AWARD

EXPOSURE, LELYSTAD

ARTIST:	ANTONY GORMLEY STUDIO
STRUCTURAL ENGINEER:	HASKONING NEDERLAND BV
STEELWORK CONTRACTOR:	HAD-FAB LTD
MAIN CONTRACTOR:	HAD-FAB LTD
CLIENT:	MUNICIPALITY OF LELYSTAD

Exposure is based on Antony Gormley's own body and stands 25.6m high. The initial shape was created when the artist was covered in plaster of Paris and removed from the shell when the plaster had set. This shell was surveyed by Cambridge University who produced an electronic 3D wire model. This model was then used by the engineers for the project to refine member locations to Gormley's instructions. The design was then imported directly onto the steelwork contractor's detailing package. The process of the transfer from design software to the detailing package was breaking new grounds as it had never been done before with such a complex project.

With such a detailed and precisely engineered project a web viewer tool was used to provide the engineer with 3D details of the nodes so that he could confirm that the construction met his design requirements. The detailing process took approximately 12 months to complete.

The web viewer tool was also essential in the fabrication process to gain the true angles of members as well as rotational and other important dimensional checks. It is safe to say that this project would not have been possible just 10 years ago, however with the advancement of modern CAD technology and direct links with CNC fabrication machinery the project was executed using detailed CAD information by interrogating the model using the laptop on the shop floor.

The sculpture is constructed entirely from steel angle profiles. Every angle member is a different length and produced from steel sections ranging from 60mm x 60mm to 200mm x 200mm. Once the angles were punched and sheared to length then the highly skilled and labour intensive shaping of the sculpture began.

Full size paper templates were used to achieve the extremely complex cuts and shaping of the member ends. The welded nodes were produced from randomly

rotated angles all joining together on the neutral axes of each member and, more importantly, having full member cross sectional area connection into the node.

The sculpture is made up of 547 nodes, the largest of which are the heart node, weighing 280kg and the brain node, weighing 56kg. The heart node has 29 individual members joining together in the centre. Producing these 2.5m diameter nodes was extremely time-consuming and complex. The nodes meet together to form locating points around the structure which were bolted in position.

Conventional 2D drawings were not suitable for communicating the fabrication information needed by the shop floor team. If a true view is made in 2D then there are no other members on the same plane that could be dimensioned on that true view. It is truly a 3D project that very unusually had to be manufactured on the shop floor in 3D (it would be more usual to produce pieces in the shop and then produce the 3D structure on site when it is erected).

The main key to achieving the project was the node building jig that was developed by the steelwork contractor. This is a 3m diameter ring pivoted top and bottom with graduations at every degree on the base and a clamping system around the ring. This allowed for a main member to be held in a fixed position to the centre of the ring and then members could be accurately added at any position within a complete sphere (anywhere in the world).

A total of 32,000 holes were punched or drilled in the angle profiles and the total weight of the structure was 60 tonnes.

The galvanizing of the structure, particularly the nodes, also posed some challenges. Venting of the nodes was impossible at the detailing stage as the expertise of how to hang the nodes to gain the best coating was impossible to visualise. Whichever way the node was dipped air pockets formed restricting the coating integrity. The galvanizers used an ingenious way of dipping each node into the bath on two wires and then releasing one wire while the node was in the bath, which then allowed the node to rotate and vent the air pockets, resulting in a fully galvanized node.

This is a one-off structure which epitomises the way software, machine technology and manual fabrication techniques can work together. The challenges of the design, detailing, equipment performance and quality fabrication have been extensive.

JUDGES' COMMENT

A remarkable structural steelwork sculpture inspired by the artist's own crouching body.

The immensely complex arrangement of hundreds of galvanized angle sections, precisely as required by the artist and structural designer, was fabricated in modules for transport and erection. The challenge facing the steelwork contractor was enormous.

This exciting work became a 'labour of love' for the whole team, who have achieved a high profile tour-de-force.