

Australian/New Zealand Standard™

**Oriented PVC (PVC-O) pipes for
pressure applications**



AS/NZS 4441:2008

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee PL-021, PVC, ABS and Polyamide Pipe Systems. It was approved on behalf of the Council of Standards Australia on 27 May 2008 and on behalf of the Council of Standards New Zealand on 9 June 2008. This Standard was published on 28 July 2008.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee PL-021, PVC, ABS and Polyamide Pipe Systems, to supersede AS 4441(Int)—2003, *Oriented PVC (PVC-O) pipes for pressure applications*.

The objective of this Standard is to specify the general aspects of pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for piping systems intended to be used underground or above-ground where not exposed to direct sunlight, for water mains and for services, for pressurized sewer systems and for irrigation systems.

This Standard is an adoption with national modifications and has been reproduced from ISO 16422:2006, *Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure—Specifications*. The modifications are additional requirements and are set out in Appendices ZZ and ZZA.

The term ‘normative’ has been used in this Standard to define the application of the annex to which it applies. A ‘normative’ annex is an integral part of a Standard.

Statements expressed in normative terms in notes to tables are deemed to be requirements of this Standard.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its title appears only on the cover page.
- (b) In the source text, ‘this International Standard’ should read ‘this Australian/New Zealand Standard’.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

The references to International Standards should be replaced by references to the following Australian/New Zealand Standards.

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO		AS/NZS	
2507	Thermoplastics pipes and fittings— Vicat softening temperature	1462	Methods of testing plastic pipes and fittings
2507.1	Part 1: General test method	1462.5	Method 5: Vicat softening temperature

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INTRODUCTION

Molecular orientation of thermoplastics results in improvement of physical and mechanical properties. Orientation is carried out at temperatures well above the glass transition temperature.

Orientation of PVC-U pipe-material can be induced by different processes.

One is the off-line process, where the thick-walled extruded tube is conditioned in a tubular mould at the desired temperature, and in which means are designed to activate the orientation process in the circumferential and axial directions.

A second option is the in-line process, where the thick-walled tube, directly after the extrusion process, is conditioned in-line at the orientation temperature, and in which means are incorporated to activate the orientation process in the circumferential and axial directions.

After the orientation process, the pipe is cooled down quickly to ambient temperature. The structure of this oriented pipe is stable up to the glass transition temperature ($\approx 75\text{ }^{\circ}\text{C}$), above which the material will have a rubber phase where the pipe will shrink back to its original dimensions after extrusion.

The orientation of the molecules creates a laminar structure in the material of the pipe wall. This structure gives the ability to withstand brittle failure emanating from minor flaws in the material matrix or from scratches at the surface of the pipe wall. PVC-O can therefore be considered as highly resistant to notches and no testing is needed. Because of the morphology of oriented PVC-U pipe-material, there is no risk of long-line rapid crack propagation.

Improved hoop strength and improved resistance to impact also result.

AUSTRALIAN/NEW ZEALAND STANDARD

Oriented PVC (PVC-O) pipes for pressure applications**1 Scope**

This International Standard specifies the general aspects of pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O), for piping systems intended to be used underground or above-ground where not exposed to direct sunlight, for water mains and services, pressurized sewer systems and irrigation systems.

The piping system according to this International Standard is intended for the conveyance of cold water under pressure, for drinking water and for general purposes up to and including 45 °C, and especially in those applications where special performance requirements are needed, such as impact loads and pressure fluctuations, up to pressure ratings of 25 bars¹⁾.

Joints constructed of other materials shall meet their own relevant standards in addition to the fitness-for-purpose requirements of this International Standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3:1973, *Preferred numbers — Series of preferred numbers*

ISO 161-1, *Thermoplastics pipes for the conveyance of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series*

ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 1628-2, *Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 2: Poly(vinyl chloride) resins*

ISO 2045, *Single sockets for unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) pressure pipes with elastic sealing ring type joints — Minimum depths of engagement*

ISO 2507-1, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method*

ISO 2507-2, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 2: Test conditions for unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly(vinyl chloride) (PVC-HI) pipes*

ISO 2531, *Ductile iron pipes, fittings, accessories and their joints for water or gas applications*

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm²