

Australian/New Zealand Standard™

Methods of test for plastics pipes and fittings

Method 3: Method for determining the impact characteristics of pipes

1 SCOPE This Standard sets out a method for determining the impact characteristics of plastics pipe when subjected to multiple impacts at 20°C or 0°C, as appropriate.

2 PRINCIPLE A pipe specimen is impacted at the appropriate temperature in an ‘around the clock’ manner by a falling weight of specified mass attached to a striker. The pipe is then inspected for evidence of failure.

3 RELEVANCE OF TEST The impact resistance of a thermoplastic pipe is a function of the material in the product, of the quality of the extrusion or moulding, of the geometry and dimensions of the test specimens, and of the testing variables used, i.e. temperature, striker nose geometry, striker mass, specimen support and height of drop. Because all these factors and their interrelations affect the test results, impact tests are useful mainly for quality control and comparative purposes; impact tests are not intended as simulated service tests.

The criterion of quality is the limitation of the number of test specimens that fail in a brittle manner during the test.

4 APPARATUS A falling weight machine is required which typically consists of the following:

- (a) *Main frame*—which can be rigidly fixed in the true vertical position, having a guide system which may be adjusted to maintain the guides parallel and vertical.
- (b) *Loaded striker*—which falls freely within the guide rails and which is equipped with a hardened hemispherical striking surface of 25.0 ± 0.5 mm diameter unless otherwise specified in the relevant pipe Standard. The striking surface shall be free from flats and other imperfections, and shall be centrally located on the vertical axis of the striker.
- (c) *Appropriate set of weights*—which shall be firmly attached to the striker to enable the combined mass of the striker and the weight to be adjusted to the values specified in the relevant pipe Standard.
- (d) *Test specimen support*—comprising a 120° solid steel V-block at least 300 mm long which is positioned below the guide rails so that it is level and centrally aligned to within 3 mm of the vertical axis of the striker falling between the guides.

The test specimen support shall be mounted directly on a firm rigid base with no packing and shall be wide enough for the ‘V’ faces to be extended beyond the points of contact with the test specimen. When levelled up in its final position, each of the ‘V’ faces should lie at an angle of $60 \pm 2^\circ$ to the vertical axis.

- (e) *Holding device*—to secure the loaded striker at the specified distance above the specimen within the range 0.5 m to 2.0 m measured from the bottom of the hemispherical striking surface to the top of the test specimen mounted in its support. The holding device shall incorporate a release mechanism to allow the loaded striker to fall freely in the guides,

thus striking the test specimen in a reproducible manner. Means may also be provided to catch the striker on the first rebound.

A suitable form of apparatus is shown in Figure 1.

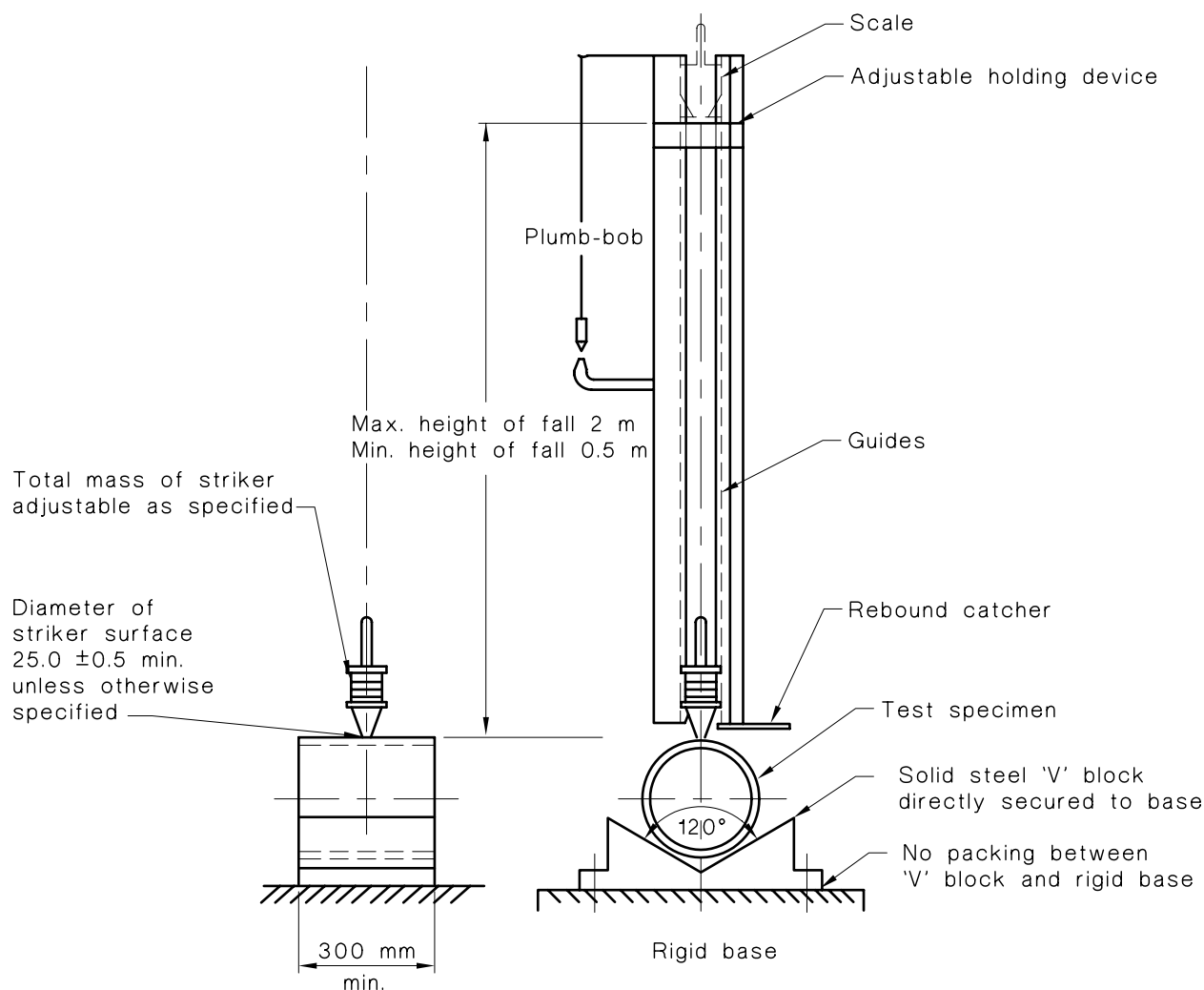


FIGURE 1 TYPICAL IMPACT TEST APPARATUS

5 TEST SPECIMENS Each test specimen shall be cut from one or more consecutively manufactured lengths of pipe. Each test specimen shall be 300 ± 10 mm. The ends of the test specimen shall be cut clean and approximately square to the axis of the pipe.

NOTE: Because a large number of impacts have to be carried out before a determinate result is obtained, sufficient pipe should be set aside for the preparation of the required number of test specimens.

A mark shall be made on each test specimen, randomly positioned on the pipe's circumference. Further marks to bring the total number to that given in the relevant pipe Standard for the number of impacts per test specimen shall be drawn spaced around the circumference.

6 CRITERIA FOR SPECIMEN FAILURE Failure is defined as fracturing or cracking through the complete wall thickness of the test specimen. The criteria for acceptance of pipe are given in the relevant pipe Standard in terms of a specified true impact rate and confidence level.

7 CONDITIONING OF TEST SPECIMENS Test specimens shall be conditioned, at the appropriate test temperature of 20 or 0°C $\pm 2^\circ\text{C}$ as required by the relevant product Standard for a period not less than that indicated in Table 1 in either air or water immediately prior to testing.

Individual specimens shall be tested within 30 s of removal from the conditioning environment.

No test specimen shall be tested within 15 h of its extrusion, unless it can be shown that the results for conditioned test specimens taken at the discretion of the manufacturer before this time are consistent with the results obtained from conditioned test specimens tested 15 h after extrusion.

TABLE 1
CONDITIONING OF TEST SPECIMENS FOR IMPACT TEST

Minimum wall thickness mm (see Note 1)	Conditioning time in water or moving air at 20°C (see Note 2)	Conditioning time in still air at 20°C (see Note 3)	Conditioning time in cooling medium or moving air at 0°C (see Note 2)	Conditioning time in still air at 0°C (see Note 4)
≤ 5	5 min	15 min	5 min	20 min
$> 5 \leq 10$	15 min	35 min	15 min	45 min
$> 10 \leq 20$	30 min	90 min	40 min	2 h
> 20	2.5 h	5 h	3 h	6 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 or by direct measurement.
- 2 These conditioning times apply when the test specimens are immersed in an appropriate cooling medium or in a circulating air current produced by means of a fan or other device.
- 3 This is considered to be a normal laboratory atmosphere.
- 4 This is considered to be the atmosphere in a non-fan-forced refrigerator.

8 PROCEDURE The procedure shall be as follows:

- (a) Adjust the total mass of the striker to the appropriate value given in the relevant pipe Standard, according to the nominal size of the pipe under test.
- (b) Centrally locate the test specimen in the V-block support so that one of the marked lines is uppermost.
- (c) Allow the striker to fall freely in the guides onto the test specimen through the height specified in the relevant pipe Standard, according to the nominal size of the pipe under test.
- (d) After each impact, examine the test specimen for evidence of failure. When any test specimen fails, remove it from the machine, record the failure and recommence the test using a further test specimen. If the test specimen does not fail, and the temperature of the testing environment does not fall within the range of temperatures for