Australian/New Zealand Standard™

Polyethylene (PE) pipes for pressure applications

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The following interests are represented on Committee PL-006:

Association of Rotational Moulders (Australia)
AusPoly
AUSTAP
Australian Association of Certification Bodies
Australian Gas Association
CSIRO Building, Construction and Engineering
Institution of Engineers Australia
Master Plumbers Australia
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committees PL-006, Polyolefin Pipe Systems, to supersede AS 4130—1997, *Polyethylene (PE) pipes for pressure applications*, which is withdrawn.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 these products.

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 based on iron pipe sizes specified in AS 1667, *Plastic pipes and fittings for gas reticulation—Polyethylene—Nominal size series* (withdrawn) and NZS 7646, *Specification for polyethylene pipes and fittings for gas reticulation*, and are included for reasons of compatibility with existing systems. Series 2 gas pipe dimensions are such as to ensure compatibility with pipes and fittings that conform to the ISO R161 size series and AS 2718, *Plastic pipes and fittings for gas reticulation—Polyethylene—Outside diameter series* (withdrawn). Series 1 pressure pipes are for general pressure applications and are compatible with the ISO R161 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, *Gas distribution*.

Changes in this revision include the introduction where possible of terminology and definitions adopted in ISO standards. The long-term hydrostatic pressure properties of the compounds are referred to as the long term prediction level (LPL) when evaluated in accordance with ISO/DIS 9080 (which is a revision of ISO TR 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. Pipes with wall thickness less than 2.3 mm are intended for rural applications only.

The basic Design Factor 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 have been included in Tables C1 and C2 to allow calculation of maximum allowable operating pressure (MAOP) for both gas- and water-based fluids.

Additional requirements for compatibility, UV and thermal resistance have been added for striping compounds, and the base compound requirements have been established in AS/NZS 4131.

The Committee considered at length the requirements for Slow Crack Growth (SCG) and for the PE 100 materials adopted a minimum test value of 500 hours following ISO/CEN decisions for gas applications. These materials are intended for use in high pressure gas and water applications. A second category, PE 100–165, was introduced with these materials being required to meet a minimum SCG test period of 165 h. These requirements will be kept under review pending developments in ISO/CEN Standards.

Rapid crack growth propagation resistance (RCP) requirements have not been included in AS/NZS 4130 but have been included in AS/NZS 4131 for PE 100 materials; however, 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.

CONTENTS

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 (F = 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 (F = 1.25)

Compound	Series 1 HDS (MPa)
PE 63	5.0
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 absolute. Pipes intended for the transmission of fuel gas are hereinafter referred to as ‘gas pipes’ and are not to be operated at pressures above 1000 kPa gauge.

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

1.2 Application

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 AS/NZS 4131.

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
1745	Outdoor weathering of plastics in the Australian environment
1745.2	Part 2: Guide for design purposes
1984	Vernier callipers (metric series)
2033	Installation of polyethylene pipe systems
2101	Internal micrometers (including stick micrometers) (metric series)
2102	Micrometer callipers for external measurement
2700	Colour Standards for general purposes
AS/NZS	
2566	Buried flexible pipes
2566.1	Part 1: Design
3500	National Plumbing and Drainage Code
3500.0	Part 0: Glossary of terms