

RICKARD
ENGINEERING

Museum of Contemporary Art

**GLASS REINFORCED CONCRETE
(GRC) APPLICATIONS**

SYDNEY • LONDON • DUBAI

INTRODUCTION TO GRC

All projects illustrated in this document have included the involvement of Charles Rickard with his previous company based in Drummoyne, Sydney (1984 - 2004) or as Rickard Engineering.

WHAT IS GRC?

Glass Reinforced Concrete (GRC) or Glassfibre Reinforced Concrete (GFRC) is one of the most versatile building materials that has been developed during the twentieth century and made a significant change to the façade industry.

Sprayed or premix GRC which contains concrete and glass fibres can be formed to any shape to create the architectural intent.

Products made from GRC can be formed into sections as thin as 8mm therefore the weight is much less than traditional precast concrete products. The design and manufacture of GRC products is covered by international standards and GRC products are manufactured in over 100 countries.

WHY GRC?

GRC typically gives a panel weight less than 50 kilograms per square metre. If you compare that with conventional reinforced concrete, which weighs 360kg per square metre from a 150mm panel. This means that the GRC panel will be seven times lighter.

GRC can achieve a fire rating. A single skin of GRC can achieve a fire rating of up to one and a half hours.

It is an extremely durable product: GRC has the compressive strength of typically 60mpa, which therefore makes it the perfect material for an exposed application.

There is no limitation on the different textures and features that can be built into GRC. The product is incredibly durable. The absence of aggregate in the mix means the lines of the panels are very sharp and the surface of the panels can be very smooth.

GRC can be engineered to suit a wide range of applications, either framed with steel or using GRC integral ribs.



GRC CAN BE USED AS:

- Façade on a new building.
- Renovate as an over-cladding on an old façade.
- Permanent formwork on which concrete can be poured, thereby gaining a very durable long-term soffit surface to the slab.
- Used to form sculptured structures: the 37-metre-high Merlion on Sentosa Island, Singapore or the Big Ram, the Big Prawn and the Big Oyster in Australia.
- Awnings or sunscreens on the face of a building.
- In or above ground drainage pits; oil or grease separators.
- Street furniture and planter boxes.
- Proprietary standard products such as cable ducting.

A big attractive advantage of the material is that you can create a fire-resistant structural product to suit any shape, subject to engineer approval.

GRC is increasingly becoming a replacement to precast concrete and aluminum composite. GRC is second to no other cementitious material. This is why it is so popular for building façades. The problem of aluminium has resulted in a 100% increase of use for façades in Australia in the last 10 years. There are no moisture traps or voids in the material.

GRC FEATURES

- High strength
- Lightweight, easy to handle and install
- Weather resistant, durable and crack resistant
- Withstands high wind pressure
- Can be formed in any shape
- Reduce loading on buildings leading to significant savings on main structure
- Wide range of surface finishes and textures
- Fire resistance
- Chemically resistant
- Environmentally friendly

CHARLES RICKARD

Charles Rickard is one of Australia's most sought-after engineers who has built a solid reputation through delivering quality, trust and innovation within his field.

Charles Rickard graduated from the University of Surrey, UK in 1975. There he was lectured by worldwide authority, Dr David Hannant in the subject of Fibreglass Composites which included Glass Reinforced Cement (GRC hereafter). After eight years of consultancy and contracting in the UK, he migrated to Sydney, Australia in 1984. In establishing his company Rickard and partners, he soon found his training and experience in composites was of value in not only GRC but also Fibre Reinforced Plastic. In 1999, he was contracted by the GRC Industry Group of the National Precast Concrete Association Australia to produce the document 'Design Manufacture and Installation of GRC'. Charlie has worked in the GRC industry in the USA, Singapore, Hong Kong, UK, the Middle East and Australia.

Charles Rickard was Technical Secretary to the National Precast Concrete Association (NPCAA), in the 90s when he wrote the Australian Code of Practice for GRC. In 1987, he ran a GRC plant in Texas, building façade panels for a variety of jobs (eg the San Antonio Marriott Hotel). Charles pioneered the use of incorporating continuous glass filament to improve strength for projects such as Royal Prince Alfred Medical Centre in Sydney and the Science Technology Park in Doha, Qatar. Charles is a consultant independent of any GRC manufacturing organisation and offers a full design service anywhere in the world.

Rickard Engineering is providing Civil, Structural and Façade Engineering services in Australia and worldwide. The aim of the company is to provide top quality engineering services in terms of durability, stability, economy and constructability with our highly professional team with over 40 years' experience in business.

Rickard Engineering is experienced in providing effective project communications with other project stakeholders. Our expert team is highly efficient in understanding project requirements and in collaborating with other stakeholders to deliver the design to meet architectural requirements.

Rickard Engineering is capable of analysing and designing the most complicated façade element and features using state of the art technology. By linking 3D CAD software and BIM platforms with FINITE element software, we are able to analyse and design façade or any other structural element in 3D mode.



**For more information phone +61 2 9904 5610
email charles@rickardengineering.com
or to view our 2019 Rickard Engineering Book
[click here.](#)**

GRC APPLICATIONS: CLADDING

GRC is gaining popularity as a material for creative prefabricated architectural cladding.

As GRC has the ability to be moulded into thin lightweight panels and into a variety of shapes, the use of GRC has a growing following with engineers, architects, designers and end-users. GRC also allows for a variety of forms and surface finishes - it can have a smooth or a textured finish.

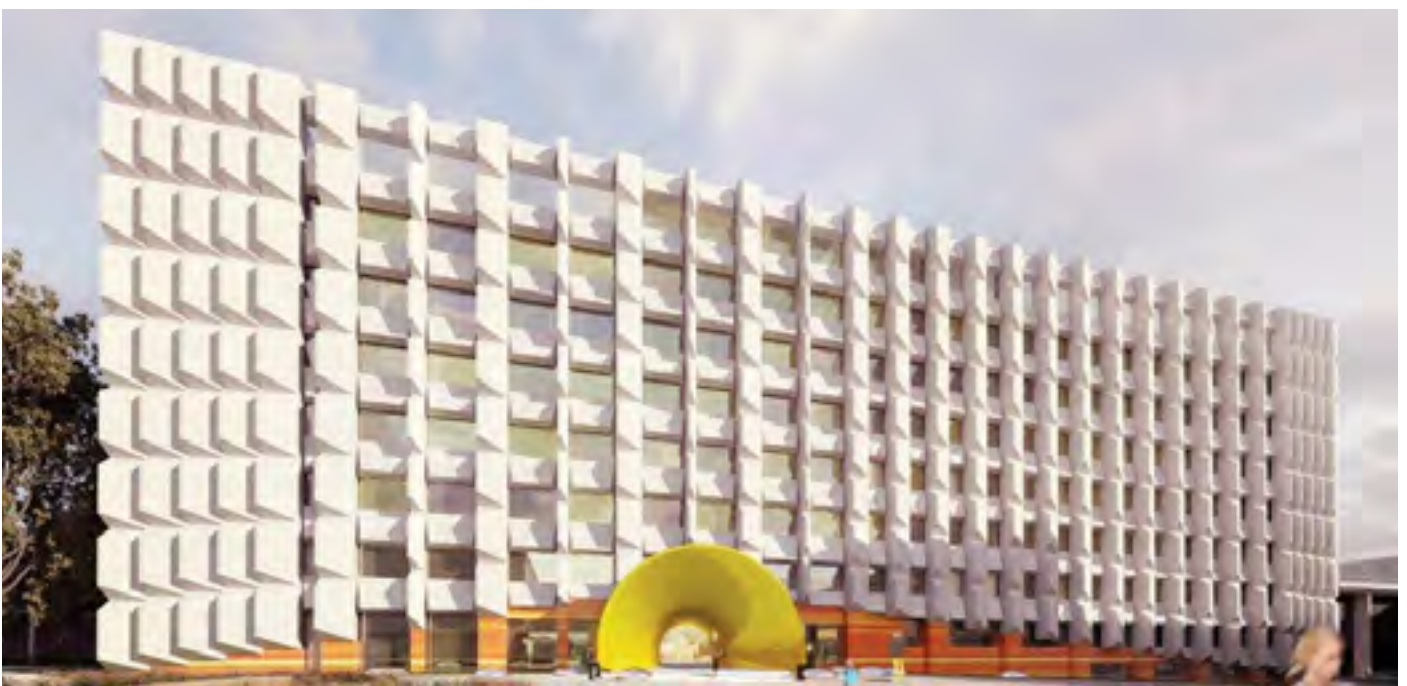
GRC can be left with a natural white or grey colour, it can also be combined with colour additives as well as being painted.

GRC cladding can be utilised on an existing structure to provide the building with a new fresh look. It can also be used to restore historic buildings to their former glory. GRC cladding provides a building with excellent insulation properties.

GEELONG LIBRARY, VICTORIA



MONASH UNIVERSITY, MELBOURNE



GRC APPLICATIONS: ARCHITECTURAL FEATURES

GRC's versatility and lightness enables it to be used in different ways making it a wonderful medium for creating architectural features.

GRC provides a durable and crack-free finish when used in the construction and decoration of building walls.

Moulded GRC components such as columns, window sills, window surrounds, cornices and door portals adds decoration as well as functionality. An ideal material to use on a variety of roofing structures.

GRC can be used for skyscrapers, commercial buildings as well as individual residences.

CONSTITUTION PLACE, ACT



INFINITY, GREEN SQUARE, SYDNEY



NATIONAL BANK OF OMAN, MUSCAT



OMAN CONVENTION CENTRE, MUSCAT



THE CARLTON, GEELONG



GRC APPLICATIONS: INTERIOR DESIGN

ACOUSTICS

GRC is very efficient at blocking the passage of noise due to its high surface mass.

GRC is being used internally and externally for acoustic barriers and screens for highways and railways for example. This is advantageous for the surrounding neighbourhood.

Bespoke and creative designs can be created so to enhance to aesthetics to the environment such as concert halls and auditoriums.

175 EAGLE STREET, BRISBANE



Photo by Cox Architects

NATIONAL BANK OF OMAN, MUSCAT



SCREENS

GRC is being used to produce architectural mouldings and features for visually appealing screens.

Using GRC makes the screen easy to handle and therefore to erect. The screens can be visually appealing as well as functional.

CEREMONIAL COURT, QATAR



LANDSCAPING

GRC is playing a major role in the area of landscaping due to its surface finish and the ability to modify shape and form. Examples such as statues, sculptors, signs, seating, planters, rockscapes and replica buildings are benefiting with the use of GRC, in particular in parks, zoos and theme parks.

GRC FEATURES

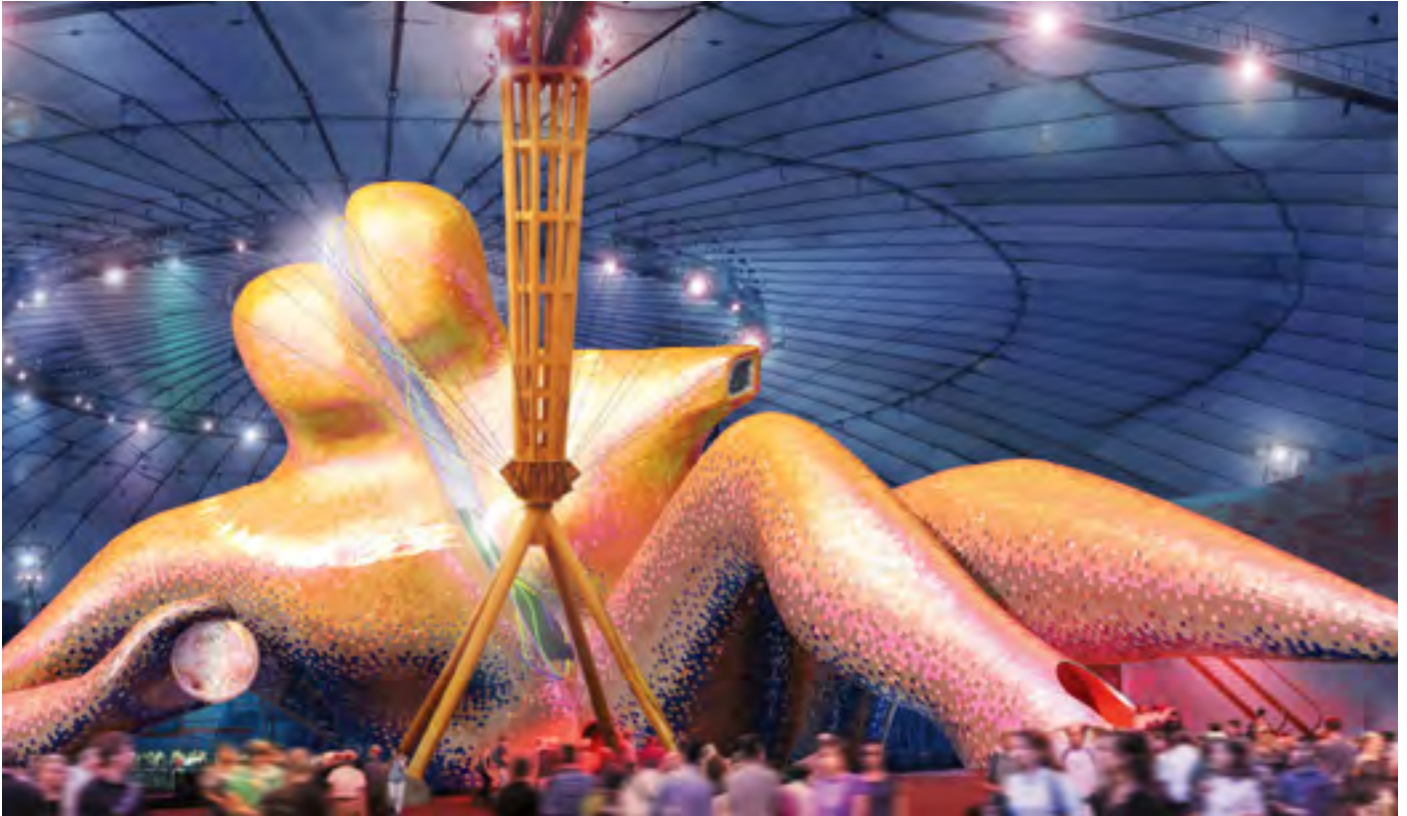
- Electrical resistance
- Design flexibility
- Fast erection on site
- Excellent thermal performance
- Easy to transport and install on site

/ FREE-FORM STRUCTURES

MERLION, SINGAPORE



BODY ZONE, MILLENNIUM CELEBRATIONS IN LONDON



/ ARTIFICIAL ROCKS

BIRD PARK WATERFALL, SINGAPORE ZOO

Owner: Mandai Project Development

Client: Pico Play Pty Ltd



/ SEATING



/ **PLANTER BOXES**



/ PITS



/ BATHROOM FLOORS

