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# CONNECT

THE MAGAZINE OF THE GLOBAL BBR NETWORK OF EXPERTS

**TOWARDS CARBON ZERO**
BBR CEO's reflections on smart use of construction technology

**WORLD'S FIRST ETA APPROVED STRAND GROUND ANCHOR**
BBR VT CONA CMG unique in the market place

**TRADITION MEETS MODERNITY**
Malaysia's newest stay cable icon

**TWINNING IN TOURAINE**
Motorway viaduct twinning in France

**THREE MILLION MILESTONE**
BBR ground slab achievement in NZ

# A Global Network of Experts

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The BBR Network is recognized as the leading group of specialized engineering contractors in the field of post-tensioning, stay cable and related construction engineering. The innovation and technical excellence, brought together in 1944 by its three Swiss founders – Antonio Brandestini, Max Birkenmaier and Mirko Robin Roš – continues, more than 75 years later, in that same ethos and enterprising style. From its Technical Headquarters and Business Development Centre in Switzerland, the BBR Network reaches out around the globe and has at its disposal some of the most talented engineers and technicians, as well as the very latest internationally approved technology.

## THE GLOBAL BBR NETWORK

Within the Global BBR Network, established traditions and strong local roots are combined with the latest thinking and leading edge technology. BBR grants each local BBR Network Member access to the latest technical knowledge and resources – and facilitates the exchange of information on a broad scale and within international partnering alliances. Such global alliances and co-operations create local competitive advantages in dealing with, for example, efficient tendering, availability of specialists and specialized equipment or transfer of technical know-how.

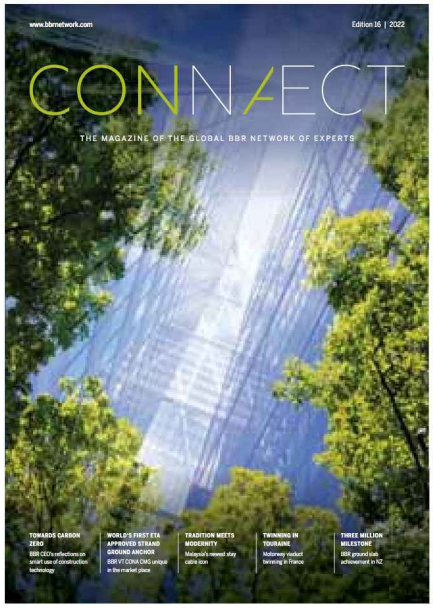
## ACTIVITIES OF THE NETWORK

All BBR Network Members are well-respected within their local business communities and have built strong connections in their respective regions. They are all structured differently to suit the local market and offer a variety of construction services, in addition to the traditional core business of post-tensioning.

## BBR TECHNOLOGIES & BRANDS

BBR technologies have been applied to a vast array of different structures – such as bridges, buildings, cryogenic LNG tanks, dams, marine structures, nuclear power stations, retaining walls, tanks, silos, towers, tunnels, wastewater treatment plants, water reservoirs and wind farms. The BBR™ brands and trademarks – CONA®, BBRV®, HiAm®, HiEx, DINA®, SWIF®, BBR E-Trace and CONNÆCT® – are recognized worldwide. The BBR Network has a track record of excellence and innovative approaches – with thousands of structures built using BBR technologies. While BBR's history goes back over 75 years, the BBR Network is focused on constructing the future – with professionalism, innovation and the very latest technology.

BBR VT International Ltd is the Technical Headquarters and Business Development Centre of the BBR Network located in Switzerland. The shareholders of BBR VT International Ltd are BBR Holding Ltd (Switzerland), a subsidiary of the Tectus Group (Switzerland) and KB Spennteknikk AS (Norway), a subsidiary of the KB Group (Norway).




# Together we can make a difference

It is our great pleasure to welcome you to the 2022 edition of CONNÆCT – the BBR Network's annual magazine. This time around we bring you some interesting insights, useful background information and some great news about BBR technologies. There is something within these pages for everyone!

In the bridge construction arena, the BBR Network has provided latest technologies and techniques not only to speed construction, but also to make the structures themselves leaner and more durable. You can read about high level motorway viaducts flowing sleekly through narrow valleys, city center viaducts whose durability has been assured with electrically isolated PT tendons and still more bridges providing practical yet aesthetically pleasing river crossings.

The excellence of BBR technologies and skills can be in no doubt when you see the major achievements in the ground slab market in New Zealand, the newest landmark building in Poland and the latest projects for the retail sector in Croatia and Slovenia. All over the world, the BBR Network is raising the standard of spaces designed for people.

In the Special Applications and MRR sections, awesome achievement meets fascinating facts! There are features which tell of how BBR teams and technologies have created important new facilities and prolonged the life – or assured the continued safe operation – of various structures.

However, we've saved the best news for last – in the Technology section! Here, you'll see how BBR's campaigning has resulted in greater regulation, hence durability, in the strand ground anchor field and how the BBR VT CONA CMG strand ground anchor system has become the first in the world to be accredited with a European Technical Approval (ETA).

Before closing the magazine, do please take a few moments to read the feature on the importance of carbon reduction in the construction sector and the value this creates. The techniques described are all very familiar to the BBR Network, so let's work to reduce embodied carbon in our built environment – together we can make a difference.

**Marcel Poser**
Chairman, BBR VT International Ltd

**José Manuel Illescas**
Vice Chairman, BBR VT International Ltd

**Courtineau Viaduct, A10, France**
Cast in situ balanced cantilever construction

# Twinning in Touraine

The Autoroute A10 – known as 'L'Aquitaine' – is France's longest motorway and runs some 549km from the south of Paris to Bordeaux. French BBR Network Member ÆVIA is part of the team working on the widening of the motorway in a challenging viaduct twinning scheme featuring latest BBR post-tensioning technology. Cédric Brunner, Principal Engineer, gives an insight into the project and its progress.

France's longest motorway, the Autoroute A10, is being widened with the addition of the new Courtineau Viaduct.


ETPO
ETPO
LINDE GC
ETPO

A great technical solution is being delivered to increase motorway capacity here in the Touraine region. The widening of the A10 motorway involves the construction of a third viaduct, to carry an additional two traffic lanes plus an emergency lane, alongside the two existing structures.

An important architectural consideration was that the new viaduct should reflect the two viaducts built in the 1970s, thereby giving a certain homogeneity to the infrastructure and perhaps creating the impression that the new viaduct had always been there.

The new €15 million viaduct is 210m long, 30m high and comprises three spans – of 56, 94 and 60m – which are supported by two piers and two abutments. The viaduct deck is a two core concrete box section which is being constructed using successive cast in situ segments cantilevering outwards from the piers.

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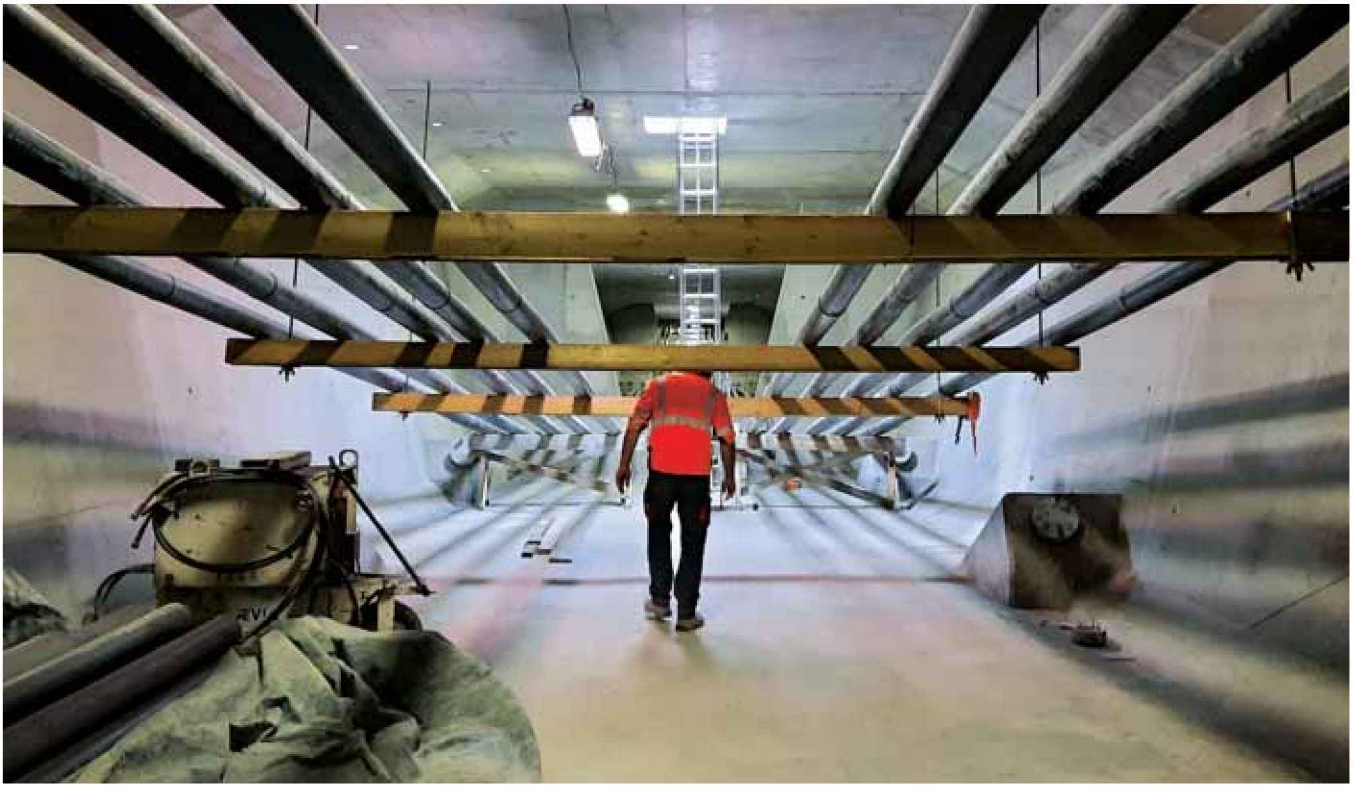

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**Balanced cantilever segmental construction**

The cast in situ balanced cantilever construction method was chosen because there is insufficient space on site for installation of a launching beam and also because access to this narrow valley site, which contains a watercourse, is challenging.

In total, 52 segments were required to complete the viaduct deck. The first segment was cast on a pier and was the largest and most complex segment to be formed. It was secured to the pier by a fixing system consisting of BBR VT CONA CMI BT 1906 post-tensioning tendons. This approach prevented the beam from tilting when a new deck section was added.

Successive segments, consisting of two corbelled beams, were then cast in situ in pairs using mobile formwork. When all segments were constructed and post-tensioned together, they formed the viaduct deck.

**Movable formwork**

The movable formwork, called a C-beam, was fixed to the previous segment and served as a support for the outer formwork which supported the upper slab, the outer faces of the webs and the underside of the lower slab.

The interior formwork of the segment – corresponding to the underside of the upper slab, as well as the internal faces of the webs – was supported by cantilever beams also fixed to the preceding segment. ›

4

### Four roles for PT

We used post-tensioning for four different functions on this project.

As well as installing tendons for the first pier segment, we also installed tendons in the beams to allow two pairs of segments to be cast on the viaduct piers.

Next, as will be familiar to most BBR Network Members, we post-tensioned the segments together. BBR VT CONA CMI internal tendons were being used for these three purposes.

Last but not least, BBR VT CONA CME BT 2706 exchangeable external tendons were installed inside the box sections to accommodate both dead and live loads from the structure after it had been completed.

### Great teamwork

This was a technically challenging and extremely satisfying project where excellent teamwork with the main contractor and other professionals greatly contributed to a successful result. Our work finished with the stressing of the final box girder segments in September, however other work continues to complete the whole project. Meanwhile, we look forward to the opening of the viaduct in summer 2023.


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1 The new viaduct takes shape, seen here during balanced cantilever construction.
2 BBR post-tensioning was used for a total of four different functions on this project.
3 View inside the box section of the new viaduct where CONA CME tendons were used to stress the segments together.
4 The CONA CMI BT system was used to secure the first – and most complex – segment to the pier.
5 The cast in situ balanced cantilever method of construction was chosen for this viaduct twinning scheme because of site constraints.
6 Stressing of one of the CONA CME BT 2706 exchangeable external tendons underway.

### TEAM & TECHNOLOGY

**Owner/client** – Vinci Autoroutes
**Main contractor** – ETPO/NGE
**Technology** – BBR VT CONA CMI internal, BBR VT CONA CME external
**BBR Network Member** – ÆVIA Câbles et Manutention (France)

**Building G2, Chapelle Internationale, Paris, France** Structural strengthening with external PT

# Uniquely placed reinforcement

Under the timeless gaze of the Sacré Cœur Basilica in Paris, the team from ÆVIA has successfully completed reinforcement work to Building G2 of the Chapelle Internationale complex. Principal Engineer Cédric Brunner describes the project and shares some photographs taken while work progressed.

Structural strengthening work underway on the roof of Building 2 of the Chapelle International development in Paris – with the famous Sacré Cœur Basilica in the background.

## Step-by-Step Guide

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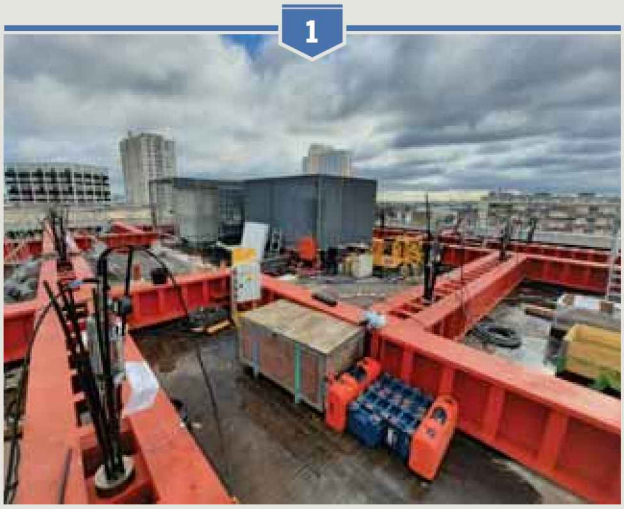

A network of steel frames was constructed on the rooftop to support installation of the BBR CONA CMB tendons to strengthen the building.

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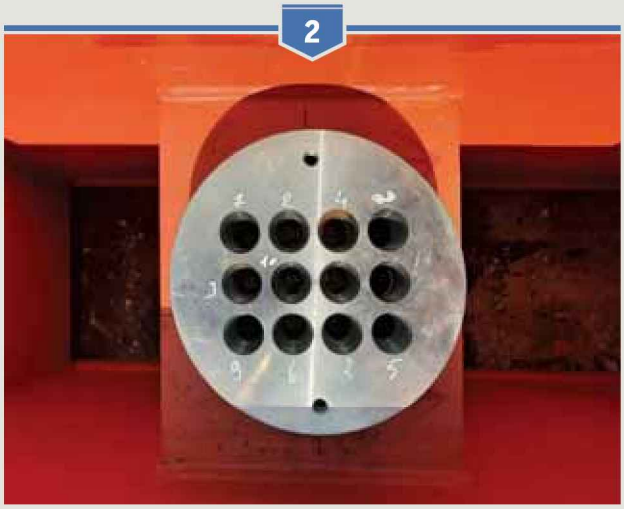

A unique feature of the project was that the individual strands of the PT tendons were anchored at different levels.

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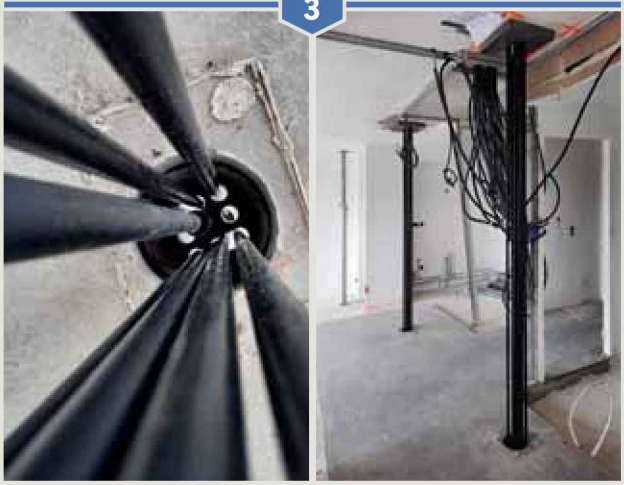

Here you can see the CONA CMB tendons installed vertically from floor-to-floor.

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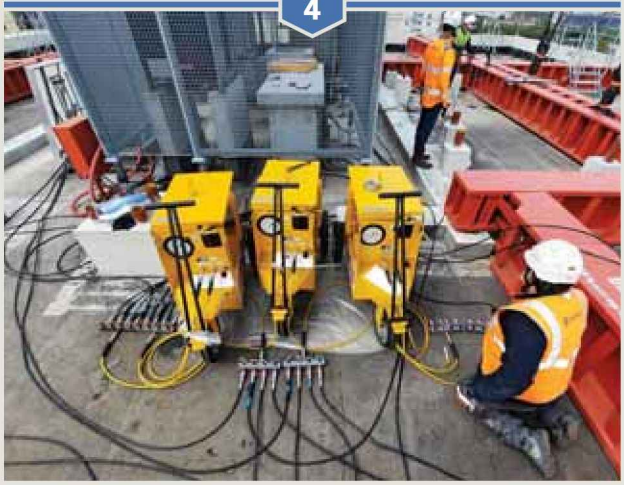

The PT tendons were stressed using 12 stressing jacks for monostrands, or 'monojacks'. These were operated simultaneously to ensure a uniform and controlled stressing process for each of the tendons. Pictured here are three monojacks being prepared for operational use.

The 18th Arrondissement of Paris, known as Butte-Montmartre, is characterized by a rich history intertwined with the development of late 18th Century European art. Artists were attracted to the famous Montmartre district which was also home to the renowned Moulin Rouge cabaret venue which still operates at the foot of the Montmartre hill. The massive Sacré Cœur Basilica, completed in 1914 after a construction program lasting almost 40 years, is now a famous landmark on the Parisian skyline and looks down on the whole district which has developed into a vibrant multicultural commercial and residential zone.

Our project, as unique and complex as its setting, consisted of reinforcing 12 floors on nine levels with external post-tensioning tendons installed vertically. We used 12 BBR VT CONA CMB monostrand tendons, each with 11 strands of 15mm diameter which were anchored to a metal frame on the flat roof. The PT tendons were installed following a very specific threading order and with the unusual feature of having each of their strands anchored at different levels. In order to ensure homogenous and controlled stressing, we used 12 monostrand stressing jacks operated simultaneously. The whole project was completed in just 10 weeks.

### TEAM & TECHNOLOGY

**Owner** – Régie immobilière de la ville de Paris
**Main contractor** – Leon Grosse
**Technology** – BBR VT CONA CMB
**BBR Network Member** – ÆVIA Câbles et Manutention (France)