

Australian/New Zealand Standard™

**Masonry units, segmental pavers and flags—
Methods of test****Method 19: Determination of bow**

This Standard incorporates Amendment No. 1 (August 2004). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

1 SCOPE

This Standard sets out a method for determining the degree of bow of flags.

NOTE: This method is based on BS 7263-1:2001, *Precast concrete flags, kerbs, channels, edgings and quadrants. Precast, unreinforced concrete paving flags and complementary fittings. Requirements and test methods.*

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS/NZS

4456	Masonry units, segmental pavers and flags—Methods of test
4456.0	Part 0: General introduction and list of methods
4456.1	Method 1: Sampling for testing
4456.2	Method 2: Assessment of mean and standard deviation

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 4456.0 apply.

4 PRINCIPLE

A flag is tested for bow by determining the maximum and minimum deviations from a notched straightedge. Such measurements are to be determined with the straightedge along each of the two respective diagonals of the flag in turn. Readings are to be taken for both the wearing face, and the rear face of the flag. Flags that have textured faces are not covered by this test method.

5 APPLICATION

Flags that are not rectangular shall have 4 or more measuring lines equivalent to the diagonals otherwise required by the manufacturer.

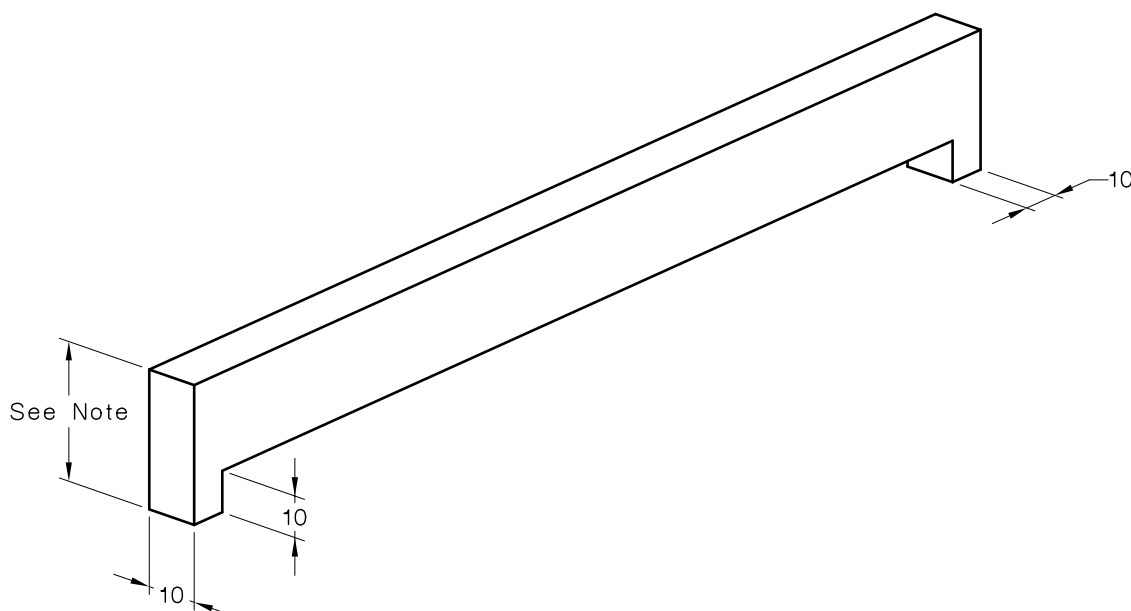
6 APPARATUS

The following is required:

- (a) *Notched steel straightedge* The straightedge shall be straight and the top and bottom faces parallel to within 0.1 mm for spans less than 500 mm, and 0.2 mm for larger spans. The 'feet' at either end of the straightedge shall be equal in height within ± 0.1 mm. A typical straightedge is shown in Figure 1.

The span of the straightedge shall be the diagonal measurement of the flag less 70 ± 10 mm, when measured between the approximate centres of both straightedge feet.

NOTE: It is desirable that the span of the straightedge be made variable. This may be accomplished by having one foot fixed with respect to the straightedge, and the other clamped in place.



NOTE: Dimension noted to be not less than span divided by 10 (for guidance only)

FIGURE 1 TYPICAL STRAIGHTEDGE (SCHEMATIC)

- (b) Gauge with an accuracy of 0.1 mm.

NOTE: The depth-measuring device on a vernier calliper has been found suitable for this test, although a digital 'dial' gauge is somewhat more convenient when mounted so as to slide along the straightedge.

7 PREPARATION OF TEST SPECIMENS

Specimens shall be tested as sampled, or as received, without further conditioning.

NOTE: Specimens may be further tested either saturated with water, and/or oven dry. Should this be required, the samples should be left in water or an oven respectively, until consecutive moisture content determinations (24 ± 8 h apart) differ by less than 0.2% when determined in accordance with AS 4456.8 at temperatures of $23 \pm 3^\circ\text{C}$ and $110 \pm 5^\circ\text{C}$ respectively. Alternatively, dimension stone shall be dried at $65 \pm 5^\circ\text{C}$.

Ten specimens shall be measured.

8 PROCEDURE

The procedure shall be as follows:

- (a) Place the gauge so as to measure the maximum and minimum distances from the straightedge to a point directly adjacent on the flag. The straightedge shall be set to rest along a diagonal of the upper wearing face of the flag. The straightedge shall be located centrally along the diagonal within an accuracy of ± 5 mm.

(b) Measure the distance from the straightedge to the paver at the following locations:

- (i) At both ends of the straightedge (directly above the feet).
- (ii) At the mid-point of the straightedge.
- (iii) At equal intervals between the midpoint and the respective ends.

A minimum of 5 measurements shall be taken for each diagonal.

(c) Repeat the procedure for the other diagonal and for the reverse face of the flag, taking care not to take measurements where purposeful indentations occur.

If a gauge that facilitates the recording of the maximum and minimum readings is used, a full traverse of the straightedge shall be undertaken and these maximum and minimum readings shall be recorded.

9 CALCULATIONS

For each of the respective diagonals, the bow shall be calculated as follows:

$$\text{Bow (mm)} = \text{Reading}_{\text{Maximum}} \text{ (mm)} - \text{Reading}_{\text{Minimum}} \text{ (mm)}$$

Where $\text{Reading}_{\text{Maximum}}$ and $\text{Reading}_{\text{Minimum}}$ are the greatest and least of the readings taken, respectively.

10 RECORDING

The following information shall be recorded:

- (a) Reference to this test method, i.e., AS/NZS 4456.19.
- (b) Description of the marking, location and identification of the lot.
- (c) Sample and specimen identification.
- (d) Date of sample and test.
- (e) Work sizes for the lot.
- (f) At least 5 discrete measurements for each respective diagonal of the flag. If only the maximum and minimum readings are recorded, the length of the traverse shall be recorded.
- (g) Bow for each flag, as determined for each respective diagonal.
- (h) Description of bow, i.e., whether the deviation was cupping or hogging.
- (i) Mean and standard deviation of all calculated bow values for each diagonal calculated in accordance with AS 4456.2.

11 REPORT

The following information shall be recorded:

- (a) Reference to this test method, i.e., AS/NZS 4456.19.
- (b) Description of the marking, location and identification of the lot.
- (c) Sample and specimen identification.
- (d) Date of sample and test.
- (e) Work sizes for the lot.
- (f) Bow for each flag, as determined for each respective diagonal to the nearest 0.5 mm.
- (g) Description of bow i.e.; whether the deviation was cupping or hogging.
- (h) Mean and standard deviation of all calculated bow values for each diagonal calculated in accordance with AS 4456.2 each to the nearest 0.5 mm.