

Meccano-man with a message



When award winning engineers, Arup drew structural smarts for a steel sculpture by a world renowned British artist from iconic builds they developed for the 2008 Olympic Games and the like, a local fabricator was up to the challenge of bringing it to life in Sydney.

The sculpture for exhibition at the Anna Schwartz Gallery at the old CarriageWorks in South Sydney comprises approximately 1050 solid 150mm balls (weighing 15 kilos apiece) and 1800 of 75x3SHS (square hollow sections) and measures 20 metres long by 13.5 metres wide and 8.5 metres high – all up weighing about 25 tonnes.

Firmament IV by world renowned British artist, **Antony Gormley** is an all-steel artwork, yet of human dimension as like many of his works, takes the human body as its subject and attempts to treat it not as an object, but a place.

Arup's **Alex Edwards**, said that while the structural analysis was not so complicated, it entailed complex geometry that required

consistent communication between the artist, fabricator and engineers.

"The artwork comprises almost 1100 connector balls and many more square hollow sections of varying lengths," he said.

"Geometrically the principle is similar to the Watercube in Beijing that Arup also engineered. The structural design on this job was done by adapting software (Oasys GSA) developed in the UK which was provided to the fabricators, C&V Engineering.

"And whilst the structure rests on the ground, it had to be made to withstand people climbing through and interacting with it up close."

General Manager of C&V Engineering, **Mario Pizzolato** regards it as one of the most challenging projects the company has ever taken on board.

"We got the original brief from a client we built some 63 metre-long triangular trusses for and the Gallery was seeking someone with this type of experience," he said.

"Next we were provided with some artist impressions with basic dimensions, but seeing those drawings was a spectacle - we were staring at one of the most complex builds our company had ever priced and was about to undertake."

He said that compared to all the other challenges they faced, transport was "massive".

"We basically built each bubble off-site and broke them down for transport reasons," he said.

"We had to take into account the site entrance, minimise wide loads and plan the structure so it could be pulled apart as efficiently as possible.

"To put the works into perspective, we had to build in some cases bubble-like 'polyhedra' which were five metres in size across all three planes. We then had to cut this into quarters ensuring we could drive through the site entrance.

"Bearing in mind that every piece was unique in its own way, we propped every ball using simple X, Y and Z coordinates and then went back to 'kindergarten basics' to join the dots with the SHS members"

"Since the SHS was Grade 350, we ensured that the balls were that grade too which made welding easier and could maintain quality.

"The steelwork was going to remain untreated which made fabrication quite difficult as we had to minimise tacks and temporary bracing as this would have left a shiny silver mark upon removal."

That posed another hurdle as propping was heavily relied on during the fabrication process.

"Bearing in mind that every piece was unique in its own way, we propped every ball using simple X, Y and Z coordinates and then went back to 'kindergarten basics' to join the dots with the SHS members," he said.

"Prior to the build there were concerns of the heavy structure collapsing on itself, but Arup's assistance was invaluable in providing a test procedure so we could destructively test a few samples to ensure that the completed product was fit for public exhibition."

At project peak, C&V Engineering had 17 to 20 men in the workshop building the bubbles and another six to eight onsite putting it together.

"Once the balls arrived it was built and delivered within three weeks, but the most impressive part of this project was that after assembling almost 3000 parts in record time, we checked the overall length, height and width and it was within a 20mm tolerance," he said.

"That's pretty much a perfect build."

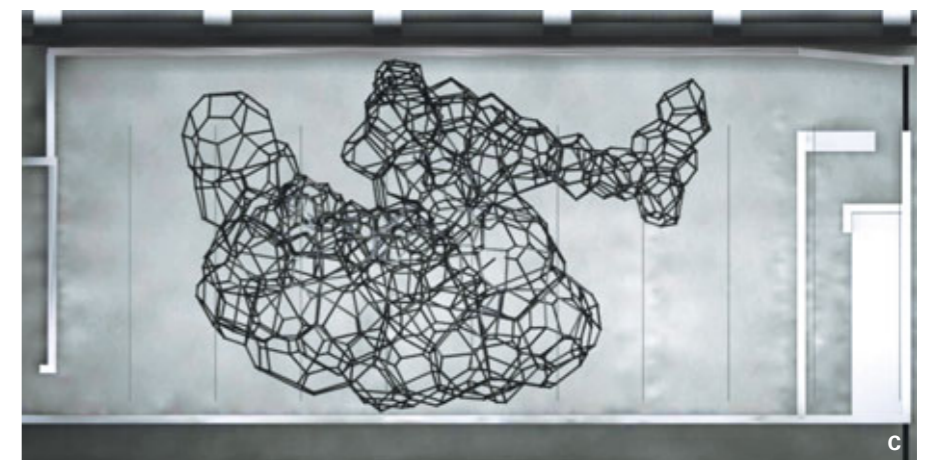
PROJECT TEAM

Client: Anna Schwartz Gallery

Artist: Antony Gormley Studio

Structural Engineers: Arup
Tristan Simmonds

Steel Fabricator: C&V Engineering Services



Images A, C and D Courtesy of Anna Schwartz Gallery, Sydney, Australia

Photograph by Paul Green, Sydney ©The Artist

Image B Fabrication view. Photograph by C&V Engineering Services ©The Artist