

# ACI Excellence Awards – 2015

## MuCEM – Low Rise Building

### Project Information

Please choose the category for your project Low Rise buildings

Name of Project [MuCEM : Museum of European and Mediterranean Civilizations]

Address [ 7 promenade Robert Laffont ]

Country France

City [ Marseille]

State - Postal Code [ F-13002 ]

Project Size (Dimensions, Area, Span) [ 72 x 72 x 25 m, floor plans 22,000 m<sup>2</sup>, 2 access footbridges 62 + 115 m-long ]

Concrete Quantity - Volume Area Tonnage [ about 27,000 m<sup>3</sup> ]

Concrete Work Duration [ 2010-2012 ]

Date of Project Completion [ 2013 ]

Overall Project Description

As an icon of urban rejuvenation located on the banks of the 2600-year-old harbor at Marseille, France, the 3-exhibition story MuCEM building houses the first French National museum outside of Paris. It was visited by 3.4 million people during its first 15 months, much more than expected. At the end of the historic pier where immigrants from all Mediterranean countries once landed, the structure blends with the surrounding mineral and stone landscape, presenting a veiled, cubic appearance that is linked to the city with ultra-thin footbridges. Efficient, wide exhibition halls are surrounded by a sheltered climbing promenade facing the sea up to the scenic terrace.

### Concrete Description

The MuCEM represents an outstanding architectural achievement made possible with the use of outstanding concrete materials and components. The technical performances of ultra-high performance fibre-reinforced concrete (UHPFRC) were uniquely applied for the first time at such a scale for a building structure in order to widen exhibition spaces, minimize material consumption and provide shelter while allowing natural light to filter through. The exposed site (at the forefront of the shoreline), schedule and erection constraints lead to the general use of prefabricated elements and optimized casting processes in order to control fiber orientation, achieve superior durability and closeness of formed surfaces -- resulting in an astonishing aesthetic quality, both at the level of detailed perception of components and of global perception, establishing the building as a monument.

UHPFRC (dark Ductal®), reinforced by steel fibers, with approximately 200-MPa in compressive strength, is associated with signature components of the building including:

- The 330 tree-shaped columns which support vertical loads, surrounding the cubic exhibition building. The precast, 6 to 9 m-high vertical, N and Y-shaped shafts are connected to high performance concrete corbels at the floors edge, and vertically post-tensioned with non-adherent tendons from the ground level to the top of the

terrace. Hinges are provided at the junction with the floors to limit ductility demand in bending under accidental (seismic or fire) situations.

- The 380 lattice panels, consisting of 10 cm-thick 6 m x 3 m vertically cast panels that support each other for the façade. They are attached to the main structure through stainless steel, hinged bars so that thermal dilations are not restrained while horizontal loads due to wind and seismic actions are equilibrated. The lattice roof panels are just 7 cm-thick and can sustain a 1.50 m cantilever span - including snow and maintenance design loads.

- The T-shaped brackets are anchored in the upper deck while balancing the weight of 3 to 4 levels of the outer suspended footbridge. Passive reinforcement has been provided only for these UHPFRC components.

- Access to the MuCEM roof from the city through Fort Saint-Jean is provided via two UHPFRC, U-shaped post-tensioned footbridges spanning over 60 m with parapets that are just 1.80 m-high.

Within the main building above the exhibition halls, floors consist of over 230 precast, pre-tensioned rounded I-shaped beams, spanning 22.50 m, made of high performance 60 MPa- concrete. Due to their shape, fluid networks, safety, lighting and acoustic equipments can be hidden but still accessible. As an additional sign of customized use of concrete, cast-in place, white 60 MPa- high-performance concrete was used in the architectural poles of the L-shaped administrative building.

By utilizing advanced concrete science and technology in unexplored uses, MuCEM was made possible by a shared spirit of challenge, awareness (to participate in the highest building quality and beauty demanded by the site location), pride of professionalism and enthusiasm in demonstrating the local capacity of excellence. This collective technical and aesthetic success has turned to public evidence of UHPFRC as a new building potential.

## Construction Team Members

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## Photographs

Photo 1:[ general view: the MuCEM in front of Marseille shoreline ]



Photo 2:[ general view ]

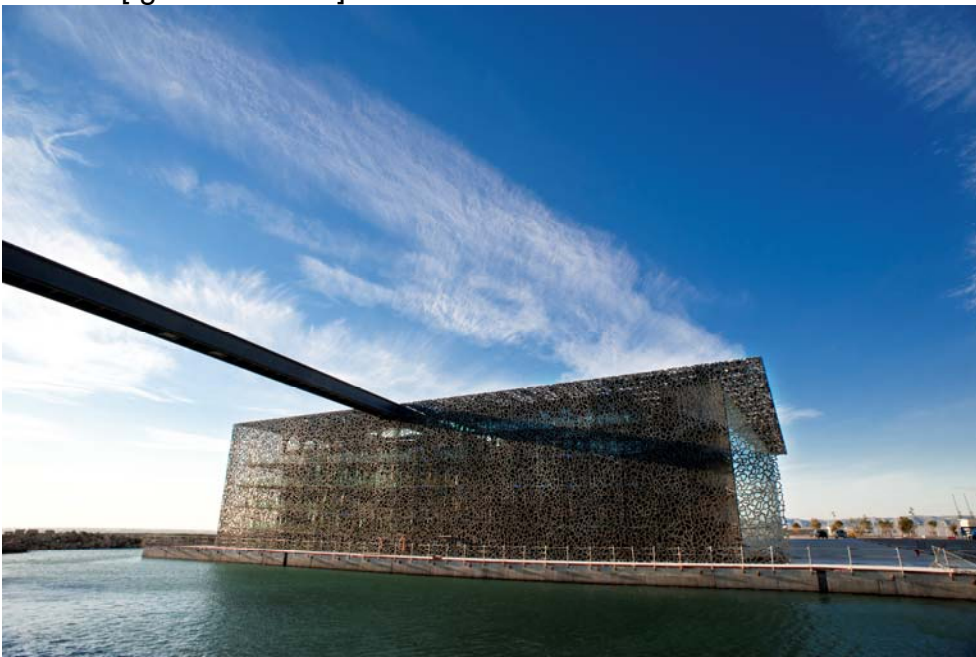


Photo 3:[ UHPFRC facings: the footbridge ]



Photo 4:[ UHPFRC glossy formed surface of the tree-shaped columns ]



Photo 5:[ tree-shaped columns and outer promenade behind the façade net panels ]



Photo 6:[ skywalk to the MuCEM ]



Photo 7:[ UHPFRC brackets and net panel roofing and cladding around the terrace ]



Photo 8:[ Exhibition hall: space and light ]





### Separate Waiver


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- Yes I agree to the terms and conditions



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