



CONCRETE MASONRY
ASSOCIATION OF AUSTRALIA

PA06

Concrete
Segmental
Pavements –
Industrial
Pavements

Contents

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Cover: The Sydney Olympic Park Project was a major development that used over 7 million paving units across 17 different product lines. This was all laid by hand, in preparation for the 2000 Sydney Olympics. The design by Hassell Architects includes Olympic Boulevard and Plazas and Olympic Park Railway Station. Paving Contractors by Shannon Tower Pty Ltd and Sam the Paving Man.

Pavers: Adibri Masonry Honed Trihex®

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Introduction

Concrete block paving (CBP), also known as segmental concrete paving, is a system of individual shaped blocks arranged to form a continuous hardwearing surface overlay. This system of blocks, jointing sand and bedding layer provides a durable wearing course. If properly designed and constructed, it will last for decades with little or no maintenance necessary.

Since CBP was introduced to Australia 35 years ago, it has achieved rapid market penetration and experienced sustained market growth. This is largely because of the valued research work done by people like Dr Brian Shackel and engineers of the Concrete Masonry Association of Australia (CMAA).

CBP can be said to be “Strong, Green and Attractive” and it is for these reasons that CBP has been successfully used in almost all forms of pavement, especially in industrial and heavy-duty pavements:

- Warehouses
- Docksides and container terminals
- Transport depots
- Airports
- Army and defence installations
- Car parks
- Bus depots and bus stops
- Loading docks
- Factories and engineering workshops

Research shows that Type A interlocking pavers (herringbone pattern) develop the best resistance to both vertical and horizontal creep and are generally recommended for all industrial and heavy-duty applications.



CBP History in Australia

Industrial Pavements

Container depots are subjected to some of the heaviest traffic loading as well as heavy long-term static loading. Concrete block paving is recognised as the most suitable and cost effective method of surfacing these areas. Experience with heavy duty CBP in Australia goes back to the early 1980s where container yards such as Webb Dock was constructed using CBP. The paving system at Webb Dock was so successful that further pavement extensions have then been designed and specified using CBP (500,000 m²).

Airports

Airports and harbours use concrete pavers because they halve the construction time when compared to removing and replacing asphalt. Pavers can be used to mark a distinct location for the pilot to park. Chamfers on the pavers contribute to their ability to shed surface water quickly. Although CBP has been used in airports around the world, Cairns International Airport was the first airport to routinely accept fully-laden B747 aircraft on CBP. Another pioneering application has been recently made at Thevenard Island, some 25 km off the coast of Western Australia. An aircraft runway has recently been constructed for West Australian Petroleum Pty Ltd using some 26,000 m² of CBP (1,000 m long, 20 m wide). This represents one of the first commercial airports utilising CBP as a runway rather than restricting its use for aprons or taxiways.

Road Traffic

CBP is also a perfect application for road. King William Road in Adelaide, which is 2.2 km long and passes through five suburbs, was reconstructed in 1985. It is the longest and oldest length of urban arterial road in Australia to utilise concrete block paving. Much of the area traversed by the road has a Heritage Classification and as such the pavement and streetscape had to be designed in conformity with heritage and tourist requirements. The structural ability of the concrete segmental pavement to carry significant urban traffic loads has proven itself throughout the design life of this pavement.

Multi-purpose

Olympic paving projects at Sydney's Homebush Bay site is a result of strong commitment of concrete block paving to comply with the most demanding client and design architect requirements for product quality, colour, surface finish and delivery. In total, 163,000 m² of paving covers an area in excess of 16 hectares which required multi-purpose use including pedestrian, driveways, parking lots and heavy duty traffic loads.

Benefits

Advantage of Concrete Block over Asphalt and Rigid Concrete Paving

Riding Quality

As the blocks perform a structural function, the requirements for the base layer works are less than for asphalt. Concrete block paving provides a tough hard-wearing surface. Used for roads in quarries, it reduces maintenance of the vehicles as well as lowering the dust level. It is suitable for all kinds of vehicles including unsprung or solid tyred equipment. Its high skid resistance provides high grade riding safety.

Curing Time

With machine laid paving method, once the paver is installed, it is immediately ready to use for general function like vehicular traffic. There is no time wasted in waiting for curing, as in the case of asphalt. To ensure the durability of the product, longer curing periods where possible may be recommended.

Environment

When the road alignment needs to be altered to suit the quarry operation, the block pavers can be lifted and re-laid along the new route. Concrete block paving can be lifted by mechanical laying machines, palletised and either reused at another site or recycled. As with a concrete hardstand, rock breakers or crushers are not required to break up the material before removal, nor are there disposal options to consider such as waste into land fill.

Aesthetics

Today, paving is available in a wide range of colours and textures which can enhance any project. There is no limit to what can be achieved to make a project more aesthetically pleasing. Incorporating a corporate image using coloured pavers or embedding a company logo into a hardstand are just a few of the different features that can be achieved.

Repairmen

A particularly useful feature of concrete block paving is that it is a 'forgiving' pavement. Thus, where design or construction defects occur locally (such as at manholes, etc.) repairs are not usually difficult, time consuming or costly. Segmented paving also permits easy access to underground services since the paving blocks in the area may be removed. The required work can then be undertaken and the same blocks replaced.

Slip and Skid Resistance

The chamfered joints in the pavement surface facilitate removal of surface water. This decreases night time glare when wet and enhances skid resistance.

- High abrasion and skid resistance.
- No damage from petroleum products.
- No damage from concentrated point loads or high temperatures.
- No damage by soap or detergents.
- A feature of many modern pavements is the incorporation of design patterns such as coats of arms, maps, insignia, crests, animals, birds, etc., in the paving by using different coloured blocks.

Because of the articulated nature of block paving, large deflections (up to 2 mm or more) have been observed under truck traffic. Such large elastic movements would be unacceptable in other types of pavement and would cause cracking of the surfacing. Because concrete block paving is dissected by a network of joints, large deflections can be tolerated and, except where stabilised bases or sub-bases are used, are not design considerations. For this reason the thickness of unbound granular sub-base needed in a block pavement is normally less than that required in an asphalt surfaced pavement.

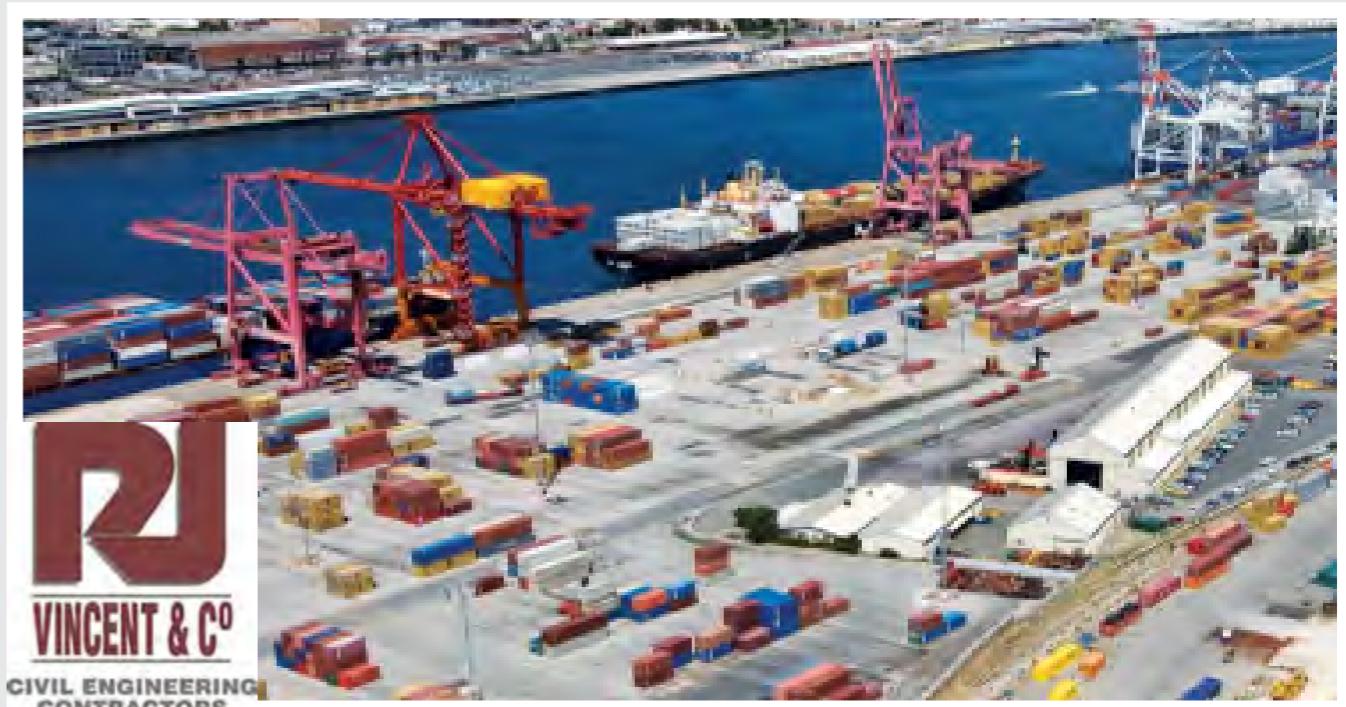
Conclusion

Within the space of just some 30 years, concrete block paving has been transformed into a worldwide phenomenon which is increasingly supported by well researched engineering technology. Also, instead of considering the initial costs of laying pavers only, people have put more focus on the long-term economic benefits and Life-Cycle Cost Analysis (LCCA). Concrete block paving is less expensive than asphalt over a 25 year period. Furthermore, the well-developed computer-based mechanistic design and laying method represents a major component of lifetime costs and cost studies demonstrate that machine-laid concrete block paving for large commercial and industrial areas is highly competitive.

Case Study

Patricks Wharf – Fremantle

Categories: Marine & Aviation case studies



PROJECT: PATRICKS WHARF FREMANTLE
SIZE: 25 000M², 1 Million Pavers

CLIENT: RJ Vincent
VALUE: \$1,000,000.00

DURATION: 4 weeks

When we were awarded this project in 2000 it was a major step forward for ACP Hardstand Solutions and an innovation for the paving industry in Western Australia. Prior to starting the project, we extensively researched and subsequently visited paving machine manufacturers in Germany and purchased the first of our paving machines for our company.

Throughout this project, ACP Hardstand Solutions were to expect a few minor teething problems but with credit to our highly experienced team, we were able to complete this project on time, to the satisfaction of our client and Patricks Wharf Operations.

As the works were being carried out on a busy operating international port, ACP staff were required to pass all maritime compliances and codes and expected to operate successfully within a highly secure site.

Today, this project is used as a benchmark for potential clients as they can see its durability. Even after 12 years of heavy traffic by 40 tonne container fork trucks & heavy articulated container trucks, the project is as good as when handed over to the client back in 2000.

This particular project pioneered the way that ACP Hardstand Solutions operates by mechanically laying product. We are always updating our equipment using the latest German technology to ensure we are leaders in our field, providing a safer environment for our staff and ensuring our projects operate more efficiently for our clients.

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