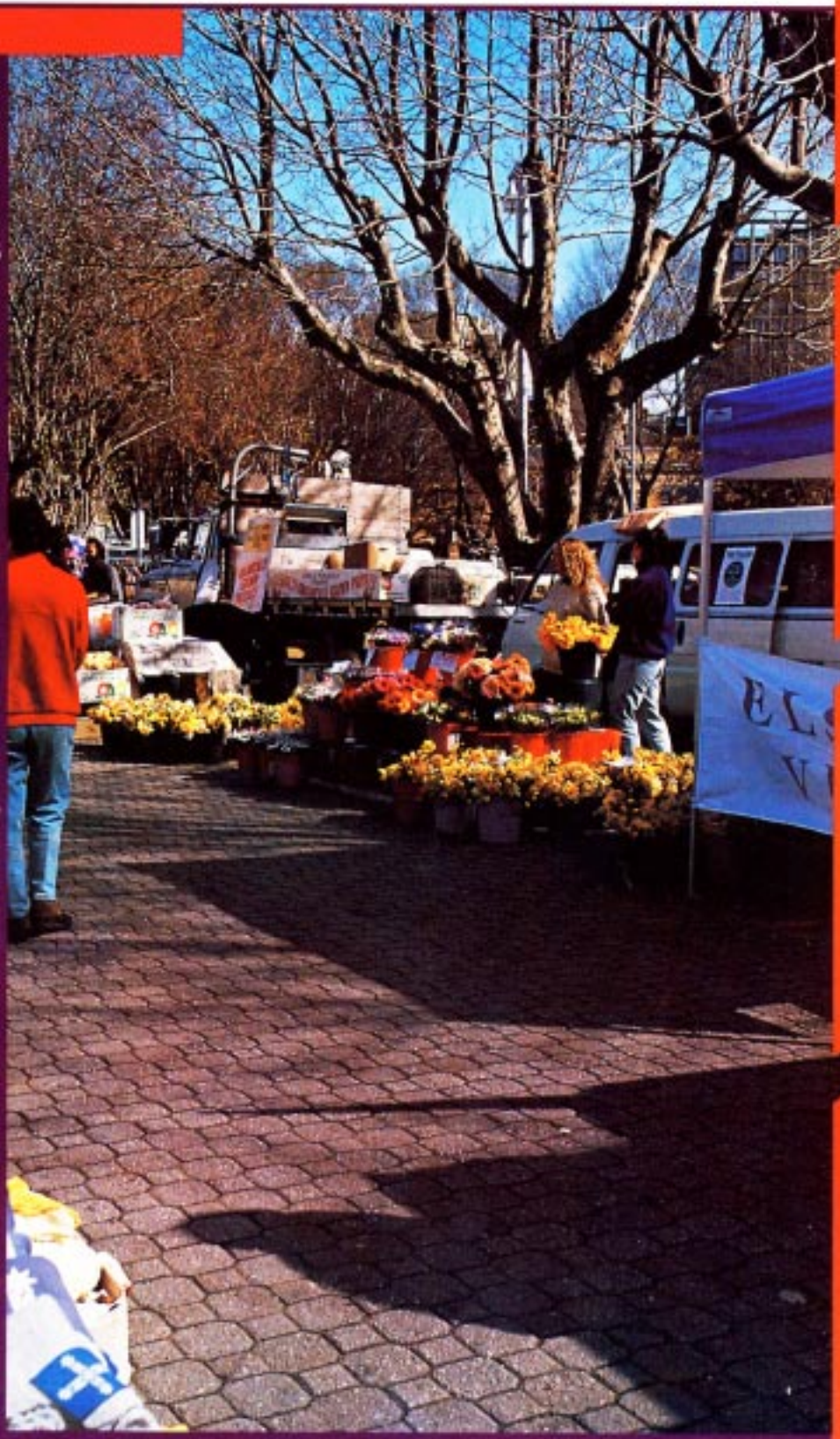
Concrete Segmental Pavements

Guide to Specifying

CMAA
Concrete Masonry Association of Australia

Cement and Concrete Association of Australia



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Introduction

This Guide supersedes *Specification for Concrete Segmental Paving Units* (MA20) published in July 1986 by the Concrete Masonry Association of Australia.

To provide specifiers with an understanding of the product, the Guide sets out the requirements for the manufacture of concrete segmental pavers. It takes account of the latest research and development and references Australian Standard AS/NZ 4456 *Masonry Units and Segmental Pavers – Methods of Test*. Current industry design, detailing and construction guides should also be referenced when specifying concrete segmental pavers.

Bibliography

Concrete Segmental Pavements – Design Guide for Residential Accessways and Roads (T45) CMAA/C&CAA.

Concrete Segmental Pavements – Detailing Guide (T46) CMAA/C&CAA.

Shackel, B *Design and Construction of Interlocking Concrete Block Pavements* Elsevier Science Publishers Ltd, 1990.

AS/NZ 4456 *Masonry Units and Segmental Pavers – Methods of Test.*

AS/NZ 4455 *Masonry Units and Segmental Pavers.*

AS/NZS 3661.1 *Slip Resistance of Pedestrian Surfaces.*

Definitions

Residential Pedestrian Pavements

Pavements subject only to foot traffic, in residential areas.

Public Footpaths

Low Volume Paths in public gardens, pavements at schools or campuses, hard landscape areas, common outdoor areas of residential buildings. Suburban shopping area pavements, pedestrian areas around institutional buildings, sporting or recreational areas.

High Volume Pavements with high-volume pedestrian traffic (over 30 000 passes per day). Inner-city and major suburban pedestrian malls and paths.

Residential Driveways

Light Traffic Operations of vehicles with a gross mass not exceeding 3 tonnes.

Medium Traffic Operations of vehicles with a gross mass more than 3 but not exceeding 10 tonnes, with occasional use by heavier vehicles not exceeding statutory limits for tyre, wheel and axle loads.

Roadways

Minor Up to 150 vehicles per day, eg residential accessways, cul-de-sacs.

Local and Collector 150 to 3000 vehicles per day.

Distributor Over 3000 vehicles per day.

Industrial Pavements

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

Segmental Pavers

Pavers (each with a gross plan area not exceeding 0.1 m^2) used in combination with a bedding course to form a surfacing layer.

Type Pavers are identified by their ability to interlock and are designated Type A, B or C. Typical shapes for each type are shown in Figure 1.

Type A Dentated pavers that key into each other and, by their plan geometry, interlock and resist the relative movement of joints parallel to both the longitudinal and transverse axes of the pavers.

Type B Dentated pavers that key into each other and, by their plan geometry, interlock and resist the relative movement of joints parallel to one axis.

Type C Pavers that do not interlock.

Verification

A system of inspection and testing, intended to give assurance to the customer, and manufacturer. The agreement of a verification system does not relieve the manufacturer of his obligations to supply units complying with the specification.

Type A Dentated units that key into each other and, by their plan geometry, interlock and resist the relative movement of joints parallel to both the longitudinal and transverse axes of the unit

Type B Dentated units that key into each other and, by their plan geometry, interlock and resist the relative movement of joints parallel to one axis

Type C Units that do not interlock

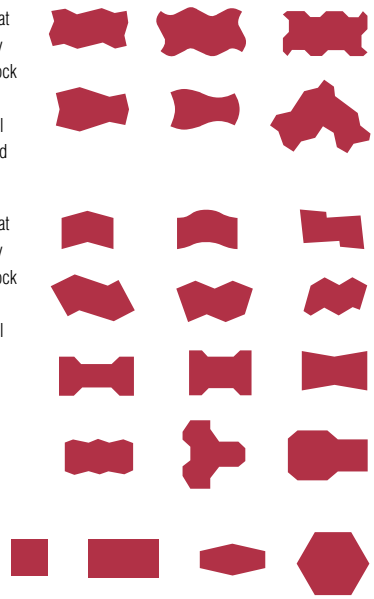

Figure 1

Advantages of Concrete Segmental Pavements

General

Concrete segmental pavers possess a number of advantages over other forms of segmental paving. Firstly, in contrast to alternative forms of paving such as brick, they can be consistently mass produced to high individual dimensional and strength tolerances. Secondly, by virtue of their shape they are designed to be laid either by hand or by machine using relatively unskilled labour and simple construction equipment. Concrete segmental pavements offer advantages over conventional flexible and rigid pavements in several specific areas as noted below.

Aesthetic Appeal

Because of their texture, human scale, pattern and wide range of colours, concrete pavers offer unique aesthetic benefits when compared to other forms of pavement in their ability to integrate and harmonise with both the built and natural environments.

Safety and Environmental

With respect to skid resistance, light reflection, water absorption and noise generation, concrete segmental pavements have been demonstrated to offer advantages over other forms of surfacing for residential, pedestrian and trafficked areas.

Structural and Operational Characteristics

Concrete segmental pavements are highly resistant to the effects of braking, slewing or acceleration of vehicles. Because of these features and their immunity to softening by fuel and oil spillages, concrete segmental pavements are particularly suited for use at bus stops, bus depots and terminals, intersections, pedestrian cross-walks, in heavy-duty pavements and aircraft aprons.

Access to Services

The fact that concrete segmental pavements can be repeatedly lifted and re-laid means that ready access is provided to underground services and that trenching and reinstatement is less unsightly than in conventional pavements.

Maintenance

Maintenance costs can be kept low because it is possible to rehabilitate areas of concrete segmental pavement without having to purchase a new surface.

Table 1 Guide requirements for concrete segmental pavers

Applications	Characteristic breaking load[3] (kN)	Characteristic flexural strength[3] (MPa)	Minimum thickness (mm)	Shape[4] (type)	Dimensional deviations (Category – see Tables 2 and 3)	Chamfers	Abrasion resistance (mean abrasion index)	Slip resistance (co-efficient of friction)	Salt resistance (cycles)
1 Residential Pedestrian									
Not around pools	2	2	No limit	Any	DPA1 or DPB1	Optional	No limit	0.4	0
Around pools	2	2	No limit	Any	DPA1 or DPB1	Optional	No limit	0.4	40
2 Residential Driveways									
Light Traffic	3	2	No limit	Any	DPA1 or DPB1	Optional	7	0.4	0
Medium Traffic[1]	5	3	No limit	Any	DPA1 or DPB1	Optional	7	0.4	0
3 Public Footpaths									
Low Volume	5	3	No limit	Any	DPB2	Optional	5	0.4	0
High Volume and Pedestrian Malls[1]	5	3	No limit	Any	DPB2	Optional	3.5	0.4	0
4 Roads[4]									
Minor	5	3	60	Any	DPB2	Yes	5	0.4	0
Local and Collector	5	3	80	Any	DPB2	Yes	5	0.4	0
Distributor	5	3	80	A	DPB2	Yes	5	0.4	0
5 Industrial Pavements[2]	10	4	80	A	DPB3[5]	Yes	7	0.4	0
Relevant Australian Standard	AS/NZ 4456.5	AS/NZ 4456.5	NA	NA	AS/NZ 4456.3	NA	AS/NZ 4456.9	AS/NZ 3661.1	AS/NZ 4456.10

NA = not applicable, O = optional

[1] Capable of taking occasional 8.2-t axle loads provided that design, detailing, construction and maintenance are carried out in accordance with CMAA recommendations.

[2] The resultant joint width is a combination of paver dimensional deviation and laying procedures – for large pavement applications, manufacturer's advice should be sought.

[3] At 28 days (it is common to test at an earlier age and correlate the results to 28 day data).

[4] Interlocking shapes offer superior performance in Road applications – appropriate design approaches should be considered.

[5] It is intended that in this category dimensional deviations will be controlled to correspond with the intended laying procedure.

Note: For freeze/thaw requirement it is suggested that a suitable deterioration value (weight loss) be established between the specifier and the manufacturer based on the test procedure ASTM C666 *Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.*

Table 2 Dimensional deviations determined over 20 segmental pavers by Cumulative Measurement (from Table 2.2 in AS/NZ 4455 *Masonry Units and Segmental Pavers*)

	Work size dimensions (mm)		
Category*	Under 150	150 to 250	Over 250
DPO	No requirement		
DPA1	±50	±60	±75
DPA2	±40	±50	±60
DPA3	By agreement between supplier and purchaser		

* All paving units will be categorised for dimensional deviations determined in accordance with AS/NZ 4456.3 *Method for Determining Dimensions*

Table 3 Dimensional deviations determined for segmental pavers by Individual Measurement (from Table 2.3 in AS/NZ 4455 *Masonry Units and Segmental Pavers*)

	Work size dimensions (mm)			
	Plan		Height	
Category*	Standard Deviation	Mean	Standard Deviation	Mean
DPO	No requirement			
DPB1	2	±3	3	±2.5
DPB2	2	±2.5	3	±2
DPB3	By agreement between supplier and purchaser			

* All paving units will be categorised for dimensional deviations determined in accordance with AS/NZ 4456.3 *Method for Determining Dimensions*

T44 ISBN 0 909407 30 4 March 1997