Strukton
Immersion Projects

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Underwater habitat at atmospheric pressure

Inflatable Barrier Monaco - Monaco

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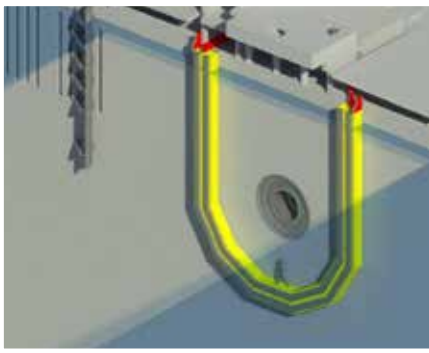
Project information

Client:	Government of Monaco, Travaux Publics
Duration:	1 year
Date of completion:	November 2016
Contract value (EUR):	€ 3.014.600,00 (excluding VAT)



Description of the activities

Design, engineering, fabrication, installation and removal of an inflatable barrier (habitat) which is to be installed for the maintenance works of the ball joint connection of the floating jetty (Quai Rainier III) in the Harbour of Monaco (La Condamine Harbour).

Details

Type:	Habitat (atmospheric)
Habitat measurements:	12.9m / 10.1m x 1.0m x 16.6m / 15.2m (L external/internal x B x H)
Installation depth:	15 meters
Structural tolerances:	within +/-20mm
Specific requirement:	strict water tightness / limited installation space / continuous movement jetty

Specific information

The 350m long floating jetty in La Condamine Harbour of Monte Carlo (Monaco) is connected to land by means of a so-called “Rotule”. A submerged ball joint of app. 3m x ø 5m which is free in all rotational directions and keeps the jetty secure to the abutment structure.

This ball joint requires decennial inspection and specialist maintenance in dry conditions. The maintenance consists among others of refurbishment of rubber gaskets and tension rods along with high accurate inspection of critical under water parts which cannot be reached from the inside of the ball joint.

In 2016 a dry cofferdam (or habitat) was designed, fabricated and installed in order to create a safe working space, which was suitable for all maintenance personnel and equipment. Part of the solution was the design and fabrication of a 10cm thick u-shaped patch concrete on the jetty end wall in order to overcome several protruding parts (shelves) and create a smooth surface for receiving the barrier. The sealing solution for holding 15m of static water pressure and waves was obtained by using double inflatable rubber gaskets mounted on the two widest edges of a steel u-shaped box structure. The seals were partly filled with water and pressurized up to 3.5 bar with air, thereby creating a watertight connection between the steel box and the concrete surfaces (abutment and jetty).

The habitat was prefabricated in manageable parts and transported to Toulon where it was assembled and tested. Installation took place in the harbour along the jetty by using a floating crane and smaller land based crane which lifted and turned the barrier as C-shape in the joint around the ball joint. The barrier was turned by using pneumatic chain hoists and diving assistance of OTN. After the barrier was turned to U-shape it was connected to the pre-installed vertical locking cylinders and horizontal cables. The installation phase was finished with successful inflation of the seals and drainage of the barrier workspace.

The atmospheric cofferdam provided a dry and safe work area for the personnel of French JV partner NFM Technologies, to carry out the required maintenance work to the ball joint. The cofferdam was able to follow the movements of the floating jetty by using an innovative interconnected hydraulic jacking system provided by Strukton Infratechnieken. Strukton Maatvoering & Monitoring has developed a real-time monitoring system showing online values like the sealing pressure, jacking pressure and stroke and various parameters inside the cofferdam. Diving works was carried out by local company Prodive with equipment and expertise from OTN.