes has been extended to include PN 20 and PN 25.

The basic Service (Design) Coefficient of 1.25 has been applied to establish the Hydrostatic Design Stress for Series 1 pipes. A series of cumulative design factors taking into account pipe configuration, location and application has been included in Tables C1 and C2 to allow calculation of maximum allowable operating pressure (MAOP) for both gas and water.

Additional requirements for compatibility, UV resistance and thermal stability have been added for striping and jacket compounds, and the base resin requirements have been established by reference to the revised AS/NZS 4131.

The Committee considered at length the requirements for Slow Crack Growth (SCG) and for the PE 80B and PE 100 materials adopted a minimum test value of 500 hours following ISO decisions for gas applications. These materials are intended for use in more demanding applications, such as high pressure gas and water transmission.

Rapid crack propagation resistance (RCP) requirements have not been included in AS/NZS 4130 but have been included in AS/NZS 4131 for PE 100 materials. For high-pressure gas, and high-pressure water applications with air entrapment, where RCP may be a controlling feature, the designer is advised to seek specific advice from the pipe supplier.

The means of demonstrating compliance with this Standard (Appendix A) have been modified for minimum sampling and testing frequency plans to include batch release tests, process verification tests and type tests requirements, to simplify and improve product quality verification.

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

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

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FOREWORD

This Standard includes three series of pipe dimensions. Series 1 for general pressure applications and Series 2 and 3 for fuel gas applications.

Pipes made from similar polyethylene compounds from different manufacturers may need to be evaluated to ensure compatibility in welding and similar operations (see AS 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. HDS values for Series 1 pipes (C = 1.25) are given in the table below. 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

In this Standard, there is a partial pressure limitation for liquefied petroleum gas (LPG). The aim of this limitation is to prevent the formation of aliphatic hydrocarbon liquids under normal service conditions and subsequent deleterious effects on the long-term performance of the pipe. At a partial pressure of 300 kPa absolute, the dewpoint for a typical propane LPG is below 0°C. The designer of a polyethylene reticulation system should be aware that if service temperatures lower than this are likely to occur or if LPG containing significant quantities of butane gases are to be reticulated, the partial pressure limitation must be revised to avoid condensation of hydrocarbon liquids.

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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, wastewater, slurries, compressed air, and fuel gas. Fuel gas includes natural gas, liquefied petroleum gas (LPG) in the vapour phase and LPG/air mixtures. The partial pressure of the LPG is not to exceed 300 kPa.

Methods for demonstrating compliance with this Standard are given in Appendix A.

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.

This Standard does not apply to gas pipes for use with petroleum liquids, including liquid LPG and liquid pentane, or with manufactured or mixed gas distribution systems, which may contain more than 1% aromatics by volume, unless resistance to aromatic constituents has been demonstrated, as required in ISO 4437.

Pipes that do not contain carbon black, in compliance with this Standard, are not intended for extended exposure in direct sunlight, and gas pipes are not intended for service temperatures outside of the range –20°C to +35°C.

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.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1199 Sampling procedures and tables for inspection by attributes

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)

1745 Outdoor weathering of plastics in the Australian environment

1745.2 Part 2: Guide for design purposes

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: Method for hydrostatic pressure testing of pipes

1462.26 Part 26

1462.28 Part 28: Method for the assessment of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds

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