

Australian/New Zealand Standard™

AS/NZS 1462.4

Methods of test for plastics pipes and fittings

Method 4: Method for determining reversion of plastics pipes

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee PL-045, Plastics Pipe Systems Test and Calculation Methods.

This Standard is based on ISO 2505:1994 *Thermoplastics pipes—Longitudinal reversion—Methods and parameters*. This Standard departs from ISO 2505 in that it increases the sample length required by a third and reduces the number of tests per sample from three to one. ISO 2505 takes specimen curvature into account when measuring specimens after immersion/exposure, this Standard does not. Specifications for test temperature, times of immersion/exposure and specifications for degree of residual stress have to be specified in the relevant product standard. Where no details are specified in the product standard, default parameters are contained in Appendix A and Appendix B. Default reversion specifications are contained in Appendix C.

METHOD

1 SCOPE

This Standard sets out the method for determining the degree of residual extrusion stress in plastic pipes by immersion in a heat transfer medium or exposure in a hot air oven. Temperatures of test, times of immersion/exposure and specifications for degree of residual stress shall be as specified in the relevant product standard.

2 REFERENCED DOCUMENTS

The following document is referred to in this Standard:

ISO

1043-1 Plastics-Symbols and abbreviated terms-Part 1:Basic polymers and their special characteristics

3 RELEVANCE OF TEST

This test is designed as a quality control test to monitor the degree of residual longitudinal stress that is present in a pipe following extrusion.

4 APPARATUS

The following apparatus is required:

- (a) *Thermostatically controlled bath* Capable of maintaining the temperature of the heat transfer medium at $\pm 2^\circ\text{C}$ of the temperature specified (see Figure 1).

or

Thermostatically controlled hot air oven Capable of maintaining the temperature at $\pm 2^\circ\text{C}$ of the temperature specified and re-establishing this temperature within 15 min after the introduction of test specimens.

- (b) *Vernier callipers or equivalent* Capable of reading to 0.02 mm.
- (c) *Mercury-in-glass thermometer* Capable of indicating test temperature to an accuracy of $\pm 1^\circ\text{C}$, or other temperature indicating instrument of equal or greater accuracy.

5 LIQUID HEAT TRANSFER MEDIUM

A mineral oil free from aromatic hydrocarbons, a silicone oil, polyethylene glycol, or glycerol.

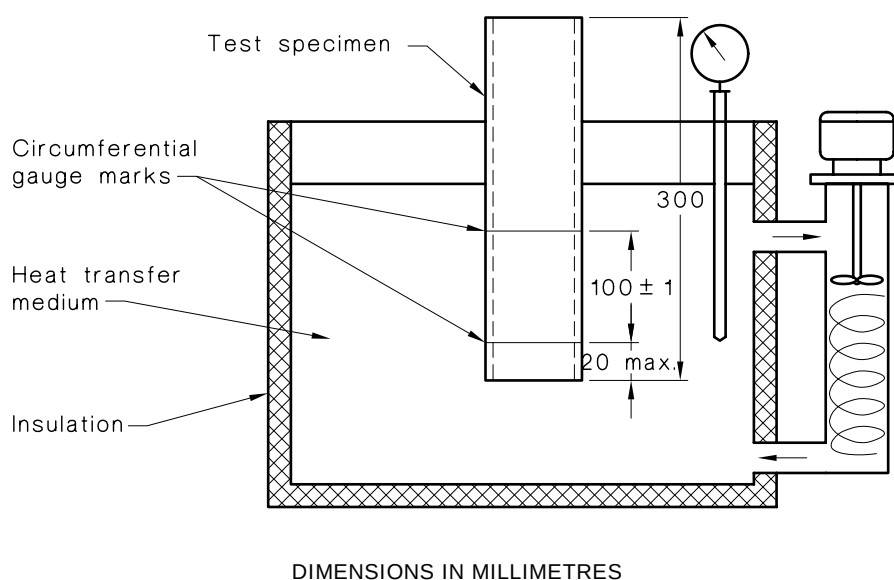


FIGURE 1 HEAT REVERSION APPARATUS (Diagrammatic only)

6 PREPARATION OF TEST SPECIMEN

The test specimen shall be a complete section of pipe of length 300 ± 25 mm. Two circumferential marks shall be scribed on the periphery of the test specimen at 100 ± 1 mm apart, and in such a way that one of these marks is not more than 20 mm from one end of the test specimen and both marks are at right angles to the axis of the pipe.

On test specimens up to size DN 50, using an indelible marker, four further points shall be marked and identified at equal intervals around the circumference at the circumferential marks. On test specimens above size DN 50, eight points shall be marked and identified at equal intervals on the circumference at the circumferential marks.

Where the liquid bath or hot air oven is not big enough to take a large diameter pipe, it is permissible to cut the test specimen longitudinally into sections.

7 CONDITIONING OF TEST SPECIMENS

Test specimens shall be conditioned at $20 \pm 2^\circ\text{C}$ for a period not less than that indicated in Table 1 in either air or water immediately prior to measurement.

TABLE 1
CONDITIONING OF TEST SPECIMENS

Minimum wall mm thickness (see Note 1)	Conditioning time in water or moving air (see Note 2)	Conditioning time in still air (see Note 3)
≤ 5	5 min	15 min
$> 5 \leq 10$	15 min	35 min
$> 10 \leq 20$	30 min	90 min
> 20	2.5 h	5 h

NOTES:

- 1 Minimum wall thickness for the nominal size under test may be determined by reference to the dimensional table(s) in the relevant pipe Standard.
- 2 These conditioning times apply when the test specimens are immersed in water or a circulating air current produced by means of a fan or other device.
- 3 This is considered to be a normal laboratory atmosphere.

8 PROCEDURE FOR IMMERSION IN A HEAT TRANSFER MEDIUM

8.1 Liquid bath

The procedure shall be as follows:

- (a) At the completion of the conditioning period at $20 \pm 2^\circ\text{C}$, measure and record the distance between the scribed circumferential lines at each of the points, marked in accordance with Clause 5, on the test specimen. The temperature shall be maintained at $20 \pm 2^\circ\text{C}$ for the measurement. The measurements obtained shall be rounded off to the nearest 0.1 mm with values ending in 0.05 being rounded up.
- (b) Suspend the test specimen vertically in the heat transfer medium, at the temperature specified, by the end furthest from the mark, so that the portion of the specimen, which is not immersed, is not greater than 100 mm. The temperature of the heat transfer medium and duration of immersion shall be as specified in the product specification, or shall be in accordance with Appendix A if not specified.
NOTE: To avoid danger to the operator from flashing steam, it is important that the test specimen be thoroughly dried before being placed in the heat transfer medium.
- (c) Suspend the test specimen in this way without it touching the walls or floor of the bath for the time specified.
- (d) Remove the test specimen from the thermostatically controlled bath and wash it under cold running water for not more than 2 min. The test specimen shall then be re-conditioned at $20 \pm 2^\circ\text{C}$ for a period not less than that indicated in Table 1.
- (e) At the completion of the reconditioning period, measure and record the distance between the scribed circumferential lines at each of the points, marked in accordance with Clause 5, using the vernier callipers or equivalent. The measurements obtained shall be rounded off to the nearest 0.1 mm with values ending in 0.05 being rounded up.
- (f) Examine the test specimen for any signs of cracks, cavities or blisters resulting from the immersion.

8.2 Hot air oven

The procedure shall be as follows:

- (a) At the completion of the conditioning period at $20 \pm 2^\circ\text{C}$, measure and record the distance between the scribed circumferential lines at each of the points, marked in accordance with Clause 5, on the test specimen. The temperature shall be maintained at $20 \pm 2^\circ\text{C}$ for the measurement. The measurements obtained shall be rounded off to the nearest 0.1 mm with values ending in 0.05 being rounded up.
- (b) Place the specimen in the oven so it does not touch the sides or bottom of the oven. The temperature of the oven shall be as specified in the product specification, or shall be in accordance with Appendix B if not specified. If the specimen is suspended, choose a suspension point at the end furthest from the circumferential lines. If the specimen is placed horizontally on a support, rest the specimen on a bed of talc or other support that does not inhibit the reversion.
- (c) Maintain the specimen in the oven for the duration specified in the product specification or in accordance with Appendix B if not specified. The duration shall be measured from the time when the temperature of the oven has returned to the specified temperature.
- (d) Remove the test specimen from the oven. The test specimen shall then be re-conditioned at $20 \pm 2^\circ\text{C}$ for a period not less than that indicated in Table 1.
- (e) At the completion of the reconditioning period, measure and record the distance between the scribed circumferential lines at each of the points, marked in accordance with Clause 5, using the vernier callipers or equivalent. The measurements obtained shall be rounded off to the nearest 0.1 mm with values ending in 0.05 being rounded up.

Examine the test specimen for any signs of cracks, cavities or blisters resulting from exposure to the oven temperature.

9 CALCULATION

The reversion of the test specimen shall be calculated at each of the marked points around the test specimen as follows:

$$R_n = \left| \frac{L_{in} - L_{fn}}{L_{in}} \right| \times 100 \%$$

where

- R_n = the percentage reversion of each marked point n on the scribed circumferential lines
- L_{in} = the initial distance between the scribed circumferential lines at each marked point n before reversion
- L_{fn} = the final distance between the scribed circumferential lines at each marked point n after reversion

The test specimen reversion (R) shall be reported as the maximum value of the reversion obtained.

NOTE: Appendix C provides default values for longitudinal reversion.