Australian Standard®

PLASTICS PIPES AND FITTINGS FOR GAS RETICULATION — POLYETHYLENE — NOMINAL SIZE SERIES

Part 1—PIPES
Part 2—FITTINGS

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The following interests are represented on Committee PL/25:

Australian Gas Association
Confederation of Australian Industry
Department of Minerals and Energy, Vic.
Department of Mines, Qld
Federated Master Plumbers of Australia
Plastics Institute of Australia Inc.
State Energy Commission of Western Australia

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PREFACE

This edition of this standard was prepared by the Association's Committee on Plastics Pipe and Fittings for Gas Reticulation, to supersede AS 1667, Parts 1 and 2—1974.

This standard sets out dimensional and performance requirements for PE pipe and fittings manufactured from polyethylene compound complying with AS 1685, for use in gas reticulating systems.

In this edition, an attempt was made to quantify the subjective requirements for freedom from defects. Tests have been introduced to check for the presence of defects, viz a light test for straight pipes and a leakage test for coils. However it was not possible to properly specify the method of identifying or measuring the defects and it was therefore necessary to include a qualifying note drawing attention to the need for suitable arrangements.

In the squeeze-off test, the size of pipe to which the test is applicable has been limited to pipes up to and including nominal size 80. An additional requirement has been included in that following release from squeeze-off, the pipe shall pass a pressure test at a temperature of 80°C for 44 h. The chemical resistance test has been transferred to AS 1685 as it was considered this was more appropriate to that standard.

Among other changes made to the 1974 standard is a rationalization of pipe sizes to more accurately reflect those currently being manufactured.

The committee recognizes the need for test(s) of fracture toughness properties of polyethylene to assess the likelihood of propagation failure during pressure testing and slow crack growth from notches occurring in the system. However there does not appear to be any established relationship between resistance to these two forms of failure, and further work is necessary to formulate suitable test(s) which may include an ESCR test. Consideration will also be given to the work already being carried out within the technical committees of ISO TC 138, Plastics Pipes, Fittings and Valves for the Transport of Fluids.

The pressure rating has been changed from that used in the 1974 edition due to a reduction in safety factor from 4 to 3. The original factor was based on US Department of Transport regulations which have since been amended. The committee believes that sufficient length of satisfactory service has been experienced with polyethylene gas pipes in order to allow adoption of the current American design practice. Class 450 will become Class 575 (rounded down from 559 kPa) and Class 200 will become Class 250 (rounded down from 267 kPa). Existing dimensions of both pipes and fittings will be retained. Only the maximum operating pressure will alter.

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PART 1—PIPES

FOREWORD

In the determination of the hydrostatic design stress of the material specified herein, an extrapolated 50-year long-term hydrostatic stress value of 8 MPa has been used to provide a factor of safety of 3.

The wall thicknesses for the pipes specified have been calculated from formulas which take into account the hydrostatic design stress of the material and the working pressure and diameter of the pipe. In the interests 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 2.3 mm.

For special applications, the design wall thickness of pipes shall be calculated from the following formula for use at service pressures of above 250 kPa and up to and including 575 kPa at a temperature in the range of -20°C to +35°C.

$$T_{min} = \frac{PD_{m\,max}}{2S + P}$$

where

P = design pressure of pipe, in kilopascals

$D_{m\,max}$ = maximum mean outside diameter of pipe, in millimetres

T_{min} = minimum wall thickness of pipe, in millimetres

S = the hydrostatic design stress at 20°C, in kilopascals

= 2667 kPa

NOTE: Where saddle fusion techniques may be used in the special applications, a provision for additional wall thickness may be necessary.

SPECIFICATION

1 SCOPE. This standard specifies requirements for polyethylene pipes for use in gas mains and services for direct burial and reliner applications. Such pipe is intended for use in the distribution of natural gas, liquefied petroleum gas (LPG) in the vapour phase and LPG/air mixtures at pressures up to 575 kPa, provided that the partial pressure of the LPG component does not exceed 250 kPa.

This standard does not apply to pipe 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 percent aromatics by volume.

NOTES:
1. AS XXXX is applicable to pipes manufactured in accordance with this standard.
2. Advisory information on alternative methods of determining compliance of a lot with this standard is given in Appendix A.

2 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1199	Sampling Procedures and Tables for Inspection by Attributes
AS 1349	Bourdon Tube Pressure and Vacuum Gauges
AS 1399	Guide to AS 1199, Sampling Procedures and Tables for Inspection by Attributes
AS 1685	Plastics Pipes and Fittings for Gas Reticulation — Polyethylene Compound for Manufacturing
AS 1821-1823	Suppliers Quality Control Systems — Levels 1 to 3
AS 1984	Vernier Callipers (Metric Series)
AS 2000	Guide to AS 1821-1823, Suppliers Quality Control Systems
AS 2033	Installation of Polyethylene Pipe Systems
AS 2102	External Micrometers (Metric Series)
AS 2490	Sampling Procedures and Charts for Inspection by Variables for Percent Defective
AS 2718	Plastics Pipes and Fittings for Gas Reticulation — Polyethylene — Outside Diameter Series
AS XXXX	Installation of Plastics Gas Pipe Systems.*

3 DEFINITIONS. For the purpose of this standard, the following definitions apply:

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

3.2 Long-term hydrostatic stress — the continuously applied hoop stress which is estimated will cause failure at a specified time and temperature.

3.3 Hydrostatic design stress — the estimated hoop stress due to internal hydrostatic pressure that can be applied continuously at a specified temperature with a high degree of certainty that failure will not occur. It is obtained by the application of a safety factor to the extrapolated 50-year long-term hydrostatic stress value.

3.4 LP gas (LPG) — liquefied petroleum gas which is composed predominantly of any of the following hydrocarbons or mixtures of all or any of them: propane, propylene, butane and butylene.

3.5 Working pressure — the maximum pressure that can be sustained by the type and class of pipe or fitting for its estimated useful life under the expected working conditions.

3.6 Type test — a test intended to prove the suitability and performance of a new composition, new compounding or processing technique, or a new design or size of pipe, joint or fitting. Type tests are generally carried out when a change is made in polymer composition or method of manufacture.

3.7 Quality control test — a test carried out during and/or after manufacture to prove the quality of a production run of pipe or fittings.

3.8 Test station — a pressure test station consisting of end connections, pressure gauges, pressurizing systems and a controlled temperature environment for the purpose of conducting pressure testing on pipes and fittings.

4 NOTATION. The following notation shall apply in this standard:

D_n = the nominal size, in millimetres.

D_m = the mean outside diameter, in millimetres.

D_o = the outside diameter including ovality, in millimetres.

T = the wall thickness, in millimetres.

5 CLASSIFICATION. Polyethylene gas pipe shall be classified as follows:

(a) *Class 250* — for service pressures up to and including 250 kPa at temperatures in the range -20°C to +35°C.

(b) *Class 575* — for service pressures up to and including 575 kPa at temperatures in the range -20°C to +35°C.

6 COMPOSITION. Polyethylene gas pipe shall be manufactured from polyethylene extrusion compound complying with AS 1685.

The compound shall be free from foreign material. The addition of rework material shall not be permitted.

7 DIAMETER AND WALL THICKNESS. When pipe is measured in accordance with Appendix B, it shall conform to the dimensions given in Table 1.

8 LENGTH. Straight pipe shall be supplied in nominated lengths with a tolerance of +0.05, -0 m. In coils, the length shall be not less than that designated by the manufacturer, and the inside diameter of the coil shall comply with Table 2.

* In course of preparation.