DINCEL
STRUCTURAL WALLING

DINCEL STRUCTURAL WALLING

COST ANALYSIS

DEVELOPER WANTS:

Superior COST and TIME savings.

Omittance of maintenance issues.

Skilled labour not to be required.

Read the following Testimonials from developers and builders.

(Download) TESTIMONIAL – CEEROSE – PROJECT AT CAMPERDOWN

(Download) TESTIMONIAL – CHC AFFORDABLE HOUSING – PROJECT AT CANBERRA

DID YOU KNOW THAT DINCEL LOAD BEARING WALLS OFFER:

- **Significantly FASTER Construction.**
- **Maximum COST EFFICIENCY.**
  - Minimum 22%, up to 43% cost efficiency.
  - Current AS3600 offer significant benefits to load bearing wall systems.
- **Maximum ENERGY EFFICIENCY.**
- **STRENGTH of up to magnitude 9 Earthquakes.**

COST EFFICIENCY

- **MATERIAL COST SAVING**
  - Less concrete and steel in typical floor slabs and transfer levels.
  - Eliminates conventional footings and waterproofing costs.
  - Cheaper concrete.
  - Reduced waste and cleaning costs.
  - Reduced maintenance costs.
- **SPEED**
  - Installation speed.
  - Co-ordination of trades.
  - Not affected by wet weather conditions.
  - Faster than column-slab system having infill walls.

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DINCEL STRUCTURAL WALLING

ECLIPSE – 200 APARTMENTS, BRUCE ACT

77 WEEKS CONSTRUCTION PROGRAM – REDUCED BY 26 WEEKS

DNA PROJECT – CAMPERDOWN, SYDNEY

52 WEEKS CONSTRUCTION PROGRAM – REDUCED BY 26 WEEKS

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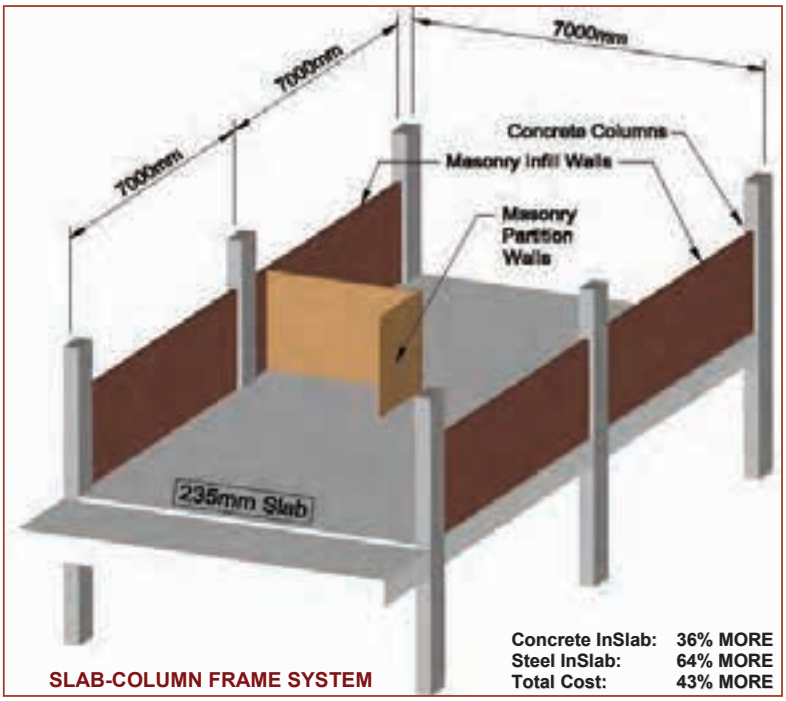
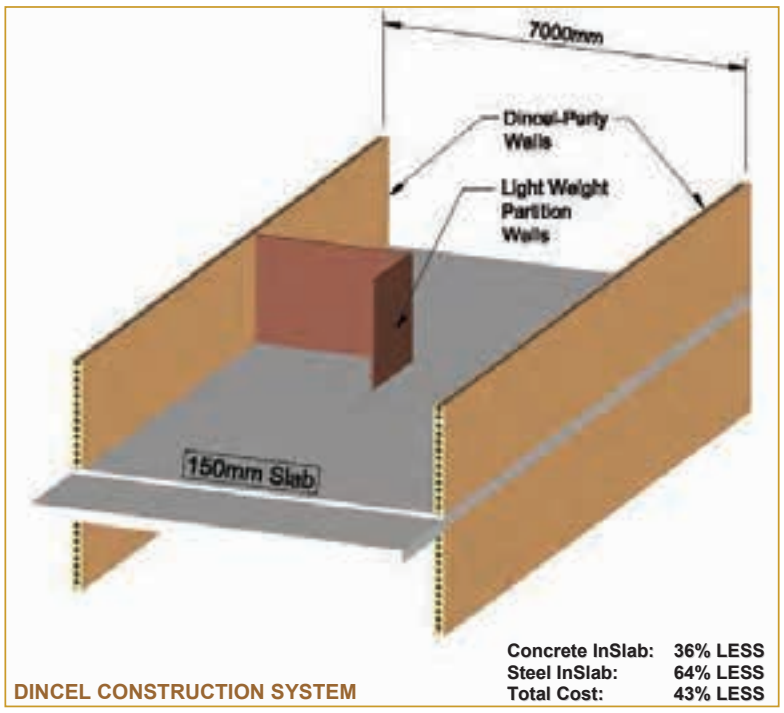
DINCEL STRUCTURAL WALLING

MAJOR COST SAVING RULES FOR ARCHITECTURAL PLANNING

- Cross ventilation requirements mostly result in party walls being parallel to each other.
- The most cost effective construction results utilising load bearing party walls.
- All party walls and wet areas are located at the top of each other in multi-unit developments and is a key cost issue.
- Where possible it is highly recommended that party walls are orientated at right angle direction to carparking aisle ways.



SLAB-COLUMN FRAME SYSTEM



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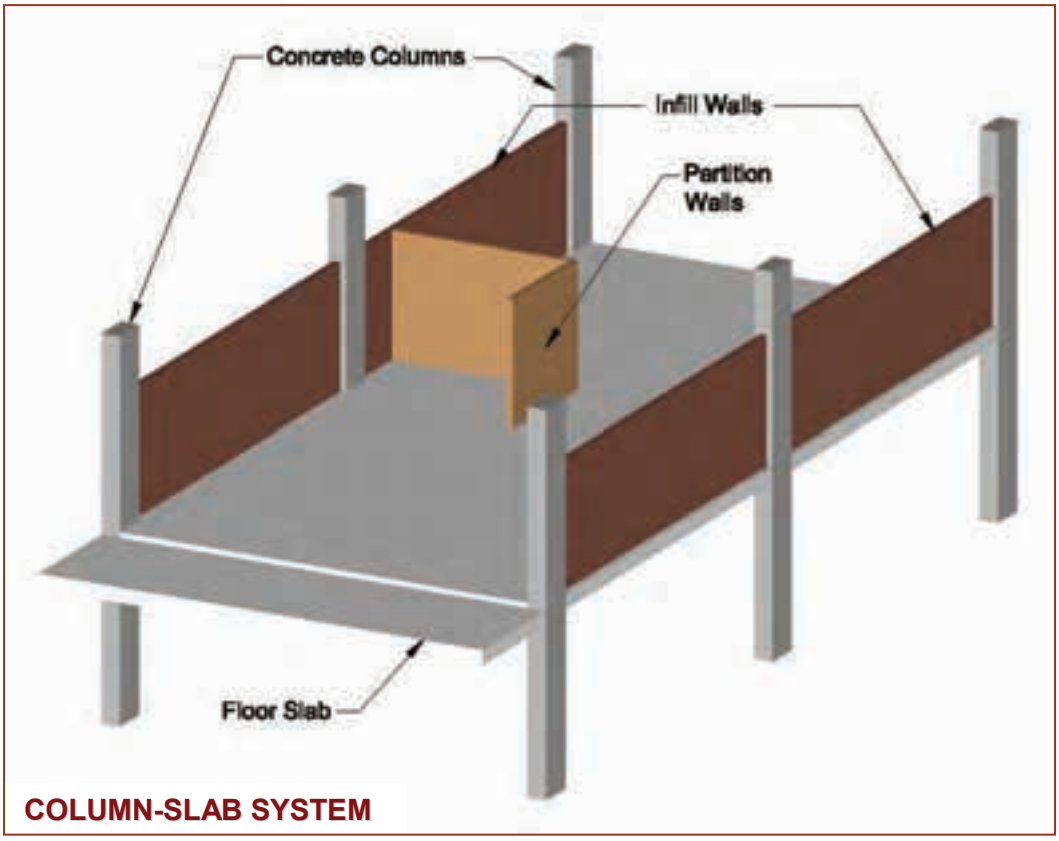
DINCEL STRUCTURAL WALLING

AS3600 – 2009
CONCRETE STRUCTURES CODE

MANDATORY FROM MAY 2011

Frame Structures with AS3600 – 2009

- Minimum slab thickness is 200mm.
- Mesh reinforcement cannot be used.
- DINCEL allows 150mm thick slabs and mesh reinforcement.



COLUMN-SLAB SYSTEM

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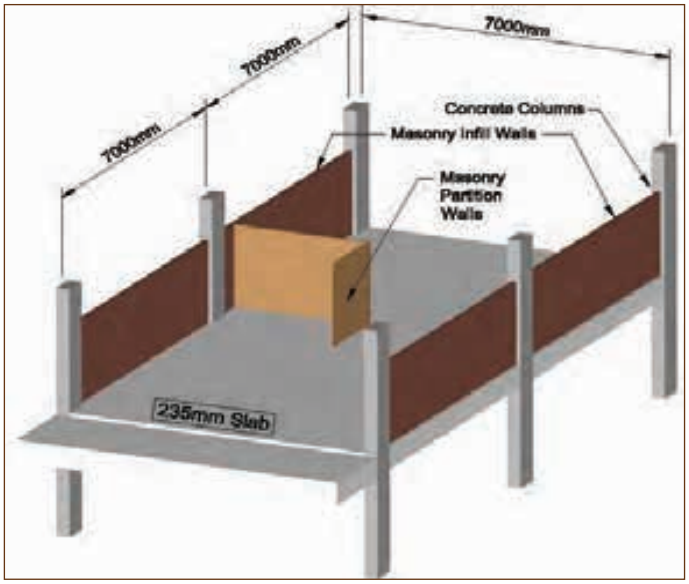
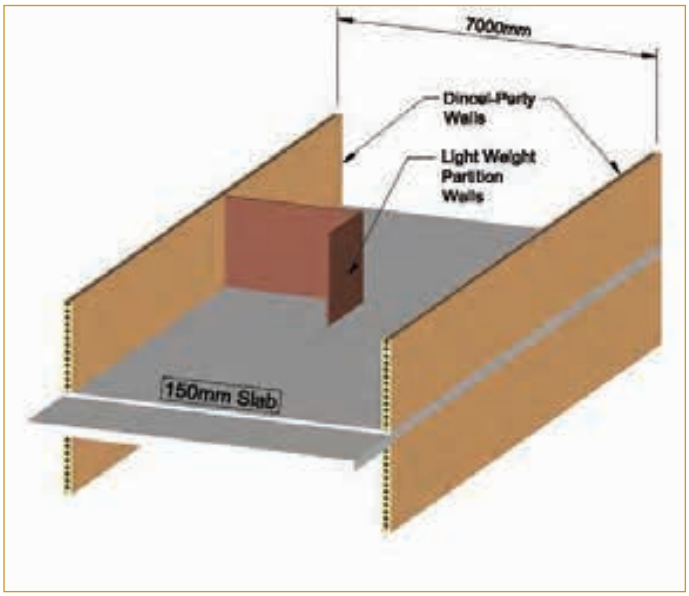
DINCEL STRUCTURAL WALLING

COMPARISON BETWEEN CONVENTIONAL FRAME AND DINCEL SYSTEMS COMPARISON



CONVENTIONAL FRAME SYSTEM – Case 2



DINCEL CONSTRUCTION SYSTEM – Case 1

CASE STUDY – FOR TWO BEDROOM + STUDY APARTMENT UNIT

DINCEL ACHIEVES COST SAVINGS AT EACH FLOOR LEVEL:

CASE 1 vs CASE 2.....43%

CASE 1 vs CASE 3.....23%

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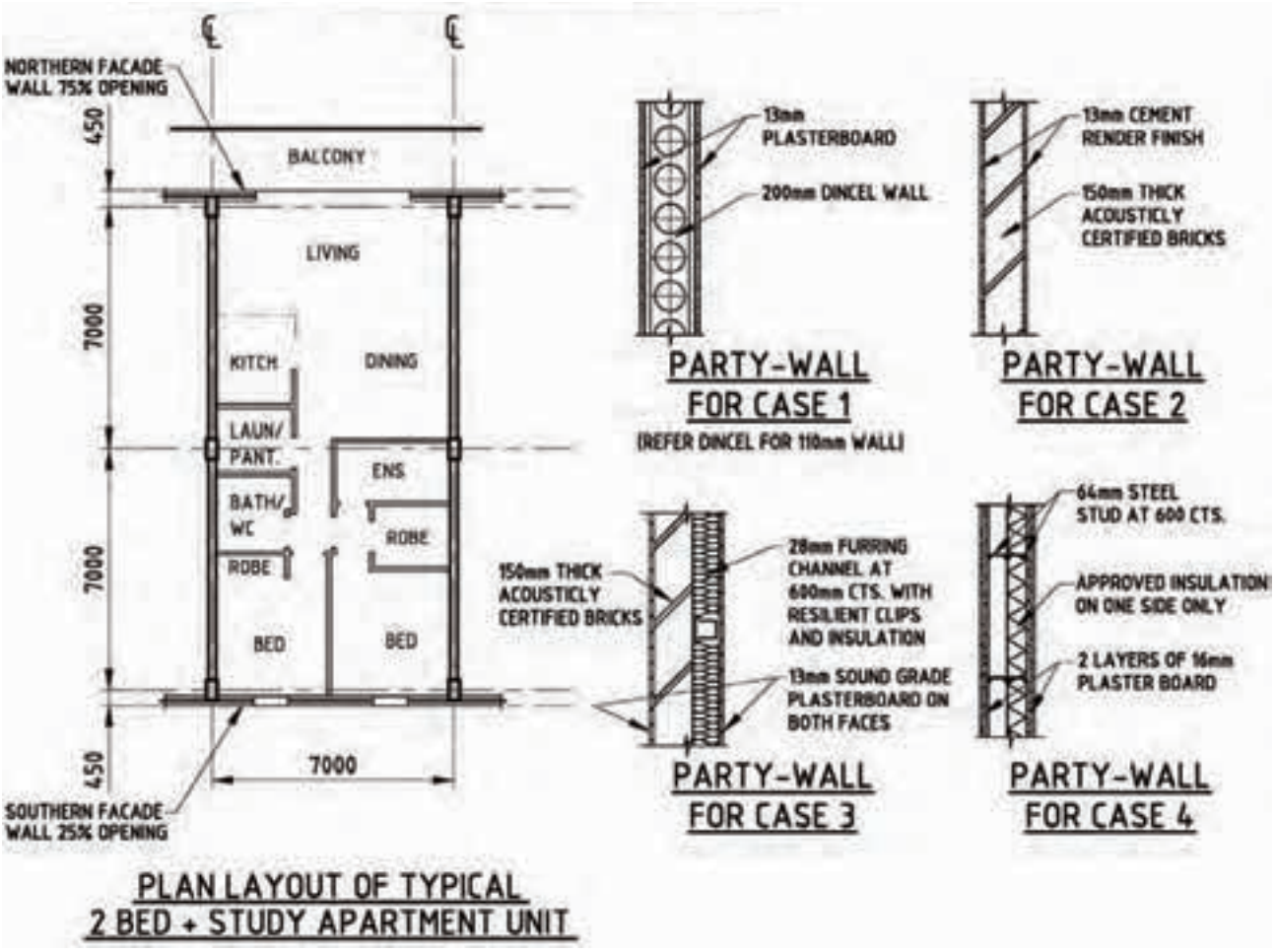
DINCEL STRUCTURAL WALLING

CASE STUDY FOR RESIDENTIAL APARTMENT UNIT



It is very often questioned whether the costing and embodied energy efficiency for alternatives such as Case 2, Case 3 and Case 4 as illustrated on the following page are viable in comparison to Case 1.

The slab thickness and reinforcement rates shown on the following page are calculated by practising structural engineers to satisfy Australian Engineering Code (AS3600) for strength as well as serviceability criteria. The detailed costing analysis for Case 1 and Case 2 is shown in the following pages. The reader can use the Case 1 and Case 2 examples and the steel and concrete quantities shown on the following page to determine the cost of Case 3 and Case 4.

The embodied energy results for Case 3 and Case 4 have been calculated in a similar way to the information shown in **(Download) – PART 1 – Energy Efficiency in Building Construction – Embodied Energy**

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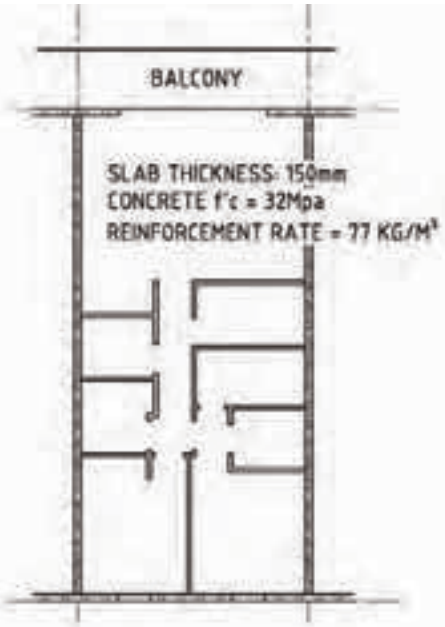
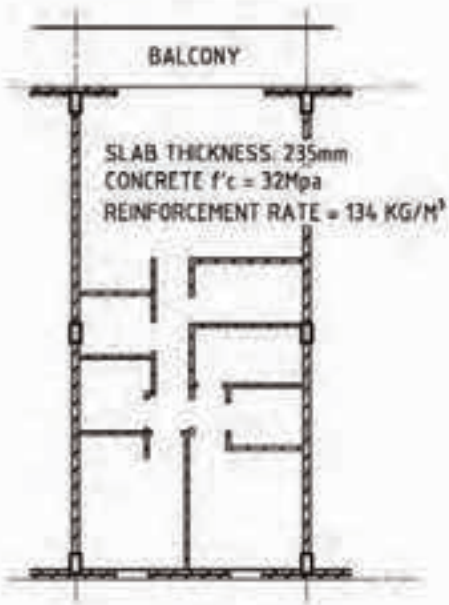


CASE 1 – DINCEL WALL

(WITH LIGHT WEIGHT STEEL STUD WALL PARTITION)

ON PLAN DENOTES DCS WALL

ON PLAN DENOTES LIGHT WEIGHT STUD WALL



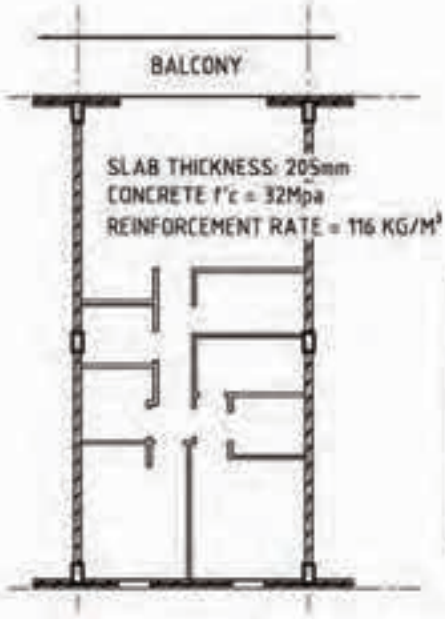
CASE 2 – FRAMED SYSTEM

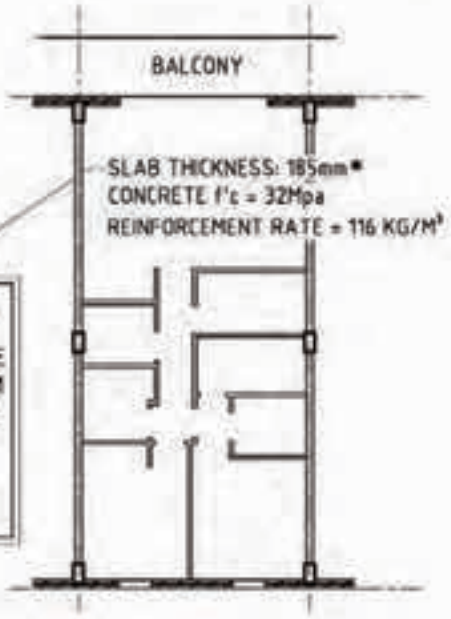
(WITH 110 BRICK PARTITION AND 150 BRICK PARTY WALL)

ON PLAN DENOTES 150 BRICK PARTY WALL

ON PLAN DENOTES 110 BRICK PARTITION WALL

ON PLAN DENOTES 270 BRICK CAVITY WALL





* AS 3600 – 2009 CONCRETE STRUCTURES CODE REQUIRES MINIMUM 200mm THICKNESS FOR 90 MINUTES FIRE RATING OF FLAT PLATES / SLABS

CASE 3 – FRAMED SYSTEM

(WITH LIGHT WEIGHT STEEL STUD PARTITION AND 150 BRICK PARTY WALL)

ON PLAN DENOTES 150 BRICK PARTY WALL

ON PLAN DENOTES LIGHT WEIGHT STUD WALL

ON PLAN DENOTES 270 BRICK CAVITY WALL

CASE 4 – FRAMED SYSTEM

(WITH LIGHT WEIGHT STEEL STUD WALL PARTITION AND PARTY WALL)

ON PLAN DENOTES LIGHT WEIGHT STUD PARTY WALL

ON PLAN DENOTES LIGHT WEIGHT STUD WALL

ON PLAN DENOTES 270 BRICK CAVITY WALL

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DINCEL STRUCTURAL WALLING

COMPARISON TABLE FOR CASES 1, 2, 3, AND 4

CASE NUMBER	COST EFFICIENCY	EMBODIED ENERGY EFFICIENCY AT COMPLETION OF BUILDING CONSTRUCTION	EMBODIED ENERGY EFFICIENCY AT 100 YEARS
1 –v– 2	Case 2 43% Dearer than Case 1	Case 2 42% Less Efficient than Case 1	Case 2 62% Less Efficient than Case 1
1 –v– 3	Case 3 22% Dearer than Case 1	Case 3 24% Less Efficient than Case 1	Case 3 58% Less Efficient than Case 1
1 –v– 4	Case 4 23% Dearer than Case 1	Case 4 10% Less Efficient than Case 1	Case 4 50% Less Efficient than Case 1

Dincel achieves a minimum of 22% COST SAVING at each floor level in comparison to conventional construction

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INTRODUCTION

All developments subject to:

Land Purchase Cost – Building Cost – Selling Price

The land purchase and selling price are basically the same for any given real estate location. The only variation is the **BUILDING COST** which determines the developer/s profit margin.

The **BUILDING COST** depends on the following factors:

(A) MAINTENANCE COST

Being brittle and porous, conventional building materials crack due to many reasons and receive water/moisture through the cracks. This causes steel corrosion in concrete walls and material decay resulting in reduced building life and unhealthy buildings due to mould – mildew development. Dincel is a non-brittle and non-porous material which does not crack and is waterproof which eliminates common maintenance costs. Refer to the following:
(Download – Waterproof Walls)
(Download – Indoor Air Quality, Condensation, Mould and Mildew)

(B) CONSTRUCTION COST AFFECTED BY THE FOLLOWING FACTORS:

- **Faster to build**
  (Download – Why Dincel is Faster)
  (Download – Testimonials)

- **Material Cost influenced by the selected structural system.**

(i) Frame System –vs– Load Bearing Wall System

Building with conventional column-slab system incorporating any type of infill walls will ALWAYS COST more than building with Dincel load bearing construction system. The following example(s) illustrates that Dincel results in up to 43% cost effective construction.

It is also recommended to read the document titled (Download) The Roles of Masonry Infill Walls In An Earthquake when selecting a structural system.

(ii) Increased Costs Due to Building Authority Requirements

- AS3600 – 2009 Concrete Structures Code require the following when a column-slab frame system is used:
  - Minimum 200mm thick slab for 90 minutes fire rating.
  - No mesh type reinforcement allowed.
- When load bearing Dincel Walls are used:
  - Minimum 150mm thick slabs with mesh type of reinforcement are allowed.
  - Refer following acoustic certificate allowing the use of 150mm thick slab.

The minimum 50mm reduction in slab thickness and mesh reinforcement use results in big cost differences at each and every typical floor level.

- Safer to build
  (Download – Dincel Solution for Construction Safety)
  (Download – Dincel Solution for Construction Problems)

This document is a CASE STUDY to demonstrate the cost efficiency of Dincel Construction System when compared to conventional construction system. The material quantities presented in this document are also used for the calculations of the embodied energy use applicable to this case study. Refer to (Download) – PART 1 – Energy Efficiency in Building Construction – Embodied Energy

CASE STUDY – DINCEL –vs– CONVENTIONAL CONSTRUCTION

The costing rates shown below are relevant for Sydney-Australia, May 2012. The rates may change, depending on the locality, supply and demand of labour forces, materials, etc. Therefore, the important point is that the ratios of costs are compared in the following costing analysis, and not the rates.

Definition:

Case 1 – Dincel Construction System

Dincel Construction System (DCS) is a structural building system which consists of floor slabs supported by load bearing Dincel-Walls. The load bearing walls are normally utilised at party (i.e. division walls in between sole occupancy units) walls, corridor and façade walls. The internal partition walls of a sole occupancy unit are not required as load bearing walls therefore consists of lightweight steel or timber stud walls with plasterboard internal finishing.

Case 2 – Conventional Construction

Conventional construction consists of reinforced concrete floor slabs, concrete columns and infill walls between columns. The infill walls can be masonry or light weight walls.

The comparison made in this case study is between Dincel and the column-slab system with infill walls. The majority of the time masonry walls are used for infill walls because Australian buyers demand having solid walls around the periphery of their living quarters for security reasons. The brick walls being solid satisfy this marketing requirement. The majority of cases for internal partition walls do remain as brick because the team of brick layers erecting the perimeter walls, the internal brick partition walls are also built by using the same team of brick layers. This also provides consistent internal rendered wall finishes as well.

However, irrespective of the type of infill wall used, Dincel will always result in minimum 23% cost effective in comparison to frame systems consisting of columns, slabs and infill walls.

It is highly recommended for the reader to review (Download – Dincel Solution for Housing Affordability) for further information.

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12 April 2013

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Dincel Construction System Pty Ltd
Level 3, 7K Parkes Street
PARRAMATTA NSW 2150

Attention: Burak Dincel

Dear Burak

Floor Slab Acoustic Certification

In our opinion, the following construction meets the laboratory airborne and impact acoustic requirements of the current BCA.

A 150 mm thick concrete slab with carpet – with either a set plaster ceiling, or with a suspended ceiling having a cavity of not less than 70mm.

a. Tiled or timber finish – with an approved acoustic underlay (to serve as the impact isolator) laid over the concrete slab and under the tiling.

Rationale:

- A 150 mm plain concrete member is "deemed to satisfy" the airborne party wall requirement of R_w + C_{tr} 50 dB, which is also the party floor airborne requirement – even though the deemed to satisfy requirement for a floor includes a 200 mm concrete slab (with carpet).

  The presence of set plaster ceiling will not reduce the airborne acoustic performance of the 150 mm thick slab.

  Note: A suitably qualified acoustics engineer should advise on the design where the ceiling cavity is less than 70mm.

- The current BCA impact requirement is $L_{n,w}$ + C_I being no more than 62 dB. This will be satisfied through the use of carpet.

  Note: A suitably qualified acoustics engineer should specify an appropriate acoustic underlay where a hard floor finish is required.

We hereby certify that the above specification, in association with Dincel-Wall is used, the floor slabs will comply for airborne and impact requirements of the current Building Code of Australia (BCA).

Yours sincerely

H Gwatk

HOWARD GWATKIN

Principal – Building Acoustics

SLR Consulting Australia Pty Ltd 2 Lincoln Street Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: 61 2 9428 8100 F: 61 2 9427 8200 E: sydney@slrconsulting.com www.slrconsulting.com
ABN 29 001 584 612

DOES A 150MM THICK SLAB COMPLY WITH AUSTRALIAN ACOUSTIC REQUIREMENTS? REFER CERTIFICATE BELOW.

RSA ACOUSTICS
Acoustic Consultants

September 2009

Dincel Construction System Pty Ltd

Level 3, 7K Parkes Street, Parramatta NSW 2150

Re: FLOOR SLABS ACOUS STIC CERTIFICATIONS

This is to confirm that as acoustic engineers we will certify the following:

A 150 mm thick concrete slab with set plaster ceiling or false ceiling will be allowed with the following floor finishes.

(a) Tiled or timber finish – there will be an approved underlay which will serve as the impact isolator laid over concrete slab under floor tiling. The floors with tiled finishes will be subjected to both airborne and impact requirements of the current BCA 2009.

(b) Carpet finish – approved carpet underlay to be provided. The floor slab with carpet finish will be subjected to air borne sound provision.

RSA Acoustics confirms that the above specifications comply with the current Building Code of Australia – BCA 2009 for the following reason:

- The overall minimum construction depth of 150mm is provided for the floor slab as described above. A 150m mm plain concrete member provides $D_{n,Tw} + C_{tr} > 45$ 5dB or $R_w + C_{tr} = 50$dB which are the requirements for the current BCA airborne sound. The presence of set plaster ceiling and carpet on underlay further improves the airborne acoustic performance of the 150mm thick slab. The floor slab therefore complies with the airborne sound requirements as described in the current BCA.

- The current BCA impact requirements are $L_{nw} + C_l$ being no more than 62dB. This will be satisfied because the slab details described above with tile finish will have an approved underlay as impact isolators. The underlay has the required manufacturing testing certificate approved by an acoustic engineer.

We herby certify that when the above specification, in association with Dincel-Wall is used, the floor slabs will comply for airborne and impact requirements of the current Building Code of Australia (BCA) 2009.

Rodney Stevens – MAAS
Principal Consultant
RSA Acoustics

A division of Heggies Pty Ltd
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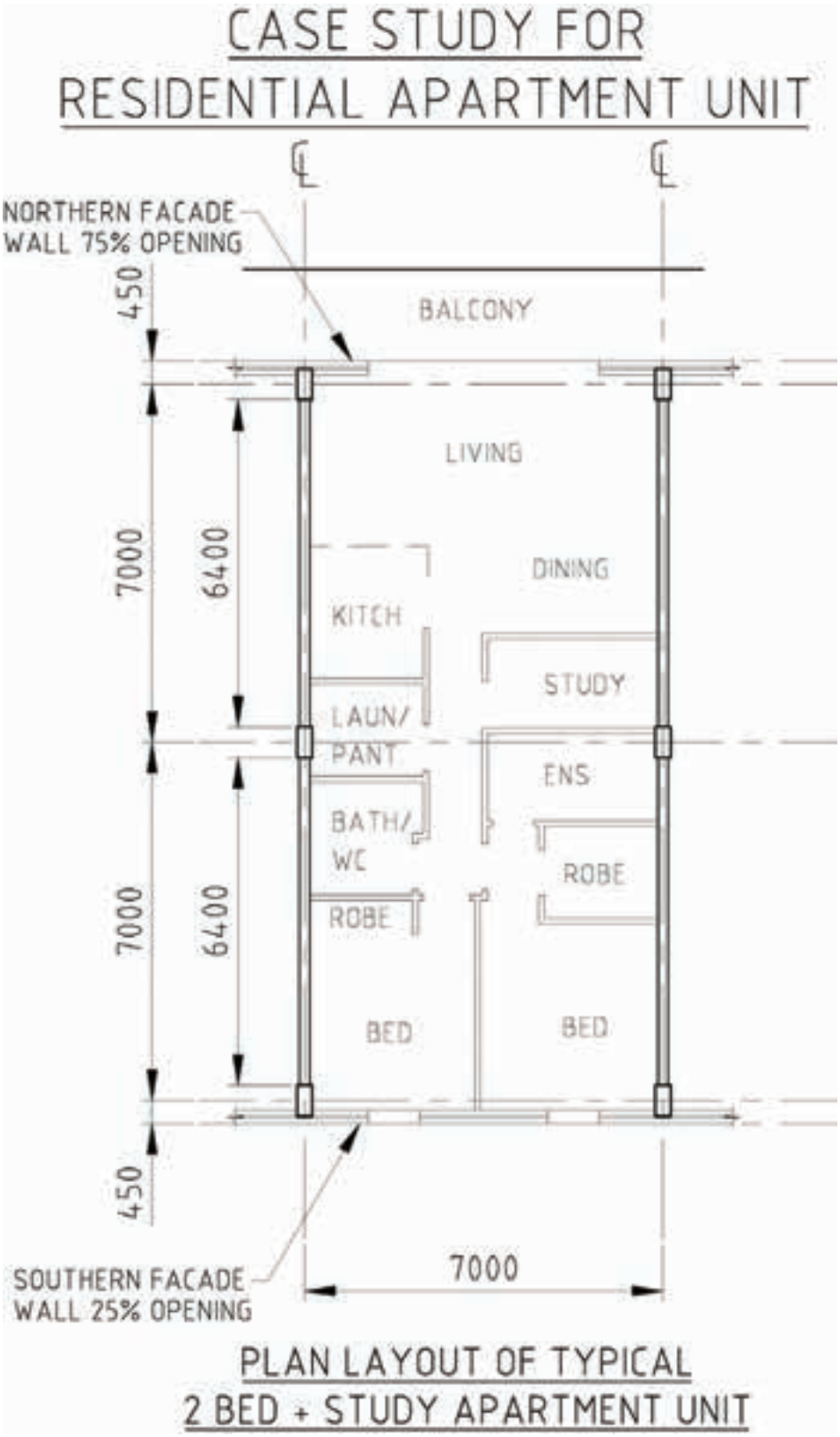
F 02 9542 7808 ABN 29 001 584 612 W www.rsaacoustics.com.au Parramatta NSW 2124



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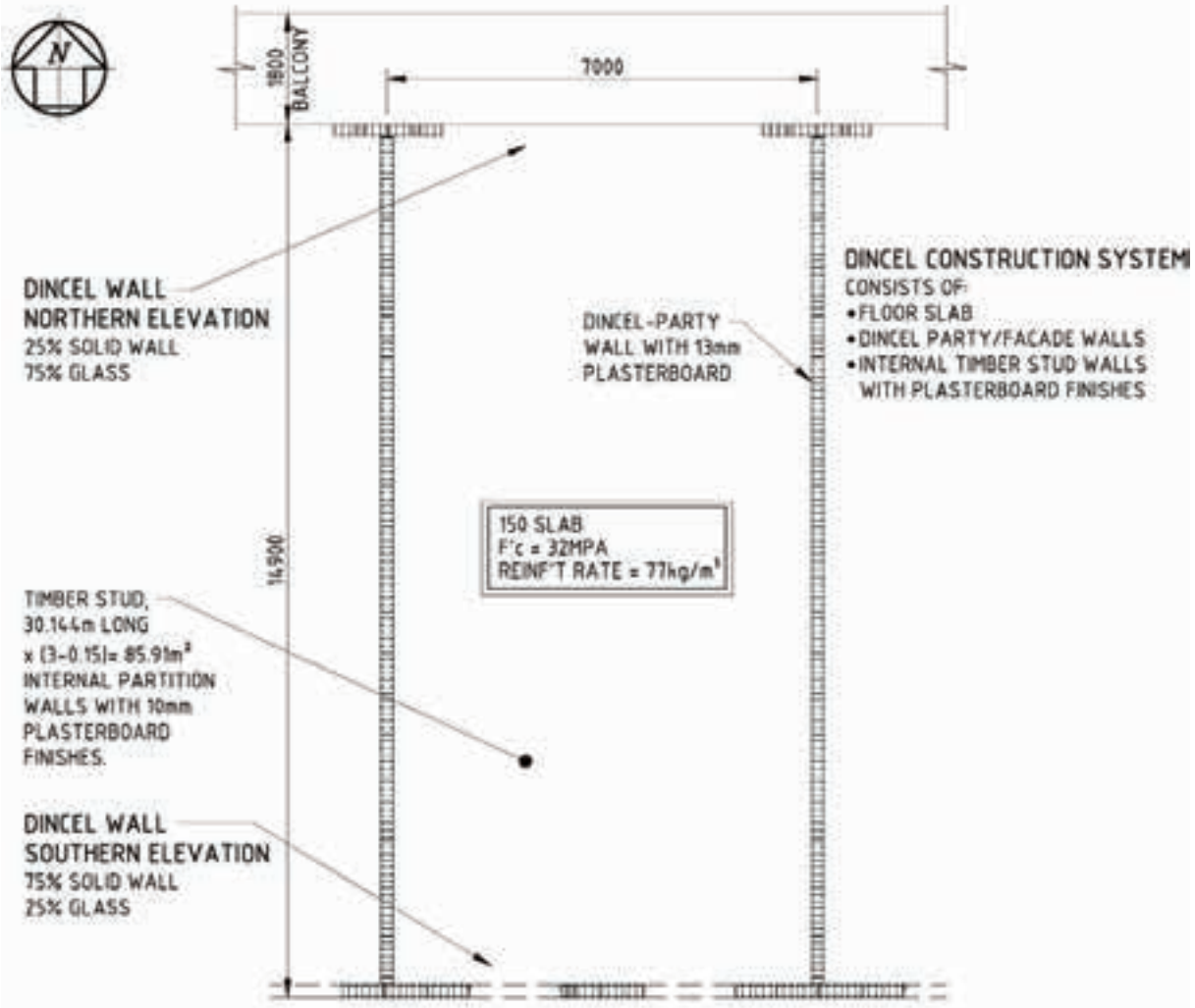
CASE 1 - DINCEL CONSTRUCTION SYSTEM



MATERIAL MASS CALCULATION
7m x 14.9m RESIDENTIAL MODULE (3m FLOOR TO FLOOR)

COMPONENT	CONCRETE 2400kg/m³	STEEL REINF'T	CLAY BRICK	DINCEL-POLYMER 13.5kg/m²	PLASTER-BOARD	TIMBER FRAME 7.1kg/m²
SINGLE FLOOR SLAB 150 THICK	32 MPa (17.5m³) 42000kg	500 MPa 1351kg	N/A	N/A	N/A	N/A
DINCEL PARTY WALLS (1 OFF EACH APARTMENT)	20 MPa (7.51m³) 18032kg	500 MPa 21kg	N/A	(41.3m²) 558kg	(2 x 41.3m²) 702kg	N/A
PERIMETER WALL (DINCEL WALL)	20 MPa (3.63m³) 8712kg	500 MPa 10kg	N/A	(20m²) 269kg	(20m²) 130kg	N/A
PARTITION WALLS	N/A	N/A	N/A	N/A	(166m²) 1083kg	(85.91m²) 610kg
TOTAL	(28.64m³) 68744kg	1382kg	N/A	(61.3m²) 827kg	(268.6m²) 1915kg	(85.91m²) 610kg

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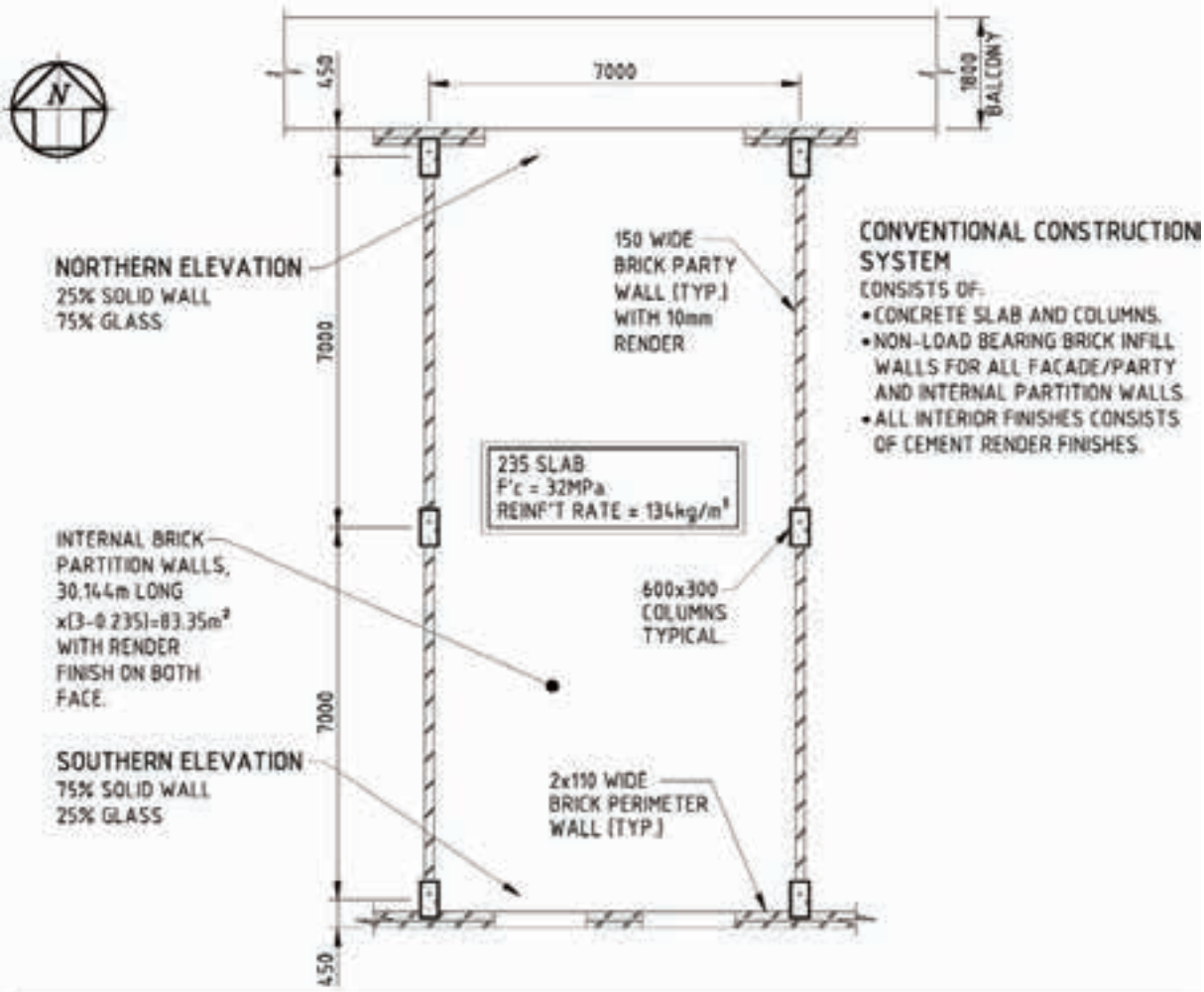
CASE 2 - CONVENTIONAL FRAME SYSTEM



MATERIAL MASS CALCULATIONS
7m x 14.9m RESIDENTIAL MODULE (3m FLOOR TO FLOOR)

COMPONENT	CONCRETE 2400kg/m³	STEEL REINF'T	STANDARD BRICK 150kg/m²	STANDARD BRICK 200kg/m²	RENDER 28kg/m²	MORTAR 25.2kg/m²
SINGLE FLOOR SLAB 235 THICK	32 MPa (27.47m³) 65928kg	500 MPa 3681kg	N/A	N/A	N/A	N/A
3 OFF COLUMNS 600x300	32 MPa (1.49m³) 3576kg	500 MPa 195kg	N/A	N/A	N/A	N/A
PERIMETER WALLS 2x110 THICK BRICK	N/A	N/A	(2x19.35m²) 5805kg	N/A	(1x19.35m²) 542kg	(2x19.35m²) 975kg
1 OFF PARTY WALL FOR EACH APARTMENT	N/A	N/A	N/A	(35.4m²) 7080kg	(2x35.4m²) 1982kg	(35.4m²) 892kg
110 INTERNAL BRICK PARTITIONS	N/A	N/A	(83.35m²) 12502kg	N/A	(2x83.35m²) 4667kg	(83.35m²) 2100kg
TOTAL	28.96m³ 69504kg	3876kg	122.05m² 18307kg	35.4m² 7080kg	256.85m² 7191kg	3967kg

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The costs shown in the tables below are for the year 2011. The following analysis can be repeated for the current year.

	CONVENTIONAL CONSTRUCTION	TOTAL
1.	**Concrete Supply**	
	Slab (235mm) + 600 x 300 columns 3 off	
	(32 Mpa) – 29m3 @ $185.00/m3	$5,365.00
2.	**Concrete Laid** (Slab - 7 x 14.9 + 7 x 1.8 = 116.9m2) + columns 3 off	
	Slab laid - Including pump cost and surcharge = 116.9m2 x $20.00/m2	$2,338.00
	Columns - Concrete to be poured prior to slab, minimum charge - 1 man labour (1 x $300/day) + pump cost (4 hours minimum @ $160/hour)	$940.00
3.	**Steel Supply**	
	Slab and columns reinforcing bars (not mesh) 3.876t @ $2,000.00/t	$7,752.00
4.	**Steel Laid** reinforcing bars (not mesh) 3.876t @ $800.00/t	$3,248.00
5.	**Formwork**	
	Slab 116.9m2 @ $60.00/m2	$7,014.00
	Column 3 off x $700.00 each	$2,100.00
6.	**110mm Brick Supplied and Installed**	
	122m2 x 55 bricks/m2 @ $1,500.00/1,000 bricks	$11,179.00
	Minimum Wastage @ 3% x $13,415.00	$403.00
7.	**150mm Brick Supplied and Installed**	
	35.4m2 x 32.3 bricks/m2 @ $2,000.00/1,000 bricks	$2,287.00
	Minimum Wastage @ 3% x $2,516.00	$75.00
8.	Brick Render (including cleaning costs)	
	257m2 @ $35.00/m2	$8,995.00
	TOTAL COST	**$50,859.00**
	Per Square Metre of Floor Area Cost $50,859.00 ÷ 116.9	**$435/m2**
	Note: Floor finishes and wall paintings are not included in the costs.	

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	DINCEL CONSTRUCTION SYSTEM	TOTAL
1.	**Floor Slab**	
	Concrete supply (32Mpa) = 17.5m3 @ $185.00/m3	$3,237.00
	Concrete laid (including pump) = 116.9m2 @ $20.00/m2	$2,338.00
	Reinforcement (mainly mesh):	
	• Supplied 1.351t @ $1,500.00/t	$2,026.00
	• Laid 1.351t @ $400.00/t	$540.00
	Slab formwork 116.9m2 @ $60.00/m2	$7,014.00
2.	**Dincel Wall** (also refer to Dincel Party Wall costing at **(Download) – How to Calculate Dincel Wall Installation Costs** for further information)	
	Concrete supply (20Mpa) 11.1m3 @ $150.00/m3	$1,665.00
	Concrete pump 61.3m2 @ $4.00/m2	$245.00
	Steel supply 0.031t @ $1,500.00/t	$46.00
	200mm Dincel-Form for party walls 61.3m2 @ $82.00/m2	$5,026.00
	Dincel-Wall installation including forms, reinforcement and concreting 61.3m2 @ $25.00/m2	$1,532.00
3.	**Plasterboard Supply and Direct Glue/Screw to 200mm Dincel-Walls**	
	2 x 83m2 (both faces) @ $20.00/m2	$3,327.00
4.	**Timber Stud Work**	
	100 x 50 @ 600 cts – 30.1m long x (3 – 0.15)m high = 85.8m2@ $25.00/m2	$2,145.00
	TOTAL COST	**$29,141.00**
	Per Square Metre of Floor Area Cost $29,141.00 ÷ 116.9	**$249/m2**
	Note: Floor finishes and wall paintings are not included in the costs.	
DCS COST EFFECTIVENESS [(1 — ($249.00/m2 ÷ $435/m2)] = 0.43 = 43%		
THIS MEANS THAT DCS IS 43% CHEAPER THAN CONVENTIONAL CONSTRUCTION.		

Note: 110mm Dincel load bearing walls can be replaced with 200mm Dincel Wall up to a typical 8 storey building (refer Design Engineer).

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CASE STUDY SUMMARY – TWO BEDROOM + STUDY APARTMENT UNIT IN NEW SOUTH WALES, AUSTRALIA				
ANALYSIS		**DINCEL CASE 1**	**CONVENTIONAL CASE 2**	**MATERIAL USE COMPARISON**
Slabs; Concrete Dincel-Walls; Concrete Columns; Brick Walls	Concrete	28.64m3	28.96m3	1.0% Less concrete by Dincel
	Steel	1 382 kg	3 876 kg	64% Less steel by Dincel
	Brick Walls	NIL	110 Brick – 122m2 150 Brick – 35.4m2 158m2	158m2 Less brick by Dincel
	Dincel Polymer	61.3m2	NIL	61.3m2 Dincel-Form use
	Lightweight Walls	85.8m2	NIL	85.8m2 of lightweight partition walls used by Dincel
	Mass (kg)	73 416	110 368	Conventional 50% heavier than Dincel
DCS ADVANTAGES	The above analysis represents that the Dincel System is clearly cheaper at each floor level by providing: • Dincel is 43% cheaper to build in comparison to conventional construction. • Dincel use 64% less steel. • Conventional system is 50% heavier than Dincel which is a substantial load and will result in additional construction costs for earthquake, transfer level(s) and footings (i.e. extra concrete and steel). The additional weight will introduce significant additional costs which will make cost effectiveness of DCS much more than 43%. • Faster construction system. Dincel is 30% (minimum) faster. The cost saving for TIME OF CONSTRUCTION is not included in the 43% cost saving. Refer below for further information. **(Download) AQ, Answer No: 3 – Faster/General** **(Download) AQ, Answer No: 21 – System Advantage/Construction** • 235 – 150 = 85mm building height saving at each floor level (e.g. 8 storey height building equals 680mm savings) which can be useful where architects fit building's height into development control planning of local Councils.			

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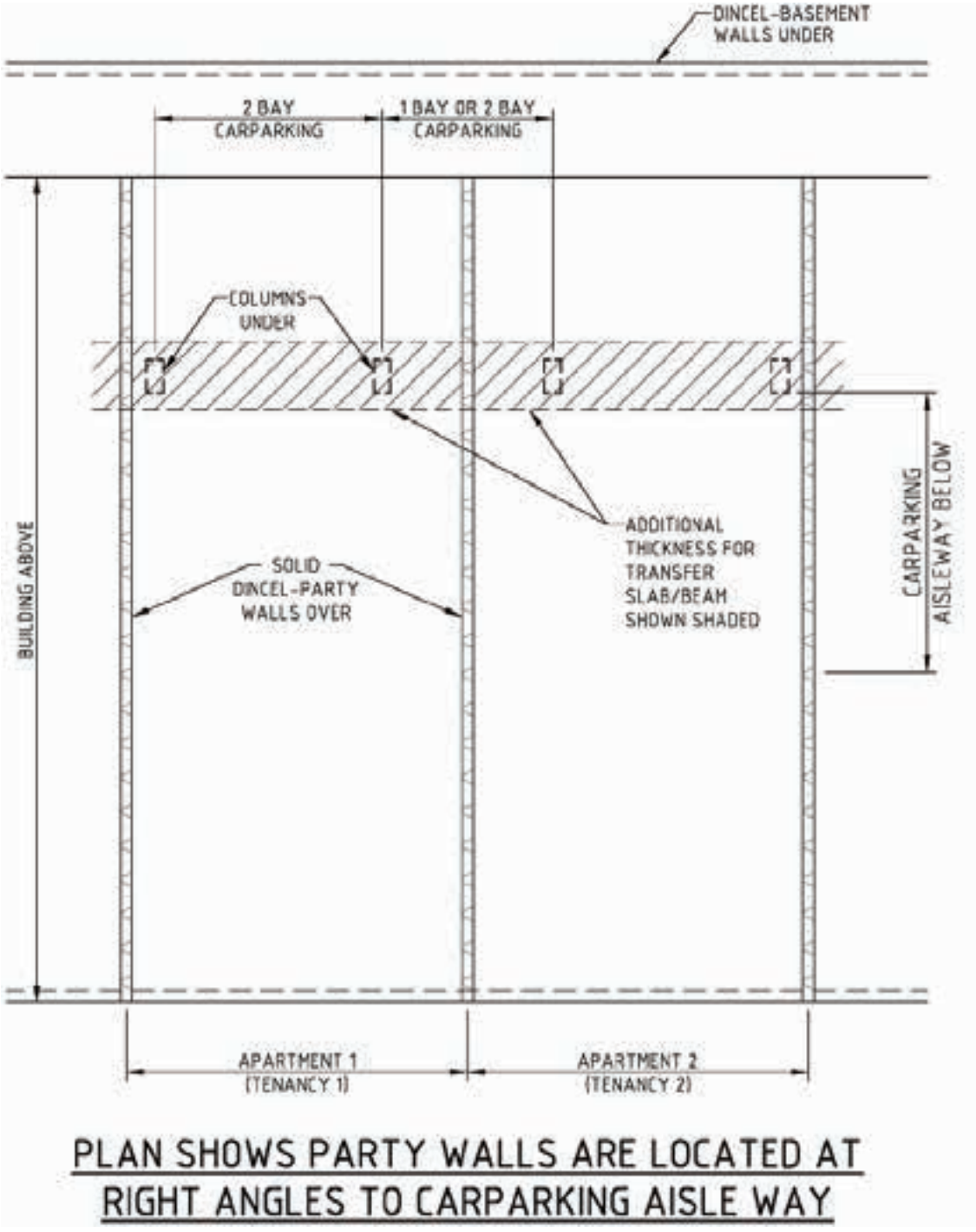
ADDITIONAL COST SAVING BY ELIMINATING COSTLY TRANSFER SLABS

Transfer slabs are eliminated if Dincel party walls are placed in right angle direction to the carparking aisle way below



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DINCEL STRUCTURAL WALLING

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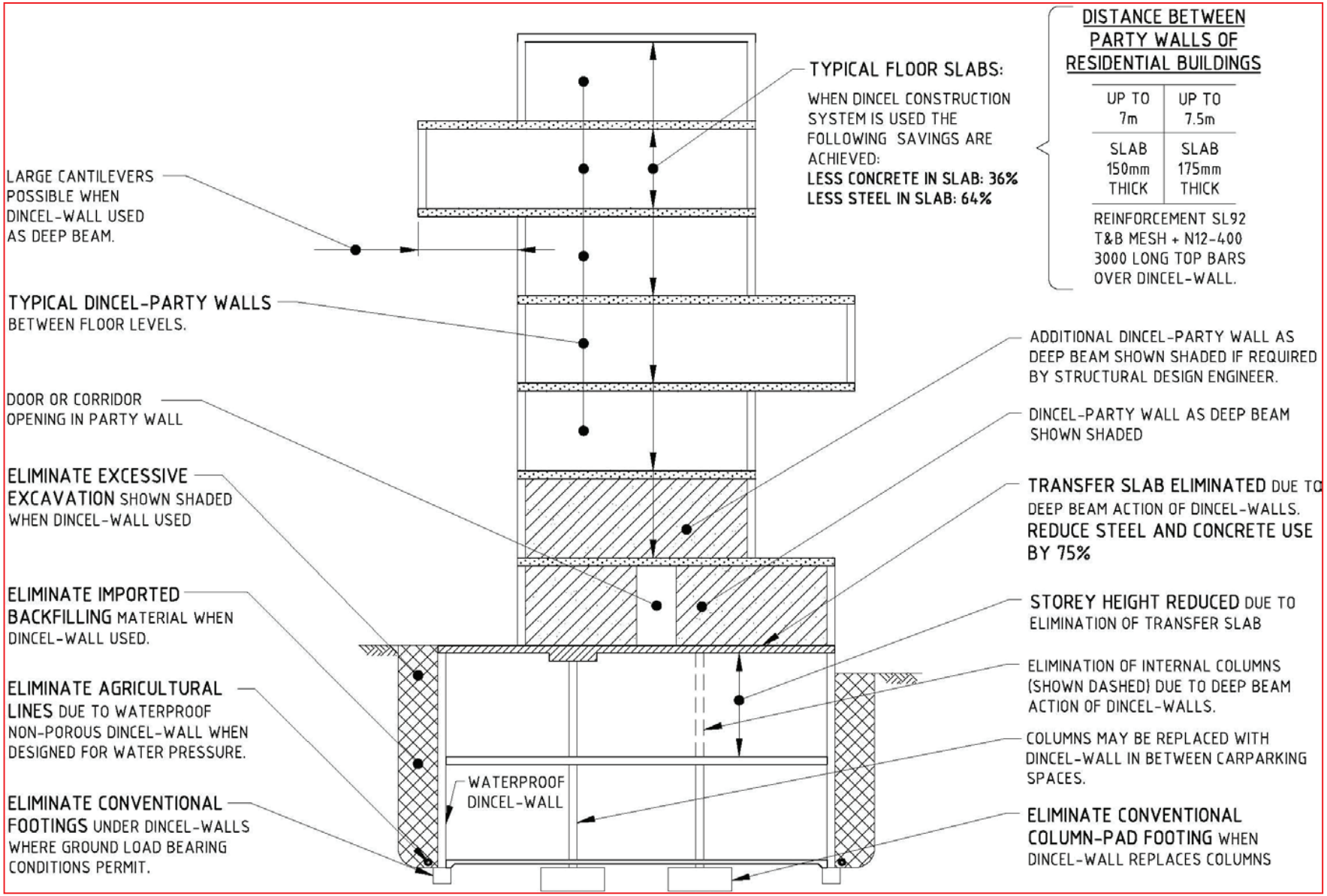

TYPICAL BUILDING CROSS SECTION