Formable façade cladding with GRC

Glass-fibre-reinforced concrete (GRC) is an extremely formable and versatile cladding material suitable for both exterior and interior cladding projects. One such project is the concert hall in Amare, the new performing arts centre in The Hague, Netherlands.

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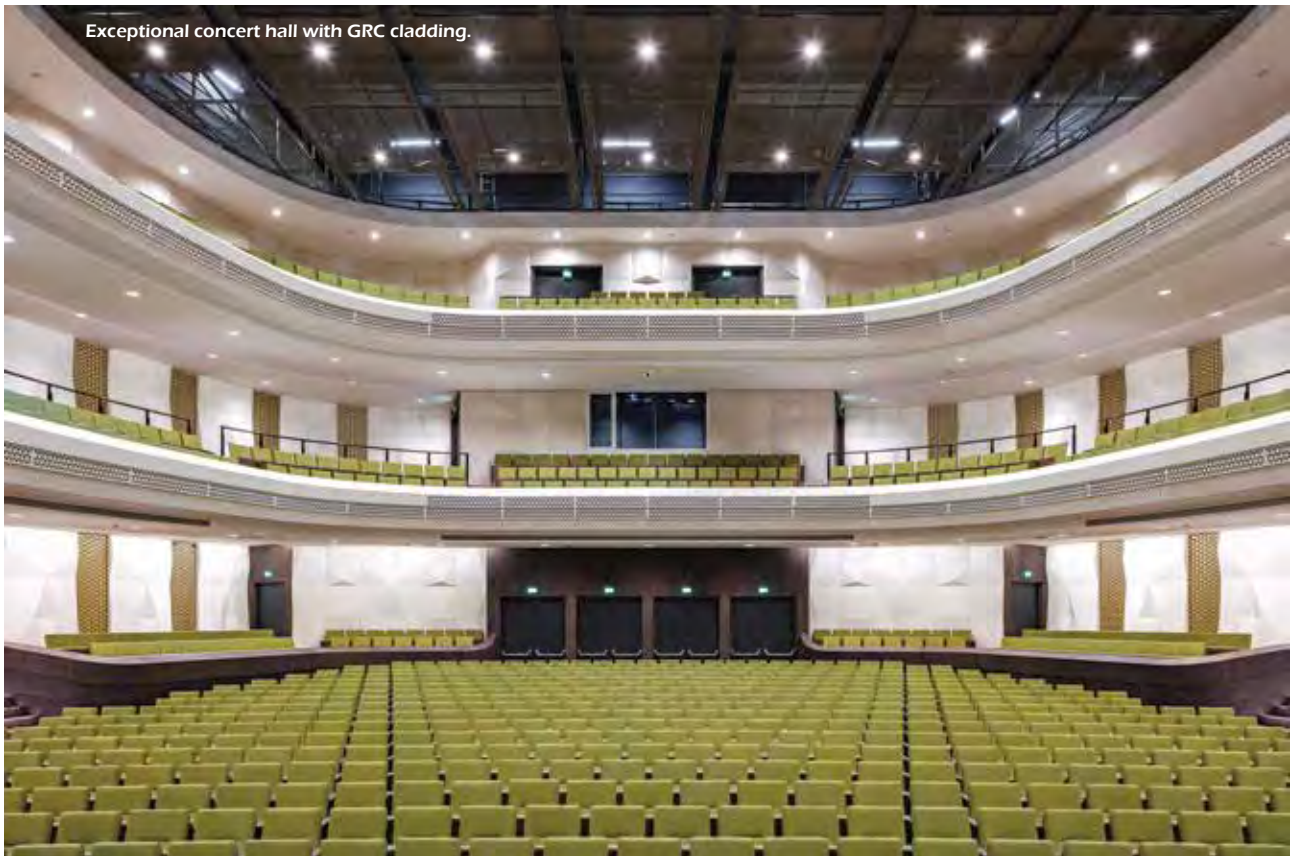
Balcony parapets in aesthetically shaped GRC.


Exceptional concert hall with GRC cladding.

The concert hall in Amare is one of the first projects in the Netherlands to use spray-cast GRC on a large scale. High demand for aesthetics and acoustics were decisive in selecting GRC for the interior wall cladding and balcony elements.

The construction of the concert hall was completed in September 2021 and developed by the consortium Cadanz (Boele & van Eesteren/Visser & Smit Bouw). It was designed by Jo Coenen Architects & Urbanists and the GRC elements were manufactured by BB fiberbeton and supplied by Hi-Con Netherlands.

Commonly, GRC is used for exterior façade cladding, acting as a durable, lightweight, and sustainable building envelope. In this case, the formable and lightweight qualities of GRC made it ideal for creating the decorative curved shapes and the patterned surfaces of the interior wall cladding and balconies.

Unparalleled design freedom

An architect's vision and design are heavily influenced by the choice of materials and vice versa. Choosing the right materials can fuel the architect's imagination. For this concert hall, the formability and versatility of the materials were particularly important.

The most distinctive quality of GRC is the ability to mould the material into thin, lightweight elements in an unlimited variety of geometries and with a multitude of surfaces. This inherent customisability and adaptability grants architects an exceptional design freedom.

The prestigious Amare concert hall accommodates the Residence Orchestra and the Royal Conservatory and, thus, there are high aesthetic demands and stringent technical and acoustic requirements. This meant that architects needed to choose a material that could be moulded into purposeful shapes, while also being aesthetically pleasing. This made GRC a great choice for designing an impressive interior that would expertly accommodate its esteemed performers.

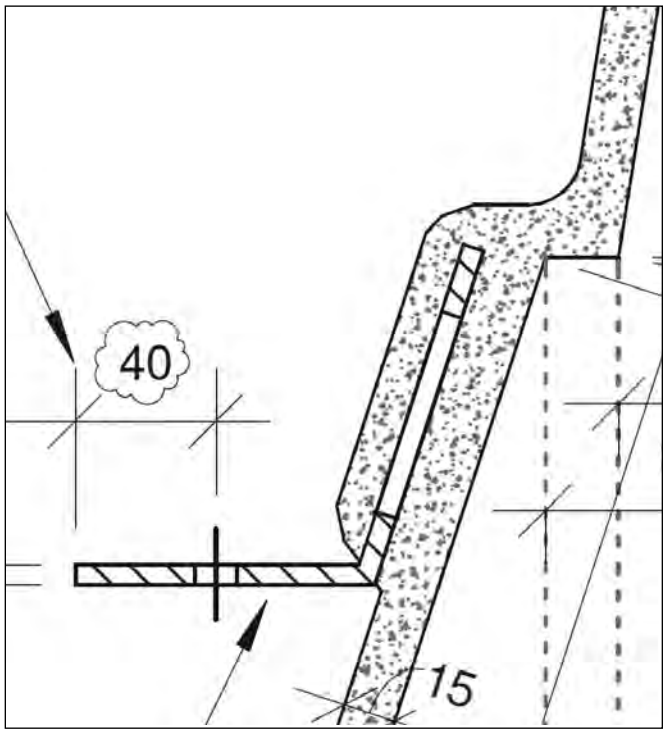
Kinked shapes and curved elements

As mentioned, an important feature of GRC is the formability of the material. This formable quality is evident in the origami-like shaped wall cladding that is carefully designed in kinked shapes with a faceted surface. The muted white colour of the GRC elements contrasts beautifully with the bold gold-coloured perforated sliding panels, adding to the remarkable overall interior.

The curvature of the balcony edges and the perforated surface pattern add another component to the visual appearance of the concert hall.

In addition to impressive aesthetics, the interior GRC cladding is deliberately designed to ensure a superior acoustic experience for both performers and the audience. The shape of the wall panels and the curvature of the balcony elements are designed to ensure an optimal spread in the reflection of sound frequencies and create a spatial 3D experience. The sliding panels allow for the sound absorption in the room to be adapted to the music style, from in-time concerts to electronically amplified exhibitions.

The ability to produce thin and lightweight elements in GRC was instrumental for the acoustic quality. The thinness and low weight are achieved by using a special spray technique that ensures an optimal distribution of fibres



Embedded brackets allow for hidden installation.

and a low water:cement ratio. The technique requires a great deal of craftsmanship and it is crucial for producing complex geometries, while guaranteeing high-strength GRC.

Typically, GRC elements manufactured by BB fiberbeton are as thin as 12mm. For this project, the thickness was increased to 15mm for the wall panels and 25mm for the balcony parapets. The thickness was specifically chosen to achieve optimal acoustics and behind the cladding elements there is a layer of 100mm-thick insulation material.

Embedded brackets

GRC elements for the concert hall are mounted with embedded brackets (see diagram above) and, like other mounting principles from BB fiberbeton, this solution uses the option of a hidden installation without visible screws and with the fewest possible loose parts. Combined with the thinness and low weight of the elements, this makes installation simple and easy to handle.

Nominated for Dutch Concrete Awards

The concert hall in Amare received two nominations at the Dutch Concrete Awards 2021 in the categories 'Utility' and 'Groundbreaking Construction' (for innovations in concrete construction).

The jury's motivation for the nominations was based on the use of GRC, which provided an extensive freedom of shape, high aesthetic quality, low mass and a long lifespan. All this achieved what the jury perceived as the most important part of the design – good acoustics.

GRC offers an incredible freedom in geometry, colour and texture. It is a maintenance-free material and it is an incredibly durable material that will neither rot, rust, nor dent. GRC is a class A1 fire-resistant material. It is also a sustainable material and comparatively has a much lower environmental impact than conventional concrete. This makes the material ideal for environmental certifications such as LEED, BREAAM and DGNB. ■

Above: Curved balcony edges with perforated pattern.

Below: GRC wall cladding with kinked shapes.