AS 3707—1989

Australian Standard®

Method for testing pressure cycling resistance of pipes and fittings

This Australian Standard was prepared by Committee PL/6, Polyethylene Pipe. It was approved on behalf of the Council of Standards Australia on 4 May 1989 and published on 11 August 1989.

The following interests are represented on Committee PL/6:

Confederation of Australian Industry
CSIRO, Division of Building, Construction and Engineering
Department of Public Works, N.S.W.
Engineering and Water Supply Department, S.A.
Melbourne and Metropolitan Board of Works
Metropolitan Water Authority, W.A.
Plastics Institute of Australia Inc.
Rural Water Commission, Vic.
Water Board, Sydney

This Standard was issued in draft form for comment as DR 88126.

Australian Standard®

Method for testing pressure cycling resistance of pipes and fittings

First published as AS 3707—1989.
Incorporating:
Amdt 1—1990

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140
ISBN 0 7262 5767 2

PREFACE

This Standard was prepared by Standards Australia's Committee on Polyethylene Pipe to provide a suitable test method for evaluating the ability to withstand pressure cycling in pipes and fittings of various materials.

When preparing this Standard, it was initially considered appropriate to arbitrarily divide the pipes and fittings into two classifications (i.e. property services and reticulation). Pipes and fittings up to 65 mm nominal diameter are generally located in property service installations, where they may experience quite severe cyclical conditions, mainly due to the presence of fast acting valves. Pipes and fittings above 65 mm diameter are generally installed in reticulation systems, where cycle regimes are generally less severe, and this is often taken into account when designing the system.

After further review it was thought appropriate that a single pressure wave cycle should be selected to provide a comparative test for all services, sizes, and piping materials.

This Standard is based on thin wall pipe theory and is therefore considered to be conservative for thick wall pipe. No criteria are given for acceptance of the various materials which may be subjected to the cycling test. Such information should be obtained from product Standards for different piping materials, or from regulatory authorities.

CONTENTS

		Page
1	SCOPE	3
2	REFERENCED DOCUMENT	3
3	PRINCIPLE	3
4	APPARATUS	3
5	TEST SPECIMENS	3
6	TESTING ENVIRONMENT	3
7	CONDITIONING OF TEST SPECIMENS	3
8	TEST PROCEDURE	4
9	DETERMINATION OF TEST CYCLE PRESSURE	4
10	REPORT	5
APPENDIX A.	DETERMINATION OF TEST PRESSURE WAVEFORM	11

STANDARDS AUSTRALIA

Australian Standard

Method for testing pressure cycling resistance of pipes and fittings

1. SCOPE. This Standard describes the method for determining the pressure cycling resistance properties of pipes, joints, and fittings for pressure applications. The method assesses the ability of the pipe/fitting system to perform in an environment that involves cyclical loadings. This performance is based on a combination of the effects of material properties, manufacturing techniques, and pipe, fitting and joint design. The combination of these three properties determines the ability to resist the propagation of cracks from stress concentrators and other flaws that may exist within the material.

NOTES:

1. This method is a standardized method for measuring performance, and should not be taken to represent a particular type of installation. It is an indicative test.
2. Where pipe or fittings, tested according to this Standard, are installed in a situation where fluctuations exceed the parameters specified in this test, steps may be required to reduce these fluctuations, or the design engineer should consult the pipe or fitting manufacturer for advice.

2 REFERENCED DOCUMENT. The following Standard is referred to in this Standard:

AS
1477 Unplasticized PVC (UPVC) pipes and fittings for pressure applications
1477.1 Part 1: Pipes

3 PRINCIPLE. The waveform required for a fluctuating pressure cycle, applicable to the material to be tested, is determined. The test specimen is subjected to a stipulated number of applications of the test pressure cycle to determine its resistance to pressure cycling.

4 APPARATUS.

4.1 Pressurizing system. The pressurizing system provided shall be capable of exerting cyclic internal pressures via the pressurizing medium to the test specimens. The pressure cycling apparatus shall be capable of producing a pressure cycle within the envelope shown in Figure 1, as determined in accordance with Clause 9. Provision may be made for one or more specimens to be connected to the hydraulic system at the one time. However, each connection shall be provided with an isolating valve that operates automatically in the event of a specimen bursting.

4.2 Pressure and cycle measurement. Pressure measuring equipment shall be capable of indicating the actual test pressures to within ±1 % of the maximum pressure tested. The pressure-measuring equipment may be isolated from the test rig once the pressure cycle has been set and stabilized. Means shall be provided to suspend the test if the set pressures fall outside the test parameters. Pressures may be measured anywhere within the pressurizing system, however the pressure measurements must be directly comparable with the pressures occurring within the specimens.

The apparatus shall have the facility to count the number of completed cycles, and shall be capable of cycling the pressure at a frequency of 30 ±2 cycles/min.

4.3 Pressurizing medium. The pressurizing medium should be water. However, if this is not suitable for the equipment in use, the medium may be a liquid that can be shown to have no adverse effects on the test result obtained.

NOTE: Ethylene Glycol has been shown to be a suitable medium for testing UPVC.

4.4 Leak detection. A method of leak detection shall be provided to ensure that testing ceases and the counter stops if leakage of test fluid occurs.

4.5 End connections. The end connections provided shall make a watertight joint at each end of the test specimen, and one end shall be connected to the hydraulic system. End connections of the type illustrated in Figure 2 for pipe, Figure 3 for fittings with rubber ring joints, Figure 4 for fittings using solvent cement, mechanical or welded joints, and Figure 5 for pipe joints, are considered suitable.

Specimens should be supported so that the only axial or bending forces imposed upon the specimen are those that arise from the fluctuating pressure within the specimen system.

When testing threaded fittings, care shall be taken that any apparatus or fitting used does not cause notching of or damage to the thread.

5 TEST SPECIMENS.

5.1 Pipe. The test specimen shall be a complete section of pipe with a free length between end connections equal to 10 times the nominal size of the pipe, or a minimum of 750 mm, whichever is the lesser.

Before testing, the test specimen shall have its ends squared and cleaned. It shall not have any burrs, notches or other markings which may cause premature failure. Ends may be chamfered to assure assembly in the test equipment.

5.2 Fittings. Test fittings shall be selected at random.

5.3 Joints. Joints shall be made in accordance with the manufacturer's instructions.

6 TESTING ENVIRONMENT. The test shall be performed at 23 ±2°C or as defined in the product Standard, and may be carried out in any suitable environment. If the specimens are tested in air suitable guards shall be provided.

NOTE: The test environment refers to conditions both inside and outside the specimen.

7 CONDITIONING OF TEST SPECIMENS. Immediately prior to testing, each specimen shall be conditioned at the test temperature for 24 h in air, or water or other suitable liquid. If the conditioning is in a liquid, the test specimen shall be filled with liquid ensuring that all air is released from the