

# ACI Excellence Awards – 2015

## Jean Bouin Stadium – Decorative Concrete

### Project Information

Please choose the category for your project Decorative Concrete

Name of Project [Jean Bouin Stadium]

Address [20-40 Avenue du Général Sarrail, Paris]

Country France

City [ Paris]

State - Postal Code [ 75016]

Project Size (Dimensions, Area, Span) [70 000 m<sup>2</sup>]

Concrete Quantity - Volume Area Tonnage [ about 33,000 m<sup>3</sup> ]

Concrete Work Duration [ 2010-2013 ]

Date of Project Completion [ 2013 ]

### Overall Project Description

The 16th arrondissement of Paris is a residential district that includes three of the city's most important sports facilities: Roland Garros, Parc des Princes and Jean Bouin stadium.

Jean Bouin stadium, originally built in 1925, had insufficient capacity and comfort, and no longer met rugby's latest requirements for hosting and broadcasting national and international matches.

The decision was made to completely rebuild it. The new stadium officially opened in 2013 has three floors below ground level and two to six upper floor levels. It has 20,000 seats, a gymnasium, an underground car park, office spaces and business premises.

The building is covered in a 22,000 m<sup>2</sup> thin envelope of ultra-high performance fibre concrete (UHPFC) which, like a mesh on a body, reduces the physical and mental boundary between the building and its environment.

In practice, the enormous ultra-thin envelope, which undulates in three dimensions like a giant Mexican wave, is a double-curved dissymmetric structure whose complexity was only made possible by conceiving a gigantic 3D jigsaw made up of 3,600 triangular pieces.

There are 3 types of these panels, of variable heights and widths:

- Façade panels with 30% voids that allow light through
- Intermediate panels that provide a transition towards the roof triangles
- Structural roof panels

## Concrete Description

The ribbed triangular panels play to the UHPFC's natural strengths: thanks to work on the cement matrix (the dimensions and the stacking of aggregates, which limit voids to a minimum) the UHPFC's mechanical capacities are much better than those of traditional concrete, while requiring very little material – hence its very favourable environmental footprint.

There lies the whole beauty of the design, in the use of a single construction material, whereas traditional construction would require four components and as many stages on the construction site.

The 3,600 UHPFC triangles serve many purposes. They allow the integration of a maximum amount of construction functions in a single element: primary structural framework, secondary structure, weatherproofing, architectonic skin, and drainage. The primary structure, between the structural framework and the triangle, does not include any metal purlins, which are incorporated monolithically when each element is poured.

The secondary structure provides rainwater drainage (the U-shaped ribs act as gutters), the architectonic skin and, above all, the impermeability ensured by adding glass inclusions during pouring.

To accompany the deformations of the metal structural framework due to weather loads, a stainless steel connecting rod was created to provide links between the rigid concrete UHPFC panels and the flexible steel structural framework. Similarly, to avoid deformations during erection, it was necessary to design the phasing of installation with millimetric precision.

The use of UHPFC for this project is explained by a strong architectural will to obtain a concrete architectonic facing while keeping an extremely thin envelope. UHPFC is used for its intrinsic qualities of high strength and great durability. The structure is built to guarantee a lifetime of 100 years.

## Construction Team Members

### Owner

[ Ville de Paris ]

Contact Name [ Marie-Elene Borie ]

Phone Number [ 00 33 1 43 47 83 00 ]

Email [ [marie-helene.borie@paris.fr](mailto:marie-helene.borie@paris.fr) ]

Address [ Direction du patrimoine et de l'architecture , 98, quai de la Rapée (12e),]

Country [ France]

City [PARIS ]

State

Postal Code [ 75570 Paris Cedex 12 ]

**Architectural Firm** [ Rudy Ricciotti Architecte]

Company Representative [ Rudy Ricciotti ]  
Phone Number [ +33 (0)4 94 29 52 61 ]  
Email [ Rudy.ricciotti@wanadoo.fr ]  
Address [ 17 boulevard Victor Hugo ]  
Country France  
City [ Bandol ]  
State  
Postal Code [ F-83150 ]

**Engineering Firm**

[ Lamoureux & Ricciotti ingenierie]  
Company Representative [ Romain Ricciotti ]  
Phone Number [ 0951864506 ]  
Email [ romain.ricciotti@lring.fr]  
Address [22 24 rue beauvau]  
Country [ France]  
City [ Marseille ]  
State  
Postal Code [ 13001]

**General Contractor Company**

[ Léon Grosse ]  
Company Representative [ Christophe Carminati ]  
Phone Number [ +33 (0)6 07 43 43 95 ]  
Email [ c.carminati@leongrosse.fr ]  
Address [26 rue Sainte Adelaïde]  
Country [ France ]  
City [ VERSAILLES ]  
State  
Postal Code [ 78000 ]

**Concrete Contractor Company**

[ Bonna Sabla ]  
Company Representative  
[ Nicolas Yatzimirsky ]  
Phone Number [ 00 33 1 46 53 24 11 ]  
Email [ [bonnasabla@bonnasabla.com](mailto:bonnasabla@bonnasabla.com) ]  
Address [ 31, place Ronde - Quartier Valmy ]  
Country [France]  
City [ Paris la Défense cdx]  
State  
Postal Code [ 92986]

## **Concrete Supplier Company**

[ Lafarge ]

Company Representative

[ Dominique Corvez ]

Phone Number [ +1(905) 738-463 ]

Email [ Dominique.corvez@lafarge.com ]

Address [ Lafarge North America – 8700 W Bryn Mawr Ave. – Suite 300 ]

Country USA

City [ Chicago ]

State IL

Postal Code [ 60631 ]

## **Entry Submitted By**

[ Christophe CARMINATI ]

Company [ LEON GROSSE ]

Title [ Deputy Chief Executive Officer ]

Phone Number [ +33 (0)6 07 43 43 95 ]

Email [ c.carminati@leongrosse.fr ]

Address [ 26 rue Sainte Adelaïde ]

Country

City [ Versailles ]

State

Postal Code [ 78000 ]

Sponsoring Chapter : ACI Paris Chapter

Name of Chapter Contact (Name of the representative of the Sponsoring Chapter who invited the submitter to submit the entry)

[ François Toutlemonde, president of ACI Paris Chapter ]

## **Photographs**



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7




Photo 8

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François TOUTLEMONDE, president of ACI Paris Chapter,  
by order and on behalf of the applicant