AS/NZS 4441:2017

Australian/New Zealand Standard™

Oriented PVC (PVC-O) pipes for pressure applications (ISO 16422:2014, MOD)

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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 20 March 2017 and by the New Zealand Standards Approval Board on 5 April 2017.
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The following are represented on Committee PL-021:

Association of Accredited Certification Bodies
Australian Chamber of Commerce and Industry
Energy Networks Australia
Engineers Australia
Local Government New Zealand (LGNZ)
New Zealand Employers and Manufacturers Association (Central)
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Plastics Industry Pipe Association of Australia
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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/NZS 4441:2008.

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 16422:2014, *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 ZA. This revision contains the following key changes:

(a) Table 4—Physical characteristics—Resistance to dichloromethane and alternative tests.

(b) Annex A—Determination of pipe material classification—Procedures for classified and non-classified feedstock material.

(c) Annex F—Determination of axial and tangential orientation factor.

Appendix ZA sets out means by which compliance with this Standard may be demonstrated by a manufacturer.

Appendix ZB sets out the provisions for best environmental practice PVC for PVC-O pressure pipe. These provisions are in accordance with the credit criteria established by the Green Building Council of Australia in their Green Star rating program.

For best environmental practice PVC satisfying the provisions of Appendix ZB, an attestation of compliance for upstream materials such as chlorine and vinyl chloride, is necessary. Such attestations can take the form of a declaration of conformity prepared and maintained in accordance with ISO/IEC 17050, *Conformity assessment—Supplier's declaration of conformity*, Part 1: *General requirements*, and Part 2: *Supporting documentation*. Part 1 addresses the contents of the declaration of conformity and the procedures necessary to ensure ongoing compliance. Part 2 addresses the documentation required to support the declaration of conformity including the contents, traceability, availability and retention period.

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:

(i) In the source text 'this International Standard' should read 'this Australian/New Zealand Standard'.

(ii) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard		*Australian/New Zealand Standard*	
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

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

CONTENTS

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.

In general the following production process is common. A thick-wall tube is extruded (feedstock) and conditioned at the desired temperature. The orientation process is activated in circumferential and axial directions under controlled conditions.

After the orientation process, the pipe is cooled down quickly to ambient temperature.

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-O pipe material, there is no risk of long-line rapid crack propagation.

Improved hoop strength, allows reduced wall thickness with material and energy savings. Improved resistance to impact and fatigue also result.

The classification depends on material compound/formulation and stretch ratios used. Therefore, with the classification, these characteristics may be specified or determined.

Variations in stretch ratios should be within 10 % of the value determined on the pipes used for classification. The determination of the stretch ratios may be carried out as shown in Annex F.

AUSTRALIAN/NEW ZEALAND STANDARD

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1 Scope

This International Standard specifies the requirements 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 of 25 bars[1)].

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces*

ISO 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 4: Preparation of assemblies*

ISO 1452-2:2009, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 2: Pipes*

ISO 1452-5:2009, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 5: Fitness for purpose of the system*

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

ISO 2505, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters*

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

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1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2