MAXXI Museum of the 21st Century, Rome

Client: Italian Ministry of Culture, working through the Ministry of Infrastructure

Form of contract: Design & Build

Contract value: EUR 150m/£133m. The architect says this would be 10-20% lower if the project had not been subject to delays.

Size: 18 000 sqm new build, plus 2 500 sqm refurb and a car park. Total 24 000 sqm.

Out-turn cost per sqm: £5541 per sqm.

Consultants: Zaha Hadid Architects; Anthony Hunt Associates; Max Fordham

Contractor: JV between Italiana Costruzioni and Societa Appalti Costruzioni.

Programme: Contract let December 2002, completion reached in early 2009

Description

Zaha Hadid Architects won a competition to design the MAXXI museum in 1998. It’s in the north of the city, in a low-rise area that’s home to the city’s barracks. MAXXI is a brand-new institution, for which the art collection is still being assembled. It’s form is a series of sinuous concrete tunnels, interweaving on three levels. On the second and third floors, the tunnels have a “lid” of glass and steel ribs. The “tunnels” house a series of galleries, which can be reconfigured by the curators.

The project was severely delayed by stop-start cash-flow from the Italian government, which saw construction on site scaled down in 2006/7. However, work never stopped.

Design

The building draws some design inspiration from the nearby brick sheds and barracks, but is essentially a typically expressive Zaha Hadid creation. The basic volume is a snaking concrete extrusion, up to 150 m in length. These weave together, creating dramatic voids and atria where they intersect.

Visitors arrive in a dramatic entrance foyer, dominated by a steel stair that flows down from the upper levels. There are five “gallery suites” with a uniform ceiling height of 6m, apart from the uppermost gallery where the floor is set at a rake. On the second and third floors, daylight enters via a continuous glass roof, supported on deep steel trusses. These trusses also include a mechanism to display paintings or sculptures that aren’t floor-mounted – the concrete walls themselves are tipped off the vertical.

There is a limited materials palette: walls are in exposed concrete, or painted white, and the floor is reflective grey epoxy.

Construction

The contract was let on a design and build basis, when the drawings were at ‘definitivo”
stage – somewhere between RIBA D and E. ZHA was appointed as site supervisor, which meant that every aspect of the contractors design and construction that impacted on the look of the building had to be signed off by ZHA. But the contractor had more freedom on structural and M&E decisions.

While the elongated construction programme drove up costs, it also provided the opportunity for on-site testing and mock-ups for the insitu concrete. A 6m by 20m wall was demolished and rebuilt “at least ten times”, says the architect.

The original plan was to truck in the concrete from elsewhere in Rome, but as the scheme involved pouring walls as large as 45m by 7m, any delay in the concrete reaching the site would have lead to visible “elephant skin” seams. So the contractor installed a batching plant on site to ensure continuity of supply.

Because of the long spans and cantilevers, the concrete also had an unusually high level of reinforcement – up to 45 kg per sqm, compared to a more typical figure of 15-20 kg per sqm.

The concrete mix had to be “fluid” with a lot of aggregate, and dry slowly for the best finish. This meant that the team did not pour the walls during the summer months, when they concentrated on the slabs. The contractor used German PERI formwork, and the spacing and edges were pre-defined to the architects’ specifications on the drawings.

Thermal and seismic movement of the completed structure was also a problem. The architect, structural engineer and contractor devised 4 special movement joints that allows the structure to act as 5 separate buildings.

The complex roof involved 2 full-sized mock-ups – for air-conditioning and lighting - at the contractor’s workshop in North Italy.

**Gianluca Racana, project architect, ZHA:** “The contractors saw [the MAXXI] as a showcase of their technology, so they were possibly more willing to explore new solutions with us. [Stretching the programme] did not have any repercussion on the quality of the building. It was a major major public tender, so it was a safe contract – even if the money came slowly, there was never any danger of the site stopping.”

“I think this would have been built more quickly in England, the UK construction industry is more advanced compared to Italy. No major public buildings have been built in Italy in the last 20 years, the majority of work is refurbishment of heritage projects. Sometime we had to look abroad for specialist sub-contractors [as they don’t exist in Italy] - Zumtobel for the lighting, PERI for formwork. But for a project of this size, it’s normal to be international.”

**Sustainability**

The building conforms to all relevant Italian legislation on energy efficiency, and calculations by ZHA in 2002 show that “the predicted heating energy usage for the MAXXI has the potential to be considerably better than the limits set by the law for a typical building of this type”.

The concrete construction gives good air-tightness, and the building is fitted with a high efficiency heat recovery air-handling system, and efficient condensing boilers. CO2 sensors minimise the quantity of incoming fresh air that needs to be heated. Air-handling plant for the displacement air-conditioning system was positioned close to each gallery in order to reduce the need for major horizontal ductwork and reduce fan energy.

The galleries have a carefully designed external fixed shading system [the steel ribs] oriented to the south, adjustable external active louvers, as well as internal roller blinds to cut down on radiant energy and create lighting conditions for 50 to 200 lux. The artificial lighting is on a sophisticated control system.

**Gianluca Racana:** “Sustainability targets are coming more slowly in Italy than the UK. But even if [BREEAM or similar] certification was not requested, it’s very efficient in energy consumption.”