



Picture of the month

## Navia Viaduct

### Leading



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## Hydroelectric project in Portugal

The contract will be executed by a joint venture between FCC Construcción, Ramalho Rosa Cobetar and OPWAY

FCC will be responsible for the construction of the Ribeiradio and Ermida dams and the accesses to the Ribeiradio Dam, as well as for the restoration of highway EM 569 on the Vouga River, near Aveiro, for EDP (Energias de Portugal).

The main dam (Ribeiradio) will be a concrete gravity dam with a circular directrix, a 262-metre crest length, a maximum height of 74 metres and a volume of 230,000 cubic metres. The spillway will be made up of three 13-by-13-metre bays and equipped with segmented gates and a bottom outlet 2.5 metres in diameter. The stilling pool will consist of a concrete reservoir

with a maximum height of six metres, located 135 metres downstream.

In order to generate the counter-dam, the Ermida dam will also be a concrete gravity dam, but its directrix will be straight. It will have a 175.1-metre crest length, a maximum height of 35 metres and a volume of 75,000 cubic metres. It will have a fixed-lip spillway and a 1.2-by-1.5-metre bottom outlet, and a 30-metre stilling pool will be provided. The hydroelectric plant will be equipped with two generators fed by independent hydraulic circuits that will cross through the body of the dam.



Ribeiradio Dam

## The Panama Canal Authority awards its Pacific access channel construction contract to FCC

The contract is worth 187 million euro



View of the canal as it is today

The Panama Canal Authority (ACP) has awarded the contract for the construction of its Pacific access channel to a joint venture partnering FCC Construc-

ción with two American firms, within the framework of the location of the third set of locks at Miraflores. The contract is worth 187 million euro and has a total completion period of 43 months.

The work consists in the construction of 3.7 kilometres of 200-metre-wide approach channel to the Pacific locks, and it encompasses the excavation, transport and disposal of approximately 27 million cubic metres of mostly rocky material.

Due to the presence of water at levels above the maximum excavation depth, a pumping system will be installed during the excavation process. The insta-

llation of systems for draining surface and underground water is envisaged, as is the administration and implementation of environmental controls.

Also included is the installation of a containment structure comprising over 1.5 kilometres of cellular cofferdams to enable the construction of a 2.9-kilometre-long clay core/rock fill dam with a riprap crest wall to a height of 30 metres above the channel, with an overall volume of six million cubic metres.



- Construction of two bridges in Panama for Minera Panamá.
- A section of the Northern Longitudinal Road in El Salvador, for the government of the Republic of El Salvador.
- Urgent work to renovate and repair Canal de Isabel II's water supply system.

## Finished projects

# New headquarters for the Spanish National Toxicology and Forensic Science Institute

The new building is situated in Las Rozas and has over 16,000 square metres of floor space



Institute opening by Minister of Justice Francisco Caamaño

On 26 November last, Minister of Justice Francisco Caamaño inaugurated the Spanish National Toxicology Institute in the locality of Las Rozas, Madrid. The institute's new headquarters involved an investment of 23.7 million euro, and more than 200 researchers will be working there.

The new building, constructed by FCC, has five storeys (one below ground), with a total area of 16,653 square metres, and it is equipped with the latest in technology.

It has premises for chemistry, biology, criminalistics, histopathology and toxicology laboratories, as well as auxiliary rooms, common areas, offices, an auditorium, a library including a video library, classrooms and a roomy filing area.

It also has special facilities, such as refrigerated chambers for maintaining tens of thousands of samples at a temperature of  $-80^{\circ}\text{C}$ , an armoured chamber for keeping drugs and a gas storage area for disposing of non-toxic waste.

### + Site team

**Department head:** Alejandro Vargas González  
**Construction manager:** Marta Rivada Rodríguez  
**Facility assistant:** Raquel Martínez Fernández  
**Manager's assistant:** María Lorenzo Sotelo  
**Foreman:** Miguel Ángel González García



Façade of the new building

## Contract to enlarge Austrian tunnel awarded

Alpine to build the Bosruck Tunnel for 130 million euro

Alpine, FCC's Austrian subsidiary, has received the 130-million-euro contract to enlarge the Bosruck Tunnel on the A9 in Austria. The contract calls for the construction of a second tunnel tube measuring 5.5 kilometres in length.

The contract is part of a tunnel safety programme implemented by Asfinag, the state entity in charge of building, financing and maintaining the Austrian motorway system.

The construction work on the new tunnel, which will be built using the traditional

method, will commence in January. The goal is for construction to be complete by 2013 and the newly expanded tunnel to be fully operational by 2015.

The enlargement of this infrastructure will provide a two-lane connection between the Austrian states of Styria and Upper Austria. The Bosruck Tunnel is currently a bottleneck on the A9 expressway.



Bosruck tunnel layout

## Railway projects in Bosnia worth 85 million euro

The projects have got a two-year completion period

Alpine, FCC's Austrian subsidiary, has signed two contracts, which together add up to a total of 85 million euro, to modernise Bosnian railway lines. The contracts will be performed in a consortium with another firm.

At issue in the contracts are the 99-kilometre-long line between Sarajevo and Ploce and a 65-kilometre-long section of the line between Kostajnica and Josavka. The projects, which consist in replacing the lines' rail and ballast in order

to boost the maximum running speed of the trains and thus improve transport and connections along these corridors, have a two-year completion period.

The work on the Sarajevo-Ploce line amounts to 51.1 million euro. Forty-five percent of this budget will be financed by the European Bank for Reconstruction and Development (EBRD) and 55% by the European Investment Bank (EIB). The work to modernise this route features a great deal of technical complexity,

due to the large number of tunnels and bridges on the line.

The contract for the Kostajnica-Josavka line involves the renovation of the 65-kilometre-long Banja Luka-Doboj section for 33.9 million euro. In this case, 45% of the sum will be coming from the EBRD and the remaining 55% from the EIB.

## Housing minister visits Teatro de Aranjuez

The minister conducted an on-site works progress check



Housing Minister Beatriz Corredor, accompanied by Jesús Dionisio Ballesteros, mayor of Aranjuez

On 22 December 2009 Housing Minister Beatriz Corredor, accompanied by Director-General of Architecture and Housing Anunciación Romero, Mayor Jesús Dionisio Ballesteros of Aranjuez and other local authorities, visited the site where the Gran Teatro Coliseo Carlos III de Aranjuez is being refurbished by FCC Construcción.

The Teatro de Aranjuez was built during the reign of Carlos III by French architect Jaime Marquet, who also designed the theatres of El Pardo and San Lorenzo del Escorial. The latter and the Aranjuez theatre are the oldest roofed theatres still standing in Spain.

From the start the Teatro de Aranjuez has seethed with cultural activity. In the 19th century it hosted a string of lyrical productions and serious plays, operas, light operas and comedies. In the early decades of the 20th century the seating was removed and the theatre served as an improvised ballroom. And lastly in 1933 it became a cinema. After alterations in 1948, the Teatro boasted seating for 1,037.

The refurbishment and reconstruction of the theatre as planned by architect Mariano Bayón respect the original mid-18th-century design and will use the original period elements that still remain. All these elements are currently under-

going restoration for their future, and now impending, reinstallation piece by piece in the building.

One of these elements is a magnificent ceiling fresco, which will again occupy its original place in the auditorium. There are also some original painted wood-carvings in the proscenium, a wooden roof truss structure, a decorated curtain on the proscenium arch and various decorative items on the extrados of the boxes.



## Workshop for Construction Model Change

### Mr Nadal promised to foster innovation in construction

At the workshop's closing event, Mr Nadal, regional councilman for land policy and public works, defended the need to foster refurbishment, since that is the best sustainable policy. He added, however, "Civil engineering work will continue to be called upon to play a driving role in the economy's productivity, and the increase in the amount of infrastructure investment will be a gua-

rantee of the creation of wealth and better employment rates".

During the workshop for construction model change, several technical statements were delivered. The presentation of the new innovative solutions applicable to the construction of public works, new buildings and the renovation and maintenance of existing buildings was handled by Antoni

Massagué, industrial engineer and structural calculations expert, Antoni Ubach, architect, Javier Ainchil, FCC Construcción's technical manager in Cataluña, and Martí Bou, civil engineer.

Before the workshop was closed, Xavier Casas, chairman of GISA and of the award panel, gave out the CCOC 2009 Construction Safety Awards.

## CSR

## FCC Construcción participates in the inauguration of post-graduate studies at the Universidad de Cantabria

### The opening lecture was offered by Chaired Professor Juan José Arenas

Numerous experts shared their knowledge with students at the inauguration of the fourth season of post-graduate master's studies for construction technology and management experts and specialists offered by the University of Cantabria.

FCC Construcción engineers Jesús Gómez Hermoso and Jesús Mateos spoke on "The Evolution and Situation of Tall Buildings" and on "The Process of Building Caja Madrid Tower", which is the highest building in Spain.

The University of Cantabria's chaired professor of bridge construction, Juan José Arenas, gave the inaugural lecture, entitled "Experiences in the Design of Various Special Buildings".

The last three times that they were offered, the post-graduate studies in construction technology and management

proved to provide an excellent continuing education opportunity for professionals in the construction sector in Cantabria and surrounding provinces.

These studies, of a decidedly professional nature, have solid business and institutional support. The Department of

Public Works and Housing, four professional associations and more than sixty other entities have collaborated in the courses offered and the sharing of experiences, along with professors from seven Spanish universities.



Site of the post-graduate studies

## FCC recognised for the construction of the Puerta del Sol local train station in Madrid

It has received the 2009 Best Public Works Award for Madrid from the Civil Engineers Association



Entrance to Sol local train station

The new local train station at the Puerta del Sol in Madrid, built by FCC, has been recognised by the Civil Engineers Association as the Best Public Works project in 2009 in the Madrid region.

The panel of judges evaluated the magnitude and difficulties of the technical and environmental challenges faced and the services affected, which had to be resolved in the city's historical centre, at the central point of the Spanish road system. Now that the issues have been dealt with, this station has become an emblematic example of public transport in our community and a prime example of the kind of work that civil engineers do in Madrid society.

The General Manager of FCC Construcción, Avelino Acero, accepted the award from the Secretary of State for Planning and Infrastructure, a branch of the Ministry of Development, at a ceremony held on 26 November 2009.

The Puerta del Sol Station, inaugurated on 27 June by Spain's prime minister, José Luis Rodríguez Zapatero, is part of a new local rail connection linking Atocha and Chamartín.

The cavern of the station, which is the only one of its kind in the world, is 207 metres long and 15 metres high and was



designed on two levels: a lower level where the platforms are located and a mezzanine level stretching right across which provides passengers access to the platforms.



Delivery of the prize to the General Manager of FCC Construcción, Avelino Acero



# Navia Viaduct distinguished by the International Federation for Structural Concrete

The project built by FCC forms part of the Navia relief road



Viaduct over the Navia River

The Navia Viaduct, constructed by FCC, has been distinguished by the jury with a Special Mention in the category of Civil Engineering Structures at the 2010 fib Awards for Outstanding Structures.

The results of the call for entries will be presented officially on 29 May 2010 at the Third Congress of the International Federation for Structural Concrete, which will take place in Washington.

Navia Viaduct is a bridge of great beauty that forms part of the relief road of the same name. It has eleven spans, measuring  $46.3 + 70.0 + 3 \times 75.0 + 2 \times 160 + 75.0 + 67.5 + 60.0 + 41.5$  metres.

The main spans are each upheld by a composite arch inclined four degrees toward the inside of the curve and lying on the medial line.

The 905-metre-long cross beam is continuous over the entire viaduct. It has joints at the abutments and is made of a central concrete box girder and transverse cantilevers with a slab of varying depths held up by precast concrete braces set every 4.3 metres.



# Vidin-Calafat Bridge over the Danube and bridge accesses on the Bulgarian side

The bridge designed and built by FCC is a total of 1,951 metres long



Bridge infographics

FCC Construcción is engaged in building a bridge over the Danube between the localities of Vidin, Bulgaria, and Calafat, Rumania. The project, which includes the dual carriageway accesses and railway accesses on the Bulgarian side, is being accomplished using 95% FCC Construcción's own resources.

The bridge, designed and built by FCC, is a total of 1,951 metres long. Its foundations are reinforced concrete piles two metres in diameter, plunging to depths ranging between 60 and 80 metres below the level of the pile caps. The bridge has three clearly differentiated parts:

## Bridge over the navigable channel

Extradosed structure, comprising four pylons whose height varies between 39 and 45 metres above the pile caps. The bridge consists of five spans 124, 180, 180, 180 and 115 metres in length. The standard cross-section of the deck in this zone holds four 3.25-metre-wide motorway lanes, 50-centimetre should-

ers on both sides, a central portion on which the six-metre-wide railway line travels, a bicycle lane off to one side and sidewalks. The bridge's total width is 31.35 metres. The deck is made of precast concrete segments 4.18 metres thick and weighing approximately 250 tonnes apiece.

## Bridge over the non-navigable channel

Made of eight piers whose height varies between three and 20 metres, this bridge has got seven 80-metre spans and one 52-metre-long span. The standard cross-section of the deck in this area is the same as in the bridge over the na-



Casting a test segment in the casting facility



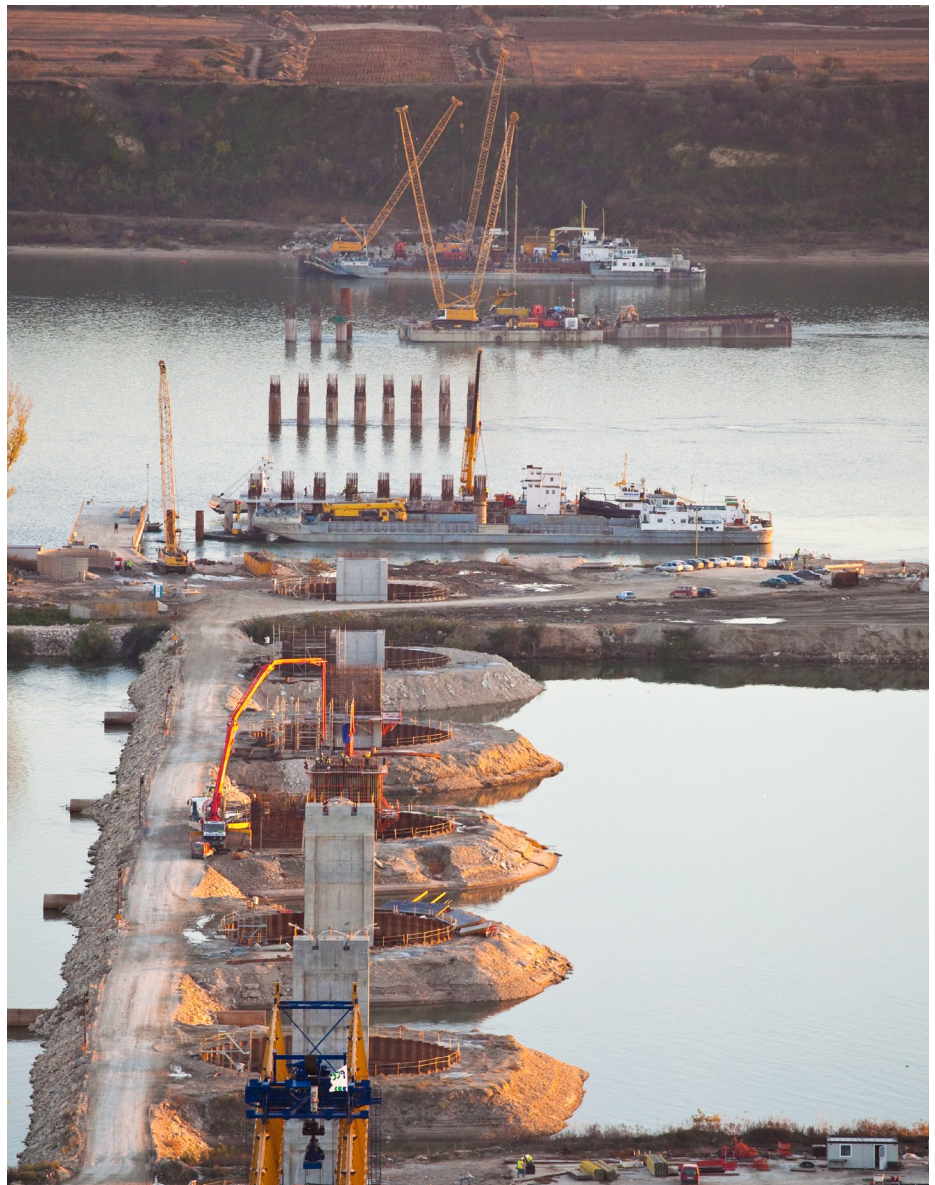
vigable channel. The deck is made of precast concrete segments 2.15 metres thick, weighing approximately 100 tonnes apiece. The portion where the cantilevers will be overhanging the sides in this zone of the bridge will be built in situ later, in phase two, using wagon-built formwork.

### Railway access bridge

This bridge is made of thirteen piers standing a maximum of 12 metres tall, with twelve 40-metre spans and one 32-metre-long span. Of these spans, ten lie on the Bulgarian side and three lie on the deck of the bridge above the non-navigable channel. The railway deck features a standard 8.60-metre-wide cross-section measuring 1.89 metres along the edge. The deck is made of concrete post-stressed in situ.

The accesses to the bridge consist of nine kilometres of motorway and sixteen kilometres of single-line electrified railway and industrial branch lines. This includes eight flyovers, two of which are 192 metres long, two pedestrian walkways, the construction of a new international railway station for goods and alterations to the existing passenger station.

The casting facility is situated three kilometres downriver from the bridge. Occupying 20 hectares, the facility consists of two concrete plants, three segment-casting lines, six beam-casting lines, ten jacked-pile-casting lines and two kerb-casting lines. It was necessary to build a harbour to supply the navigable zone of the bridge with materials.



Bridge-building work



Aerial view of the casting facility