



# Carpark

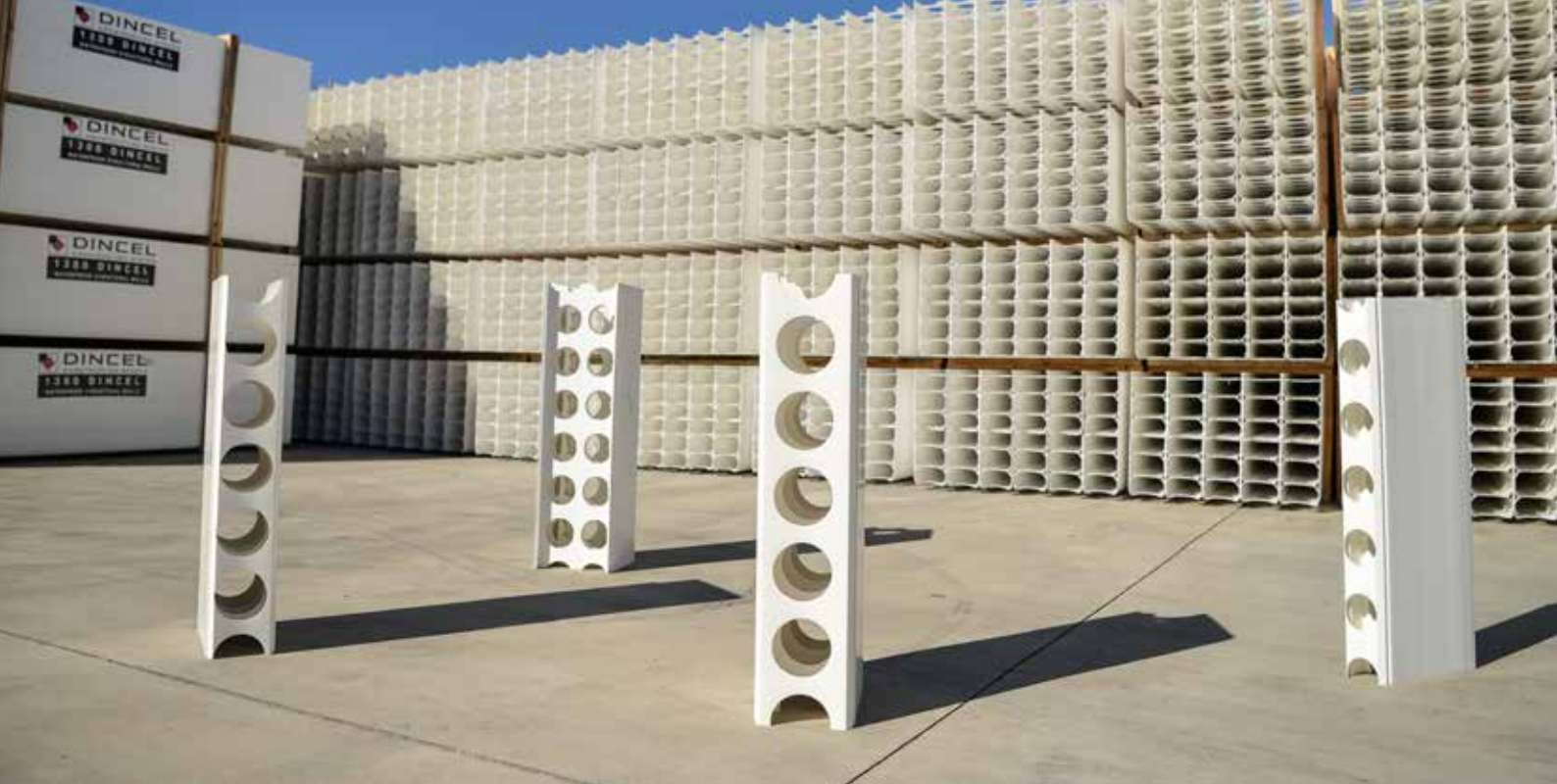
NCC Class 7a Applications



*The Original & Internationally Patented*  
**PVC PERMANENT FORMWORK SYSTEM**

[WWW.DINCEL.COM.AU](http://WWW.DINCEL.COM.AU)

1300 DINCEL



**The Dincel Construction System Group consists of 3 business divisions.** Dincel Structural Walling (manufacturing and supply), Dincel & Associates Consulting Engineers (structural engineering and design services) and Dincel Civil Solutions (design, supply and install for civil and infrastructure projects).

The Dincel Group was founded in 1989 as Dincel & Associates Consulting Engineers. The group originally specialised in structural and design engineering work, across both commercial and residential markets.

In 2006 Dincel Structural Walling went to market.

The years preceding 2006 were spent researching and developing the original PVC based permanent formwork system, proving the initial concept, demonstrating compliance with Australian NCC and finally internationally patenting what is now Dincel Structural Walling.

As a qualified and registered structural engineer Burak Dincel knew all too well the challenges facing the construction industry. To combat these he founded

and still owns the Dincel Construction System Group. This group, using modern engineering methods and practices, develops construction solutions that boost construction speeds, prevent concrete cancer, improve onsite material handleability and durability. These solutions are applicable across the entire spectrum of the construction industry from multi-storey high superstructures to low rise commercial buildings and residential homes.

Today, use and acceptance of Dincel products in the marketplace both locally and internationally is growing rapidly, with Dincel being used in over 7,000 projects across commercial, residential and civil markets in Australia, New Zealand, New Caledonia and Fiji.





# SUSTAINABILITY & GREEN STAR RATING

**Dintel Structural Walling is a PVC based permanent formwork system. Dintel's PVC is phthalate free, consists of heavy metal free stabilisers and is manufactured to the requirements of Best Environmental Practice as per the relevant Australian or International Standard and Section 7 as specified by the Green Building Council of Australia.**

Dintel Structural Walling is a PVC based permanent formwork system. Dintel's PVC is phthalate free, consists of heavy metal free stabilisers and is manufactured to the requirements of Best Environmental Practice as per the relevant Australian or International Standard and Section 7 as specified by the Green Building Council of Australia.

Dintel permanent formwork is classed as a low VOC emitting product. It has been tested for volatile organic compound (VOC) emissions and results were found to be less than the recognised threshold as a newly manufactured product and below detection limit 30 days after manufacture.

For projects seeking Green Star certification, Dintel permanent formwork can provide significant benefits in achieving the desired Green Star rating, specifically under the following credit sections:

- **19B.1.1 Portland Cement**  
Dintel can reduce the use of Portland cement by up to 50% potentially providing 2 points towards Green Star rating.
- **19B.2B Reduced Use of Steel Reinforcement (concrete framed building)**  
Dintel can reduce the use of reinforcing steel bars by up to 30% potentially providing 1 point towards Green Star rating.

In order to maximise Green Star rating points, structural design with the use of Dintel as structural load bearing walls is paramount. Dintel & Associates Consulting Engineers can provide expert advice on how to maximise cost, time and embodied energy savings with the use of Dintel as load bearing walls.



# SAVINGS IN CONSTRUCTION TIME, LABOUR AND RAW MATERIALS

Conventional multi-storey construction dictates that the floor cycle starts with vertical elements. The Dincel system allows floor formwork placement to take place on Day 1, which removes the vertical elements from the critical path and reduces the floor cycle time.

Dincel Structural Walling can provide significant benefits to builders, designers, installers and end users. These benefits can be easily translated to real financial savings around construction time, labour, cost of raw materials and increase in available floor space.

A summary of Dincel's features and benefits include:

#### Handleability and manoeuvrability onsite.

- Each panel can be carried by a single person (3m long panels weigh up to only 13kg), minimising the need for craneage.
- Use of scaffolding can be kept to a minimum, if not eliminated.

#### Speed of construction.

A two-person team can install up to 25m<sup>2</sup> of Dincel wall per hour.

#### Less trades onsite.

Dincel does not require skilled labour to assemble nor an extra trade onsite. One trade can install Dincel panels, steel reinforcement and pour the concrete.

#### No requirement for shop drawings.

Dincel permanent formwork panels are installed onsite and compliant to AS 3600.

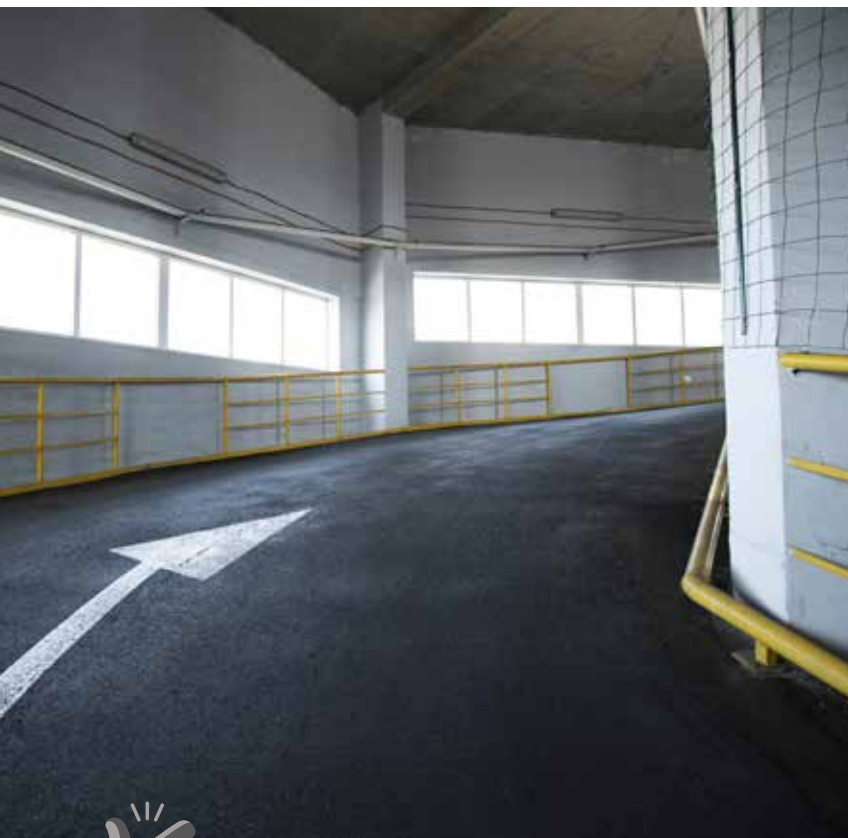
Dincel panels' internationally patented "**snap lock**" joint is what gives it its weatherproof and waterproofing ability. Dincel can be used for applications such as swimming pools, water tanks and basement walls located below the water table. For waterproofing capability Dincel panels must be installed as per the Dincel construction manuals.

When designing a project with Dincel in mind, Dincel & Associates Consulting Engineers are able to maximise our customers' savings benefits around:

- Construction time – up to 50% savings
- Materials – up to 50% savings in Portland cement, up to 30% savings in reinforcing steel, waterproofing membranes
- Labour costs

#### Green Star and sustainability.

- Dincel can help reduce the use of Portland cement by up to 50% for a potential 2 Green Star points
- Can help reduce reinforcing steel by up to 30% for a potential 1 Green Star point.
- Dincel panels use Best Environmental Practices PVC and VOC emissions that are below detectable levels or below the acceptable threshold.





## DINCEL'S FEATURES & HOW TO MAXIMISE BENEFITS

Carparks should be designed with load bearing walls such as Dincel in mind. For example, typical intertenancy party walls which consist of columns and lightweight 'infill' materials could be replaced with Dincel load bearing walls in order to achieve the following benefits:

### ➤ **Reduced slab thicknesses**

Slabs that were 200-250mm thick could be reduced to as thin as 150mm thick (or 175mm thick with a 25mm set down for wet areas). Transfer slab thickness can also be reduced by utilising Dincel walls on the level above as deep beams.

### ➤ **Reduction in slab steel reinforcement**

Post tensioning (PT) or standard rebar can be substituted with mesh reinforcement which is economical and incredibly quick to lay.



To achieve this, it is important that architects ensure that in a carpark design, wet areas and party walls are placed on top of each other. This is a fundamental requirement to achieve cost and time efficient apartment construction. By using Dincel as your choice for load bearing walls, the following benefits can also be attained within the walls themselves:

### **Reduction or even elimination of wall reinforcing steel.**

This is possible through Dincel's unique crack inducing technology as certified by the University of New South Wales (UNSW), which removes the need for crack control steel.

### **Reduction of Portland cement content in concrete mix wall concrete.**

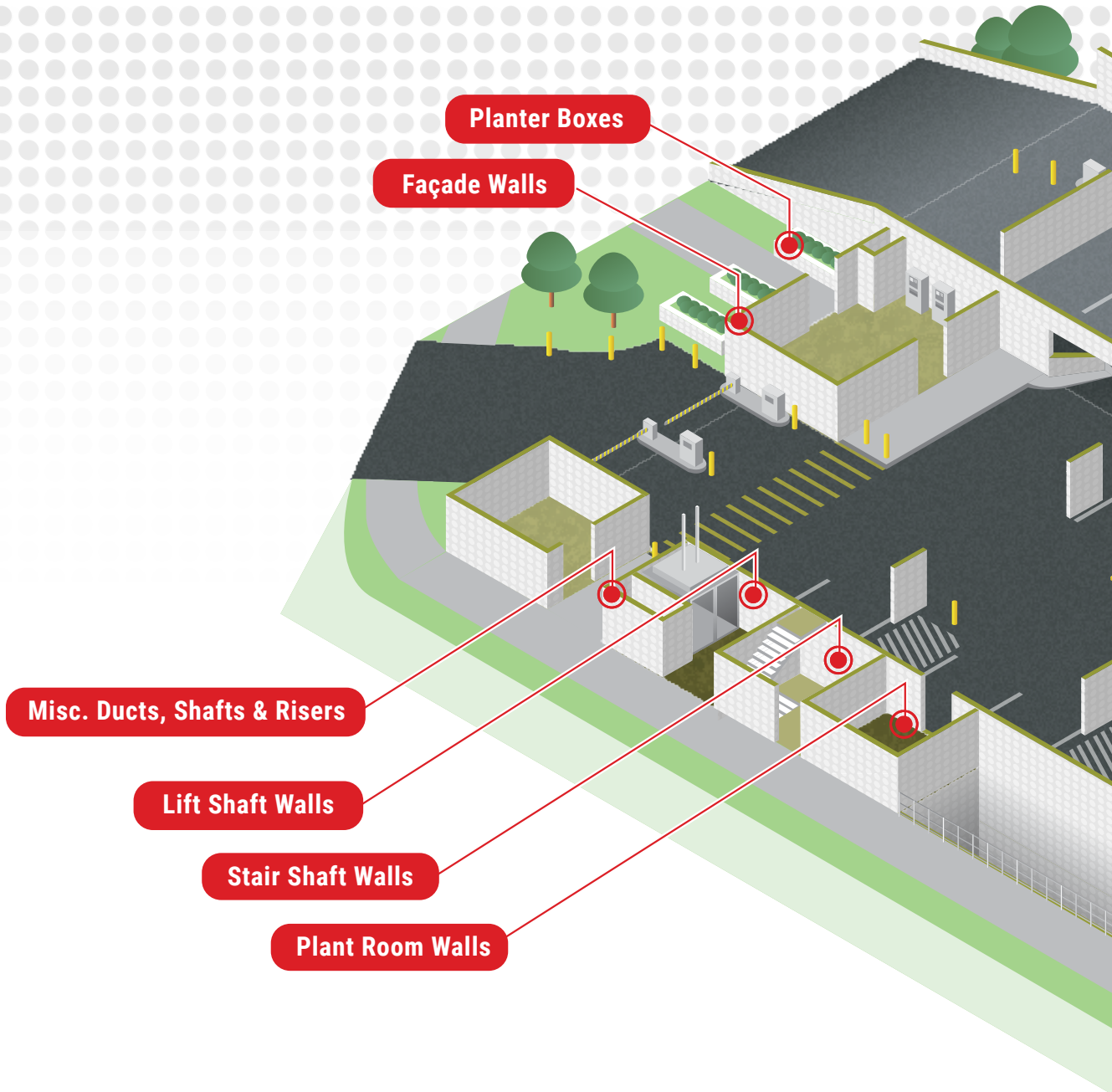
Dincel's protective polymer skin allows for:

- Enhanced wall durability and therefore enables for replacement of Portland cement with materials such as fly ash, making for more environmentally friendly concrete mixes.
- Ongoing hydration achieving denser concrete, which in turn can result in 50% less cement use.

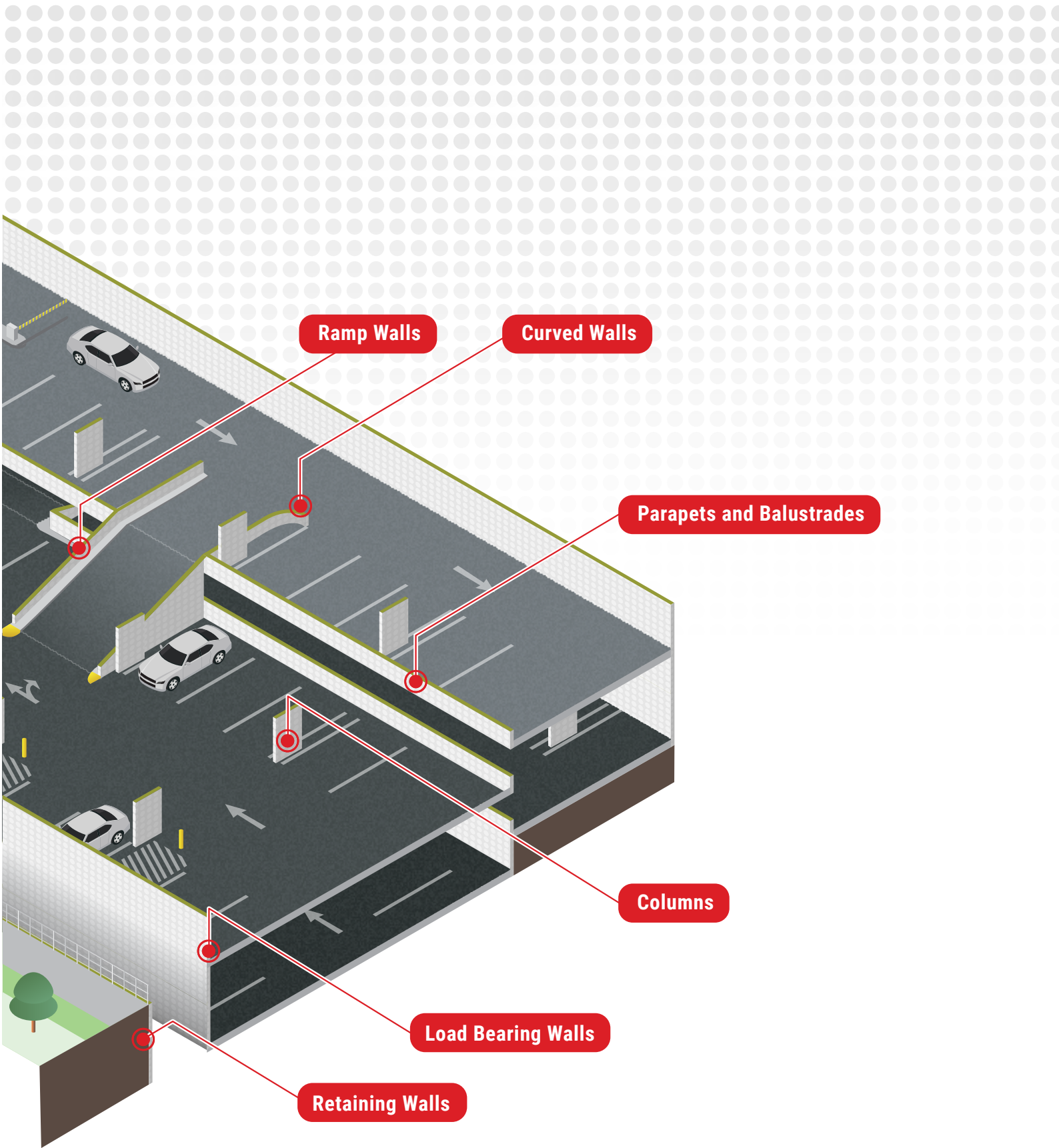
A structural engineer who is experienced with the Dincel system can turn the above into a reality for your project. Please speak to us early on in your project for more information.



# APPLICATIONS








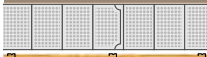









# INTERNAL APPLICATIONS

## NCC CLASS 7A - CARPARK

				System Performance		
System	Dintel Profile	Min. Plasterboard Thickness	Total Wall Width	Rw (Rw+Ctr)	Maximum FRL achievable	
<b>DIN-IW1</b> 	<b>SIDE 1</b> Left bare	110	N/A	110	48 (43)	90/90/90 <sup>1</sup>
		155	N/A	155	51 (45)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> Left bare	200	N/A	200	53 (48)	240/240/240 <sup>1</sup>
		275	N/A	275	53 (48)	240/240/240 <sup>1</sup>
<b>DIN-IW2</b> 	<b>SIDE 1</b> Plasterboard	110	10	120	45 (41)	90/90/90 <sup>1</sup>
		155	13	168	50 (45)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> Left bare	200	10	210	51 (46)	240/240/240 <sup>1</sup>
		275	10	285	51 (46)	240/240/240 <sup>1</sup>
<b>DIN-IW3</b> 	<b>SIDE 1</b> Plasterboard	110	10	130	45 (41)	90/90/90 <sup>1</sup>
		155	13	181	50 (45)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> Plasterboard	200	10	220	51 (46)	240/240/240 <sup>1</sup>
		275	10	295	51 (46)	240/240/240 <sup>1</sup>
<b>DIN-IW4</b> 	<b>SIDE 1</b> Plasterboard	110	13	166	45 (42)	90/90/90 <sup>1</sup>
		155	10	205	48 (43)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 28mm furring channels (600 c/c, 30mm cavity), plasterboard	200	10	250	53 (46)	240/240/240 <sup>1</sup>
		275	10	325	53 (46)	240/240/240 <sup>1</sup>
<b>DIN-IW5</b> 	<b>SIDE 1</b> Plasterboard	110	10	160	53 (46)	90/90/90 <sup>1</sup>
		155	10	205	55 (48)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 28mm furring channels (600 c/c, 30mm cavity), 25mm glasswool (HD), plasterboard	200	10	250	57 (50)	240/240/240 <sup>1</sup>
		275	10	325	57 (50)	240/240/240 <sup>1</sup>
<b>DIN-IW6</b> 	<b>SIDE 1</b> 28mm furring channels (600 c/c, 45mm cavity), 25mm glasswool (HD), plasterboard	110	16	232	63 (50)	90/90/90 <sup>1</sup>
		155	13	271	60 (52)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 28mm furring channels (600 c/c, 45mm cavity), 25mm glasswool (HD), plasterboard	200	13	316	63 (54)	240/240/240 <sup>1</sup>
		275	13	391	63 (54)	240/240/240 <sup>1</sup>
<b>DIN-IW7</b> 	<b>SIDE 1</b> Left bare	110	10	191	51 (43)	90/90/90 <sup>1</sup>
		155	10	236	54 (45)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 51mm steel studs (600 c/c, 71mm cavity), plasterboard	200	10	281	57 (47)	240/240/240 <sup>1</sup>
		275	10	356	57 (47)	240/240/240 <sup>1</sup>
<b>DIN-IW8</b> 	<b>SIDE 1</b> Plasterboard	110	13	207	57 (50)	90/90/90 <sup>1</sup>
		155	13	252	63 (51)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 51mm steel studs (600 c/c, 71mm cavity), 50mm glasswool (LD), plasterboard	200	10	291	61 (53)	240/240/240 <sup>1</sup>
		275	10	366	61 (53)	240/240/240 <sup>1</sup>
<b>DIN-IW9</b> 	<b>SIDE 1</b> 28mm furring channel (600 c/c, 30mm cavity), plasterboard	110	10	231	47 (41)	90/90/90 <sup>1</sup>
		155	10	276	51 (43)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 51mm steel studs (600 c/c, 71mm cavity), plasterboard	200	10	321	55 (46)	240/240/240 <sup>1</sup>
		275	10	396	55 (46)	240/240/240 <sup>1</sup>
<b>DIN-IW10</b> 	<b>SIDE 1</b> 28mm furring channel (600 c/c, 30mm cavity), plasterboard	110	13	237	57 (50)	90/90/90 <sup>1</sup>
		155	13	282	63 (51)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 51mm steel studs (600 c/c, 71mm cavity), 50mm glasswool (LD), plasterboard	200	13	327	61 (53)	240/240/240 <sup>1</sup>
		275	13	402	61 (53)	240/240/240 <sup>1</sup>
<b>DIN-IW11</b> 	<b>SIDE 1</b> 28mm furring channel (600 c/c, 30mm cavity), 25mm glasswool (HD), plasterboard	110	HD13	237	62 (50)	90/90/90 <sup>1</sup>
		155	HD13	282	67 (52)	180/180/180 <sup>1</sup>
	<b>SIDE 2</b> 51mm steel studs (600 c/c, 71mm cavity), 50mm glasswool (LD), plasterboard	200	HD13	327	68 (53)	240/240/240 <sup>1</sup>
		275	HD13	402	68 (53)	240/240/240 <sup>1</sup>

The 'NCC/Other requirements' information provided above is for guidance purposes only please check with your consultants for specific requirements for your project. The above requirements are based upon the NCC deemed-to-satisfy provisions (Specification C1.1 and F5.0 - F5.5)

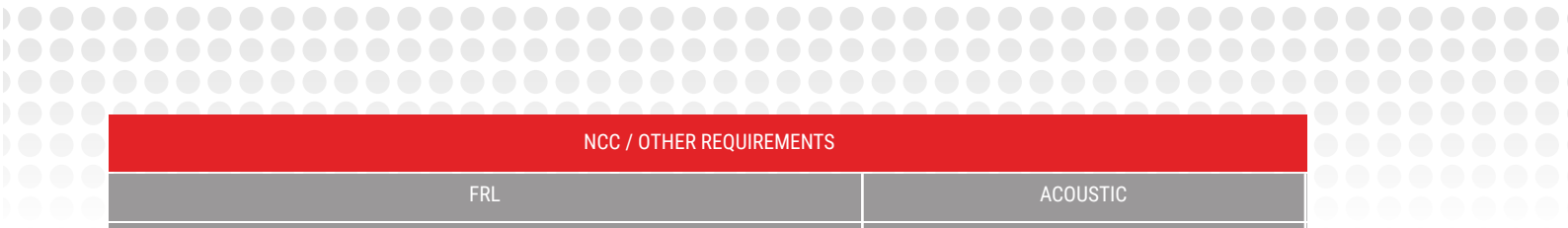
The above performance is based on the following product densities:

- 10mm thick plasterboard - 650 kg/m<sup>3</sup> bulk density
- 13mm thick plasterboard - 623 kg/m<sup>3</sup> bulk density
- HD13mm thick plasterboard (HD = High Density, typically fire rated plasterboard) - 808 kg/m<sup>3</sup> bulk density

- 16mm thick plasterboard - 766 kg/m<sup>3</sup> bulk density
- 25mm thick glasswool insulation (HD) - 24 kg/m<sup>3</sup> bulk density
- 50mm thick glasswool insulation (LD) - 11 kg/m<sup>3</sup> bulk density
- Concrete within Dintel formwork - 2350 kg/m<sup>3</sup> bulk density








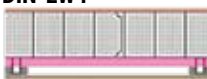




NCC / OTHER REQUIREMENTS				
FRL			ACOUSTIC	
COLUMNS & WALLS			COLUMNS & WALLS	
Type A & B construction	Type C construction	Open-deck or suitably sprinklered carpark and separated as per NCC requirement	Internal, not adjoining a different class	
Up to 240/240/240 <sup>2</sup> FRL	Up to 90/90/90 <sup>2</sup> FRL	Up to 60/60/60 <sup>2</sup> FRL	No acoustic req.	
-	✓	✓	✓	
✓	✓	✓	✓	
✓	✓	✓	✓	
-	✓	✓	✓	
✓	✓	✓	✓	
✓	✓	✓	✓	
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-	✓	✓	✓	
✓	✓	✓	✓	
✓	✓	✓	✓	

<sup>1</sup> Dependant on design and wall loading. 'Structural Adequacy' component of FRL must be calculated and provided by the project's structural engineer, in accordance to AS3600, Eurocode or other relevant concrete design codes.  
<sup>2</sup> FRL requirement is based upon a wall with a distance of less than 1.5m from a fire source feature. Please check the NCC for other FRL requirements which may be applicable to your project.

# EXTERNAL APPLICATIONS

## NCC CLASS 7A - CARPARK

				FRL		
				COLUMNS AND WALLS		
				System Performance	Type A & B construction (those that require FRL)	Type C construction (those that require FRL)
System	Dintel Profile	Total Wall Width	Maximum FRL achievable	Up to 240/240/240 <sup>1</sup> FRL	Up to 90/90/90 <sup>1</sup> FRL	
<b>DIN-EW1</b> 	<b>SIDE 1</b> Left bare	110	90/90/90 <sup>1</sup>	-	✓	
		155	180/180/180 <sup>1</sup>	✓	✓	
	<b>SIDE 2</b> Left bare	200	240/240/240 <sup>1</sup>	✓	✓	
		275	240/240/240 <sup>1</sup>	✓	✓	
<b>DIN-EW2</b> 	<b>SIDE 1</b> Choice of finish: paint, render or cladding	110	90/90/90 <sup>1</sup>	-	✓	
		155	180/180/180 <sup>1</sup>	✓	✓	
	<b>SIDE 2</b> Left bare	200	240/240/240 <sup>1</sup>	✓	✓	
		275	240/240/240 <sup>1</sup>	✓	✓	
<b>DIN-IW3</b> 	<b>SIDE 1</b> Left bare	110	90/90/90 <sup>1</sup>	-	✓	
		155	180/180/180 <sup>1</sup>	✓	✓	
	<b>SIDE 2</b> 50mm+ cavity, secondary wall for habitable room (either 110 Dintel, lightweight partition, masonry or dry wall)	200	240/240/240 <sup>1</sup>	✓	✓	
		275	240/240/240 <sup>1</sup>	✓	✓	
<b>DIN-EW4</b> 	<b>SIDE 1</b> Choice of finish: paint, render or cladding	110	90/90/90 <sup>1</sup>	-	✓	
		155	180/180/180 <sup>1</sup>	✓	✓	
	<b>SIDE 2</b> 40mm insulation board, 28mm furring channel on clips, 13mm plasterboard	200	240/240/240 <sup>1</sup>	✓	✓	
		275	240/240/240 <sup>1</sup>	✓	✓	
<b>DIN-EW5</b> 	<b>SIDE 1</b> 110mm brick veneer w/20mm cavity	110	90/90/90 <sup>1</sup>	-	✓	
		155	180/180/180 <sup>1</sup>	✓	✓	
	<b>SIDE 2</b> 40mm insulation board, 28mm furring channel on clips, 13mm plasterboard	200	240/240/240 <sup>1</sup>	✓	✓	
		275	240/240/240 <sup>1</sup>	✓	✓	
<b>DIN-EW6</b> 	<b>SIDE 1</b> Insulated panel system on top hats	110	90/90/90 <sup>1</sup>	-	✓	
		155	180/180/180 <sup>1</sup>	✓	✓	
	<b>SIDE 2</b> 28mm furring channels on clips, 13mm plasterboard	200	240/240/240 <sup>1</sup>	✓	✓	
		275	240/240/240 <sup>1</sup>	✓	✓	

The 'NCC/Other requirements' information provided above is for guidance purposes only please check with your consultants for specific requirements for your project.

<sup>1</sup> Dependant on design and wall loading. 'Structural Adequacy' component of FRL must be calculated and provided by the project's structural engineer, in accordance to AS3600, Eurocode or other relevant concrete design codes.

<sup>2</sup> FRL requirement is based upon a wall with a distance of less than 1.5m from a fire source feature. Please check the NCC for other FRL requirements which may be applicable to your project.

<sup>3</sup> Dintel recommends the 275 profile for permanently submerged applications due to enhanced design. For more information please refer to waterproofing documentation on our website.





NCC / OTHER REQUIREMENTS

FRL		WATERPROOFING					
COLUMNS AND WALLS		BASEMENT WALL		FAÇADE, BALUSTRADE, DADO OR BLADE WALL		TANK WALL	RETAINING OR PLANTER BOX WALL
	Open-deck or suitably sprinklered carpark and separated as per NCC requirements	Above the water table	Underneath the water table	Separating exterior environment from interior	Exterior environment on both sides of the wall	All	All
	<b>Up to 60/60/60<sup>1</sup> FRL</b>	<b>Waterproof</b>	<b>Submerged conditions</b>	<b>Waterproof (and includes insulation)</b>	<b>No water-proofing or insulation req.</b>	<b>Waterproof</b>	<b>Waterproof</b>
	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	-2 -2 -2 ✓ <sup>2</sup>	N/A N/A N/A N/A	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	-2 -2 -2 ✓ <sup>2</sup>	N/A N/A N/A N/A	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	-2 -2 -2 ✓ <sup>2</sup>	N/A N/A N/A N/A	N/A N/A N/A N/A	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
	✓ ✓ ✓ ✓	N/A N/A N/A N/A	N/A N/A N/A N/A	✓ ✓ ✓ ✓	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A
	✓ ✓ ✓ ✓	N/A N/A N/A N/A	N/A N/A N/A N/A	✓ ✓ ✓ ✓	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A
	✓ ✓ ✓ ✓	N/A N/A N/A N/A	N/A N/A N/A N/A	✓ ✓ ✓ ✓	N/A N/A N/A N/A	N/A N/A N/A N/A	N/A N/A N/A N/A







# COMPLIANCE & CERTIFICATIONS

**Dincel is a CodeMark certified product.** Its performance has been tested and assessed by NATA registered laboratories and engineering field experts such as Warringtonfire, CSIRO, Omnii Consulting Fire Engineers, Day Design Consulting Acoustical Engineers, The University of NSW (UNSW), The University of Technology Sydney (UTS) and CETEC.

The following documentation is available from our website [www.dincel.com.au/resources/compliance](http://www.dincel.com.au/resources/compliance) or alternatively by contacting us via email at [enquiry@dincel.com.au](mailto:enquiry@dincel.com.au) or calling **1300 DINCEL**.

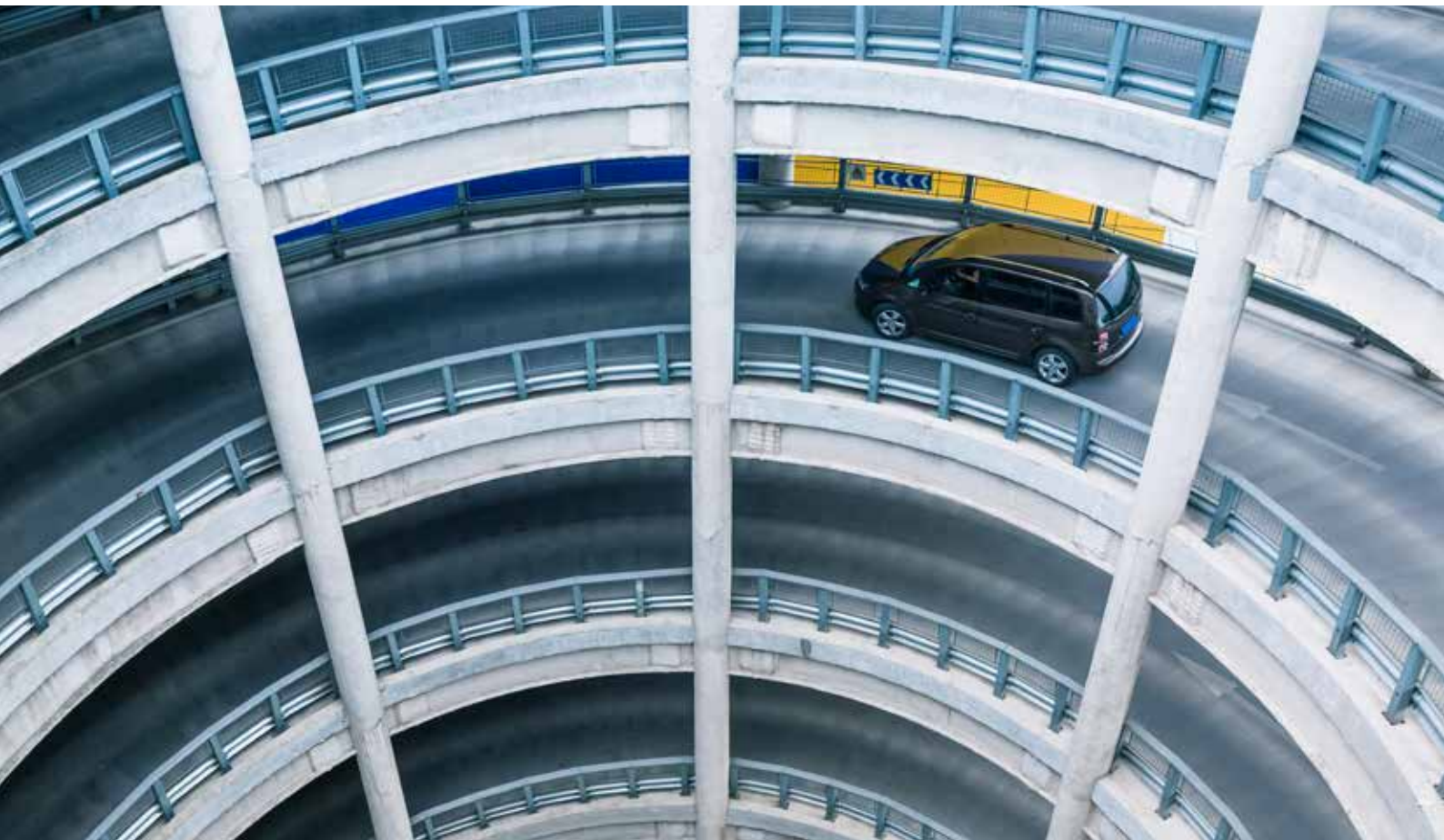
## Fire Performance

Dincel permanent formwork has been tested and assessed to meet the NCC bushfire regulations for BAL FZ areas in accordance with AS 3959.

It has also been tested to meet other fire regulations by NATA registered laboratories, including AS 5637.1 and ISO 9705 Full Room Test for internal walls and found to be Deemed to Satisfy to NCC 2019 requirements (Group 1, SMOGRA 14).

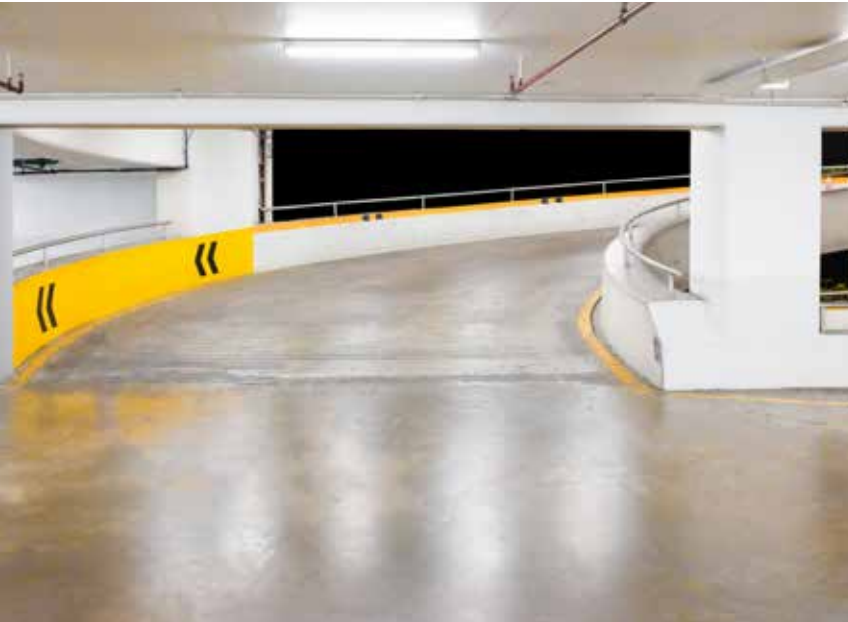
For external façade walls, Dincel has also been tested to AS 5113/BS 8414 and found to be compliant with the NCC requirements as a Performance Solution.

Several tests to AS 1530.4 have been carried out on the Dincel Structural Walling system, including joint tests with other wall types (plasterboard, aerated autoclaved concrete panels and bricks), as well as penetrations tests (including cable trays, water and electrical services), and in terms of Fire Resistance Levels, when tested to AS 1530.4, the Dincel system can achieve an FRL between 90/90/90 and 240/240/240.





# COMPLIANCE & CERTIFICATIONS



offers a safe, practical and reliable seismic resistant solution based on its performance under the most hostile loading environments.

## Waterproofing Performance

The Dincel system has been tested and certified by CSIRO as meeting waterproofing requirements without the need for waterproofing membranes and other wall junctions in accordance with the following test methods:

- **ASTM E 514 –08**  
Standard Test Method for Water Penetration and Leakage Through Masonry.
- **AS/NZS 4347.1:1995**  
Determination of Water Permeability for Damp-Proof Courses and Flashings.
- **ASTM E 96/M**  
Standard Test Method for Water Vapour Transmission of Materials.

## Structural Performance

The design, use and install of Dincel structural walls in accordance with Dincel's design and construction manuals has been assessed as being compliant with AS 3600.

Dincel Structural Walling was put through an extensive testing and assessment regime to determine the adequacy of the system in seismic regions.

The series of tests and accompanying analysis, have confirmed the suitability of the Dincel system to resist large lateral forces and resulting displacement caused by major ground motions measuring up to 9.0 on the Richter scale. Hence the Dincel system

## Acoustic Performance

The Dincel system has been full system tested by CSIRO at their acoustic testing facility. Acoustic assessments have also been carried out by an external Acoustical Engineering Consultancy firm.

## Environment & Sustainability

Dincel PVC is BEP (Best Environmental Practices) certified. Our polymer PVC uses stabilisers that are free from heavy metals and plasticisers.

Our permanent formwork system has been tested for volatile organic compound (VOC) emissions and found to be a low emission product with results below detectable thresholds/limits.







**1300 DINCEL | DINCEL.COM.AU**

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**Certified  
& Compliant**



**Faster  
& Easier**



**Cheaper  
& Stronger**

