

## 7.1 Concrete Segmental and Flagstone Pavers

### Guide to Specifying

#### Introduction

To provide specifiers with an understanding of the product, this Guide sets out the requirements for the manufacture of concrete segmental pavers and flags. It takes account of the latest research and development and references:

- New Zealand Standard *NZS 3116 Concrete Segmental and Flagstone Paving*,
- Joint Standards *AS/NZS4456 Masonry Units, Pavers, Flags and Segmental Retaining Wall Units – Methods of Test*, and
- *AS/NZS 4455.2 Masonry Units, Pavers, Flags and Segmental Retaining Wall Units - Part 2 Pavers and Flags*.

Industry design, detailing and construction guides should also be referenced when specifying concrete segmental and flagstone pavements.

These Standards are available from:

Standards New Zealand  
Private Bag 2439  
Wellington 6140

Freephone 0800 782 632 (New Zealand)  
Phone +64 4 498 5990  
Fax +64 4 498 5994  
Email [enquiries@standards.co.nz](mailto:enquiries@standards.co.nz)  
Website [www.standards.co.nz](http://www.standards.co.nz)

#### Definitions

- **Abrasion Resistance**

A measure of resistance to erosion of the surface of a paver or flag, expressed as an index, when tested in accordance with AS/NZS 4456.9.

- **Annual Average Daily Traffic (AADT)**

The total volume of traffic passing a point in the pavement, in both directions, for one year divided by the number of days in the year.

- **Breaking Load**

The failure load determined in accordance with AS/NZS 4456.5 as modified by NZS 3116.

- **Characteristic Value**

The value that is exceeded by at least 95% of the units in the lot.

- **Commercial Vehicle (CV)**

A vehicle, having a gross weight of 3 t or more, that complies with legislation for the axle load, tyre pressures and dimensions of vehicles permitted on public roads and streets.

- **Dimensional Deviation**

The deviation from work size of paving units when determined in accordance with AS/NZS 4456.3.

- **Flagstone**

Large format solid (non-cored) paver with a gross plan area greater than 0.08 m<sup>2</sup>.

- **Light Vehicle (LV)**

A vehicle which, when fully loaded, has a gross weight less than 3t.

NOTE: This category includes cars, utilities, delivery vans and some light two-axle trucks.

- **Industrial Pavements**

Pavements that may be subject to a range of unregulated vehicle types, axle configurations, wheel and tyre pressures.

- **Lot**

A group of units of a single type with specific characteristics and dimensions presented for sampling at the same time.

- **Paver**

Solid unit with a gross plan area less than or equal to 0.08 m<sup>2</sup> which is used to form a surfacing layer.

- **Salt Attack Resistance**

Resistance to attack by the action of soluble salts, determined by the action of sodium sulphate or sodium chloride, in accordance with AS/NZS 4456.10.

- **Slip Resistance Class**

A classification of slip resistance as determined in accordance with AS/NZS4586.

- **Traffic Loading Classification**

NZS 3116 sets out the full details of the traffic loading:

(a) Residential Paving:

- No vehicles.

(b) Residential Driveways:

- Light traffic
- Medium traffic

(c) Public Footpaths:

- Low impact
- High impact (high volume, malls etc.)

(d) Roads

- Minor (up to 150 vehicles a day)
- Local (150-400 vehicles a day)
- Main (over 400 vehicles a day)

(e) Industrial

For full details see *NZS 3116 Concrete Segmental and Flagstone Paving*.

- **Work Size**

The size of a unit specified for its manufacture, from which deviations are measured.

## Concrete Paver Selection

**Table 1:** Maximum Requirements for Dimensions Breaking Load and Abrasion Resistance (based on Table 1, NZS 3116)

Applications	Characteristic breaking load <sup>(1)</sup> (kN) per 100 mm width	Minimum thickness <sup>(2)</sup> (mm)	Shape <sup>(3)</sup>	Dimensional tolerances <sup>(4)</sup>	Edge detail <sup>(5)</sup>	Abrasion resistance <sup>(6)</sup> at 56 days mean	Minimum slip resistance classification <sup>(8)</sup>
<b>Relevant AS/NZS</b>	<b>4456.5</b>	-	-	<b>4455/4456.3</b>	-	<b>4456.9</b>	<b>4586</b>
<b>1. Residential Pedestrian</b>	3.0	40	Any	DPB1	SQ/SC/R/CH	Not required	W
<b>2. Residential driveways</b>							
Light Traffic	5.0	50	Any	DPB2	CH/R	Not required	W
Medium Traffic	Follow provisions of application 4 Roads: Minor						
<b>3. Public Footpaths</b>							
Low Impact	5.0	50	Any	DPB2	SQ/SC/CH	6.0	W
High Impact	5.0	50	Any	DPB2	SQ/SC	3.5	W
<b>4. Roads</b>							
Minor	6.0	60	Rr/Dd	DPB2	CH	Not required	W
Local	12.0	80	Rr/Dd	DPB2	CH	Not required	W
Main	12.0	80	Rr/Dd	DPB2	CH	Not required	W
<b>5. Industrial Pavements</b>	Specific engineering design <sup>(7)</sup>	80	Rr/Dd	DPB3	CH	See Note (7)	W

### NOTES to Table 1

- (1) The characteristic breaking load to AS/NZS 4456.5, as amended by clause 202(b), is carried out on a 150 mm actual paver width in mm. The figures quoted are based on a 100 mm width, i.e. actual breaking load x the ratio of 100 mm divided by the actual paver width mm. The modulus of rupture value of any paver shall not be less than 4 MPa. Where pavers may be subject to chemical/environmental exposure e.g. marine, swimming pools, thermal pools etc., it is recommended that they be subjected to the resistance test contained in AS/NZS 4456.10 to demonstrate an acceptable performance at 50 cycles of test.
- (2) In application 3 where pedestrian areas may be subject to service vehicles, a 60 mm SC paver is recommended.
- (3) The principal shapes are:
  - (a) Rectangular 2:1 ratio (Rr);
  - (b) Rectangular 2:1 ratio (Dd) but dentated for additional interlock;
  - (c) Approximately square, see 304.1 for laying patterns.
- (4) DPB is fully defined in AS/NZS 4455 and relates to dimensions (D) of paver (P) and specifies a method of measurement (B) with a tolerance (1 or 2). The method of measurement is contained in AS/NZS4456.3.
- (5) Definitions:
  - SQ - square edge
  - SC - shallow chamfer no deeper than 2 mm and no wider than 7 mm.
  - R - rumbled
  - CH - chamfer no deeper than 4 mm in depth and no wider than 7 mm.
- (6) The abrasion index figures quoted are values established as criteria for satisfactory performance of pavers going into service at an age of 56 days in areas subjected to pedestrian impact traffic. Typical abrasion test index values at 28 days rather than 56 days are 7 and 4 respectively. Where abrasion resistance is required, the drawings, specification, and/or purchase order for the pavers should specify the abrasion resistance value to be achieved.
- (7) Industrial pavers may be required to have special strength requirements. Specific engineering design requirements need to be agreed between the specifier/designer and the producer. These may require a specified abrasion index. Alternative testing regimes may be arranged between the producer and the product user.
- (8) Products with minimum slip resistance classification W when tested in accordance with AS/NZS 4586 and used in accordance with SAA HB 197 and AS/NZS 3661.2 provide an Alternative Solution for the Compliance Document for NZBC Clause D1.

© Copyright Standards New Zealand.  
 Content from NZS 3116:2002 has been reproduced by New Zealand Concrete Masonry Association Inc with permission from Standards New Zealand under Copyright Licence 000938.  
 Please see Standard for full details, available from [www.standards.co.nz](http://www.standards.co.nz)

## Flagstone Selection

**Table 2:** Flagstone Selection: Minimum Requirements for Dimensions Breaking Load and Abrasion Resistance (based on Table 1A, NZS 3116)

Pavement Applications	Characteristic breaking load (kN) per 100 mm width <sup>(1)</sup>	Nominal Size (mm)	Minimum thickness (mm)	Dimensional tolerance <sup>(2)</sup>	Flatness tolerance (mm)	Edge Detail <sup>(3)</sup>	Abrasion resistance at 56 days (mean) <sup>(4)</sup>	Minimum slip resistance <sup>(5)</sup>
<b>Relevant AS/NZS</b>	<b>4456.5</b>	-	-	<b>4455/4456.3</b>	-	-	<b>4456.9</b>	<b>4586</b>
<b>1. Residential Pedestrian</b>	2.6	600 x 600 500 x 500 450 x 450 400 x 400 300 x 300	40 40 40 40 40	DPB1	2.5 2.2 2.0 1.5 1.0	SQ/SC/CH	Not required	W W W W W
<b>2. Residential driveways Light Traffic</b>	3.8	300 x 300	60	DPB2	1.0	CH	Not required	W
<b>3. Public Footpaths Low Impact High Impact</b>	3.8	450 x 450 400 x 400 300 x 300	60 60 60	DPB2	2.0 1.5 1.0	SQ/SC/CH	Low Impact 6.0 or High Impact 3.5	W W W

### NOTES to Table 2

- (1) Breaking loads are characteristic on a 250 mm span by 100 mm nominal width. For large sizes, specimens may be cut, tested, and compared with the results above.
- (2) DPB is fully defined in AS/NZS 4455 and relates to dimensions (D) of paver (P) and specifies a method of measurement (B) with a tolerance (1 or 2). The method of measurement is contained in AS/NZS 4456.3.
- (3) Definitions:  
 SQ - square edge  
 SC - shallow chamfer no deeper than 2 mm and no wider than 7 mm.  
 CH - chamfer no deeper than 4 mm in depth and no wider than 7 mm.
- (4) The abrasion index figures quoted are values established as criteria for satisfactory performance of flagstones going into service at an age of 56 days in areas subjected to pedestrian impact traffic. Typical abrasion test index values at 28 days rather than 56 days are 7 and 4 respectively. Where abrasion resistance is required, the drawings, specification, and/or purchase order for the pavers should specify the abrasion resistance value to be achieved.
- (5) Products with minimum slip resistance classification W when tested in accordance with AS/NZS 4586:2004 and used in accordance with SAA HB 197 and AS/NZS 3661.2 provide an Alternative Solution for the Compliance Document for NZBC Clause D1.

© Copyright Standards New Zealand.  
 Content from NZS 3116:2002 has been reproduced by New Zealand Concrete Masonry Association Inc with permission from Standards New Zealand under Copyright Licence 000938.  
 Please see Standard for full details, available from [www.standards.co.nz](http://www.standards.co.nz)

**Pavement Thickness Design and Construction**

See NZS 3116, Section 3.

**Bedding Sand Abrading Stability**

See NZS 3116, Appendix A.

**Table 3:** Maximum Dimensional Deviations Determined for Pavers and Flagstones by Individual Measurements (from Table 2.2(B) AS/NZS 4455.2)

Category	Work Size Dimensions, mm			
	Plan		Height	
	Standard Deviation	Mean	Standard Deviation	Mean
DPO	No requirement			
DPB1	2.0	±3.0	3.0	±2.5
DPB2	2.0	±2.5	3.0	±2.0
DPB3	Values declared by the supplier or by agreement between supplier and purchaser			
DPB4	1.5	±2.0	2.0	±2.0

© Copyright Standards New Zealand.  
Content from AS/NZS 4455.2:2010 has been reproduced by New Zealand Concrete Masonry Association Inc with permission from Standards New Zealand under Copyright Licence 000938. Please see Standard for full details, available from [www.standards.co.nz](http://www.standards.co.nz)

All paving and flag units will be categorized in accordance with *AS/NZS 4455.3 Method for Determining Dimensions*.

## Copyright and Disclaimer

© 2010 New Zealand Concrete Masonry Association Inc.

Except where the Copyright Act and the Limited-License Agreement allows otherwise, no part of this publication may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing of the New Zealand Concrete Masonry Association. The information provided in this publication is intended for general guidance only and in no way replaces the services of professional consultants on particular projects. No liability can therefore be accepted, by the New Zealand Concrete Masonry Association, for its use. For full terms and conditions see <http://www.nzcma.org.nz/manual.html>.