



DINCEL STRUCTURAL WALLING

CONSTRUCTION PROBLEMS



INTRODUCTION

The world's population is growing hence the required construction need is growing exponentially.

The majority of problems in the construction industry are related to base construction materials, namely concrete and steel. The other very rapidly emerging problem that is becoming an even bigger issue with growing construction need is skilled labour.

The material related problems are well known. We have no choice but to use materials that come from the most abundantly available resources, not from depleting resources such as trees. These materials are clay, rock, sand and carbon steel. Limestone is used for Portland cement, iron ore is used for the production of carbon steel.

These materials are not perfect in eliminating the well known handicaps, but they are most abundant. **Carbon steel and Portland cement have established so much in the last 200 years that it is financially not possible to introduce their replacement.** For example, there are technologies available to produce superior Portland cement replacement. However, it is not remotely possible for alternatives to compete with Portland cement.

The need for skilled labour is rapidly rising because we cannot train enough people for the exponentially increasing construction need. The reduction in skilled labour increases the cost of labour which increases the total construction COST. In order to compensate for the increase in labour cost, the productivity must be increased, i.e. faster construction. Faster construction with less skilled people increases the construction safety need.

Dincel Construction System answers all these compounding problems by providing:

- **Skilled Labour**
 - o see that skilled labour use is not really required.
- **Faster and Safer Construction**

Average installation rate for Dincel is 20m²/man/hour which is at least 50 times faster than conventional brick walls or 10 times faster than conventional formwork. This productivity increase will compensate for the increased labour charges ([Download – How to Calculate Dincel Wall Installation Cost](#)). Dincel reduces or eliminates conventional construction safety issues. ([Download – Dincel Solution for Construction Safety](#)).
- **Cost Effective Construction**

In addition to having the solution to labour costs, Dincel Construction System use, especially in multi-level construction, significantly reduces the overall project construction costs, up to 43% construction cost savings are achievable at each floor level of an apartment building. For further information ([Download – Costing Analysis](#)) and ([Download – Cost Saving Summary](#)).
- **Maintenance Free**

This document explains how Dincel eliminates or significantly reduces all well known maintenance issues, mainly water, termite damage and cracking.

IT IS EXTREMELY IMPORTANT THAT WE CANNOT HAVE SUSTAINABILITY IN THE BUILDING CONSTRUCTION INDUSTRY WITHOUT CONSIDERING THE CONSTRUCTION COST AND TIME ISSUES.

THE FOLLOWING ARE THE MOST COMMON CONSTRUCTION PROBLEMS

1. PROBLEM – NO UNIFIED BUILDING AUTHORITY ASSESSMENT TO SUIT A PRODUCT

This represents one of the biggest obstacles for the specifier who may not have the time or the necessary knowledge to evaluate the product.

The following document is a unified document covering all of Dincel-Wall's related Building Code of Australia (BCA) compliance issues. Print and hand over this document to the relevant Building Authority Representative.

2. PROBLEM – EFFLORESCENCE

When water containing dissolved salts evaporates from a masonry structure, it leaves a salt deposit. The stain is called efflorescence. The problem is usually associated with mortar, sand/cement render, brick, concrete block and concrete wall. Besides being unsightly, efflorescence may lead to serious problems such as cracking. Dincel Forms, being waterproof, encapsulates the concrete infill and avoids this problem.

3. PROBLEM CRACKING, FAULTY FLASHING, WATER DAMAGE, RISING DAMP, CORROSION, STRAY CURRENT PROTECTION

All porous materials are also brittle in nature. These materials include clay/concrete brick, masonry block and concrete walls. Due to their hygroscopic nature they absorb moisture and the clay expands whilst masonry blocks and concrete shrink. They need joints between 6m to 9m centres to minimise the shrinkage and expansion related movements and also to accommodate building settlement related movements. Building settlements are usually associated with foundation movement which most commonly occur due to ground moisture condition changes (i.e. nearby big trees, collection of surface or ground water against the building, leaking drainage, sewerage, water lines). Cracking will also occur with the settlement of floor slabs as well.

The joints for shrinkage and temperature movement are placed to control big cracks occurring between the joints.

There is no guarantee that additional cracks will

not occur between the joints which can be big enough to allow moisture to pass through. It must be understood that cracks are unavoidable unless wall joints are placed at much closer centres than the conventional 6m to 9m spacing.

The presence of cracking, joints and the hygroscopic nature of common construction materials cannot stop vapour transmission through the walls. Especially in the case of bricks and masonry blocks, they easily penetrate the wall through the mortar joints. This requires the necessity of CAVITY WALL CONSTRUCTION WITH FLASHING. The flashing is a gutter at the bottom of the cavity wall to collect moisture that penetrates the wall and diverts it out of the wall through weep holes. This mechanism is called a passive drainage system and must have properly installed flashing, unblocked weep holes and ventilation holes at the top of the walls. If this mechanism does not work, the water collected inside the cavity will cause wall movement, cracking, corrosion, fungus growth, paint peeling and material deterioration leading to the reduction in the life of the structure.

The most common WATER DAMAGE to structures occurs in below ground conditions. As explained above, wall crackings, joints, vapour/water transmission are unavoidable with porous natured materials, hence water damage. To avoid this problem, conventionally all basement walls receive waterproof membranes where its performance significantly relies on many factors.

The WATER DAMAGE can also occur because of RISING DAMP. Materials like clay, masonry block and concrete absorb ground moisture. This moisture initiates an EFFLORESCENCE problem which leads to cracking and rising damp above the floor level which affects the building's interior by causing paint peeling, fungus growth and material deterioration.

Dincel addresses all these issues in the following way:

Dincel-Wall has already been built for a wall of up to 140m long without joints (Cochlear Building, Macquarie University, Australia). The inbuilt crack inducers of Dincel-Wall eliminate the need for JOINTS IRRESPECTIVE OF HOW LONG THE WALL IS.



“Basement walls of this project consisted 140m long walls. These walls were installed without the need of waterproof membranes, scaffolding, horizontal wall reinforcement and joints in a very short space of time. The product improves the site logistics and housekeeping, reduces the potential risk of injuries and its speed and ease of installation are major advantages. Dincel-Walls lends itself to be installed with minimum skill and training level.”

Yours faithfully
 Watpac Construction
 (NSW)
 Michael Kouknas
 Project Manager.

WATPAC – COCHLEAR BUILDING

Dincel-Wall consists of Dincel Forms and concrete infill. The polymer encapsulation of concrete creates a composite action, which represent increased flexural and impact resilience and significant reduction in conventional concrete’s brittleness. It was not possible to crack unreinforced Dincel-Wall when tested against magnitude 9 earthquake force at the University of Technology Sydney, Australia ([Download – Building Solution for Earthquake Prone Regions](#)). It is therefore not possible to have a cracked Dincel-Wall because of shrinkage/temperature, foundation settlements and floor deflections.

The permanent polymer of Dincel Forms can stay in place for a minimum of 120 years even if it is subjected to the worst environmental conditions. This product was tested at the joints of Dincel panels by CSIRO Australia under 6m head of water pressure and found to be waterproof. The polymer was also tested by CSIRO and found to have 180 times better vapour transmission rate than the threshold recommended for conventional waterproof membranes. This way, the waterproof Dincel-Wall protects the concrete infill and steel reinforcement (if any, majority of steel reinforcement can be omitted with Dincel-Wall). Therefore, the need for CORROSION AND CONCRETE DETERIORATION, RISING DAMP and FLASHING (i.e. Dincel is vapour/waterproof) is totally eliminated.

The paint peeling off is an ongoing problem with conventional walls and can be eliminated because of the waterproof nature of Dincel-Wall ([Download – Dincel Solution For Render Cracking](#)).

CORROSION is also associated with steel lintels used in conventional masonry construction. Dincel Construction System does not need steel lintels. If necessary, Dincel-Wall can be installed as lintels for much greater spans.

The reason for CORROSION other than water, oxygen and salt exposure in basement construction is where the structure is being subjected to an ELECTRIC CURRENT CORROSION PROBLEM. This problem usually exists in basement walls near railway lines and infrastructure pipes/storage facilities protected by Cathodic Protection Methods. To understand how Dincel totally eliminates this problem ([Download – Dincel Solution for Stray Current Corrosion Protection](#)).

It is highly advisable for readers to refer to the following Dincel documents for further information.

[\(Download – Dincel Wall Waterproofing Warranty\)](#)

[\(Download – Dincel Solution for Concrete Problems and Cement Minimisation\)](#)

[\(Download – Dincel Solution for Stray Current Corrosion Protection\)](#)

4. PROBLEM – WALL FINISHES

Wall finishes may consist of cladding type materials or applied render/paint finishes. The biggest problem is the vapour/moisture transmission through the walls or within the applied render material. All common construction materials such as clay/concrete brick, masonry block, fibre-cement sheets and concrete are porous and they have a tendency to absorb water/moisture either from the ground (rising damp or direct contact with ground conditions such as a basement wall), or ambient air (i.e. from rain or moisture available in the air), or concrete walls that already have 11% moisture content when the wall was poured. Only 90% of the wall drying occurs within the first year after concrete pouring. The 11% moisture source becomes a problem when it is coupled with additional moisture from the ground or air.

All commercially available paints are breathable, i.e. they let vapour pass through. Therefore, they cannot be relied on as vapour barriers unless they are properly applied with waterproof membrane type paints.

The paint peeling off (and render failure) will occur when vapour penetrates through porous walls (including concrete walls). This is the main reason why all porous walls (i.e. hydroscopic nature) must have a properly functioning cavity wall construction.

As explained in Item No: 3 waterproof Dincel-Wall does not let vapour into the interior of the building to avoid paint peeling. Dincel-Wall has inbuilt vapour barriers on each face. The building authorities require the placement of vapour barriers with the walls. The common problem occurs with conventional vapour barriers around power outlets where the vapour barriers are cut and around the windows as well. This is not an issue with Dincel since Dincel-Wall has vapour barriers on each face.

The issue with paint/render finishes is a major problem and a big maintenance cost (including scaffolding costs) for the builders and building owners.

The presence of Dincel-Wall eliminates the above problems. Refer to the following for a detailed explanation.

[\(Download – Finishes\)](#)

5. PROBLEM – CONDENSATION

The water/moisture sources discussed in previous problems are some of the reasons for condensation occurring.

Dincel eliminates two main moisture sources for condensation. These are mainly water/moisture ingress from the exterior environment (i.e. air and contact with ground conditions) and the majority of 11% of water from the wet concrete mix exists within the concrete walls within the first 12 months after concrete pouring. However, human occupational use also creates enough moisture within the buildings' interior to cause condensation. The best way of eliminating this condensation problem is to prevent moist air from coming into contact with cold wall surfaces which can be achieved by means of mechanical ventilation and provision of insulation on the walls.

For further information and solution to avoiding the condensation problem refer to the following.

[\(Download – FAQ/Sustainability/Q12 – Is it possible to have condensation with Dincel Wall\)](#)

[\(Download – Indoor Air Quality, Condensation, Mould and Mildew\)](#)

6. PROBLEM – PROBLEM CONSTRUCTION SITE

Problem construction site is defined where the construction site may have: crantage, access, ground conditions, mine subsidence zones and steep site related issues.

• CRANAGE

Large construction sites require more than one crane where reaching of the cranes becomes an issue to lift heavy construction materials such as precast panels. Heavy panels associated with cranes defined by the authorities as the most dangerous construction activity.

[\(Download – Dincel Solution for Construction Safety\)](#)

Lightweight and man handleable Dincel panels eliminates the need for cranes.

• ACCESS

Construction sites with access difficulties, such as steep sites for delivery of formwork, brick/block pallets or precast panels represent a problem. The lightweight and man handleable Dincel panels is a solution to this problem.

• GROUND CONDITIONS

No Cracking:

Conventional walls are brittle and they only need small ground movements to crack the walls. Ground movements can occur:

- When moisture changes in clayey type soils due to climatic/seasonal conditions, overland or ground water is interrupted by the building's footings or basement walls, leaking services: water, sewerage, drainage, presence of nearby trees.
- Building in Mine Subsidence Zones, having a building near a mining area and ground disturbed by explosions. ([Download – Dincel Solution for Mine Subsidence Areas](#))

Eliminate Conventional Footing:

As stated in Item No: 3, the forces representing magnitude 9 earthquake forces could not crack Dincel-Walls as observed by the University of Technology Sydney. Therefore, the above reasons would not create big enough stresses to cause cracking with Dincel-Wall.

The monolithic Dincel-Wall, without joints, enhanced by the resilience of the polymer encapsulation, act as a very deep footing itself. The footing can be buried into the ground or extended above ground as in the case of Dincel. Therefore, the footing sizes recommended in AS2870 – Residential Building Code or other similar codes around the globe are not relevant in the case of Dincel-Wall as Dincel Wall provides much more stiffness than recommended by the AS2870 – Residential Footing Code. This leads to cost effective and maintenance free footings in all structures utilising Dincel-Wall.

• STEEP SLOPING CONSTRUCTION SITES

The cheapest development land with the best views are available with steep sloping construction sites. These sites require the creation of a flat plateau for buildings and roads for accessibility to the buildings. However, this necessitates very large soil removal and soil retaining by means of a very expensive retaining walls. The market value for views and the reduction in the purchase price for steep sloping land does not deter developers because of the soil removal. **The real cost makes these developments not feasible for the cost of retaining walls.** Dincel will achieve up to 1/5th of the cost of conventional retaining construction applicable to the subject use when the height of the retaining walls is within the region of 8m to 10m in height.

7. PROBLEM – MATERIAL RELATED ISSUES

• HYDRO CARBON FIRE

Many building structures are subject to hydro carbon fire where the Building Code of Australia has no requirement. The designers, builders and occupants are at risk ([Download – Dincel Solution For Hydro Carbon Fire](#)).

• BUSH FIRE

Bush fire prone areas can be built by using Dincel. ([Download – Dincel Wall Fire Assessment](#)) and read CSIRO Australia certificate for bushfire areas.

• CONDITIONS CANNOT BE COST EFFECTIVELY HANDLED BY CONVENTIONAL CONSTRUCTION

Dincel resists all environmental conditions, including sea water, acid sulphate soil and even exposure to contaminated soil.

Dincel polymer has been tested successfully against exposure to sulphuric acid, nitric acid, potassium sulphate and hydrochloric acid. The long time immersion tests within petroleum and diesel oil showed that there is no disintegration of Dincel polymer occurring.

These properties of Dincel will allow any construction in contact with:

- Structures in the sea water, swimming pools, water tanks and fish farming tanks.
- Ground salination and acid sulphate soil conditions ([Download – Acid Sulphate Soil Concrete](#)).
- Sewage, petroleum and diesel oil storage.
- Waste water treatment, manure storage, agricultural buildings (piggeries, poultries, etc.).
- Environmental barriers for soil contamination and chemical bunding walls.

• TERMITE DAMAGE

Termites are wood eating pests. Buildings made out of timber may suffer structural damage. The fixtures can be easily replaced, however the replacement of the structure is an unmanageable financial burden and the presence of pests are a health risk to the occupants. To read the Dincel Solution ([Download – Dincel Termite Barrier](#)).

8. PROBLEM – ECONOMICAL, SOCIAL AND ENVIRONMENTAL ISSUES

- **COST** is a driving issue in any building construction which also leads to social disorder.
- ENVIRONMENTAL issues are related to each other. The subject topics are:
 - **CONSTRUCTION SAFETY –**
[\(Download – Dincel Solution for Construction Safety\)](#)
 - **WATER CONSERVATION**
[\(Download – Water Conservation\)](#)
 - **FOOD CONSERVATION**
[\(Download – Storage Tanks/Silos for Grains/Liquids\)](#)
 - **SUSTAINABLE CONSTRUCTION**
Longevity and recyclability are important issues of sustainability.
[\(Download – 7 Green Star for Your Next Project\)](#)
[\(Download – Dincel Solution for Concrete Problems and Cement Minimisation\)](#)
[\(Download – Sustainable Concrete\)](#)
 - **ENERGY EFFICIENCY, CO₂ REDUCTION**
[\(Download – Part 1 Emodied Energy\)](#)

[Operational Use\)](#)

COPYRIGHT © Dincel Construction System Pty Ltd All rights reserved. No part of the information contained in this document may be reproduced or copied in any form or by any means without written permission from Dincel Construction System Pty Ltd.

DISCLAIMER

The information contained in this document is intended for the use of suitably qualified and experienced architects and engineers and other building professionals. This information is not intended to replace design calculations or analysis normally associated with the design and specification of buildings and their components. Dincel Construction System Pty Ltd accepts no liability for any circumstances arising from the failure of a specifier or user of any part of Dincel Construction System to obtain appropriate professional advice about its use and installation or from failure to adhere to the requirements of appropriate Standards and Codes of Practice, and relevant Building Codes.