CASE STUDY

Qualifying accuracy & integrity of complex steel structure

The Mass Transit Railway Corporation (MTR) and the Hong Kong Government are constructing the world's largest, underground, high-speed train terminus in Kowloon - an urban area within Hong Kong. The West Kowloon Terminus will connect Hong Kong to major cities in Mainland China and will consist of 15 platforms and an iconic roof top structure. The roof top structure is an intricate masterpiece of engineering, formed from three geometrically complex lattice trusses supported at only nine locations by 30 metre high, curved steel columns.

The Challenge

Manufacturing, installing and erecting the complex structure in a timely and cost effective manner

The steel design of the roof structure was based on a pre-cambered 3D model created by a sub-contractor who supplied the model to different manufacturing plants in Thailand and China. The client's main concern was achieving the required tolerance and accuracy of each piece of steel so that the pieces would fit together seamlessly. This presented numerous challenges:

- The two manufacturers each had their own team of surveyors and survey metholdogy for checking the steel structures. The company installing and erecting the roof on-site in Hong Kong also had thier own surveyors & methodology - resulting in three different survey methodologies for checking the manufacture, installation and erection of such a complex steel structure, and
- Temperature differences in Thailand, China and Hong Kong would also affect the tolerance and movement of the steel.

The Solution

Standardised survey methodology across all survey teams

AAM completed a survey audit and a full review of the survey techniques used in the verification of the major steel elements during the manufacture of the steel structure, including the main trusses, columns and colun heads. AAM also reviewed the methodology proposed for the connection of the structure's elements in their correct locations onsite.

- AAM proposed a survey methodoloy to ensure the steel elements met specifications in regards to length and geometry and that interfaces of critical elements were within tolerance. We recommended that First Principle and Best Practice Survey Methods be undertaken for the installation of the steel in Hong Kong and at the two fabrication sites in Thailand and China.
- Checklists, comparable asbuilt reults and survey methods were standardised across all three countries.
- The results of AAM's audit confirmed that a working accuracy of 5mm was the only practical and realistically achievable result due to the complex nature of the steel and the temperature differences across all three locations.

The Results

Confidence and peace of mind during the planning and coordination of the installation and erection of the roof

An audit report was completed, based on observations taken from site visits to Hong Kong and the fabrication yards in Thailand and China, as well as the information received from both manufacturers and the subcontractor. This report was verbally presented to all relevant parties including MTR and upon completion, bound copies also given. The audit report provided the following benefits:

- Confidence that the steel structure would fit together once delievered onsite and its installation and erection commenced;
- The ability for the client to pre-plan optimal crane locations and allocate accurate numbers for additional staff for the erection phase of the roof; and
- Savings in time and resources as the accuracy achieved from the survey audit ensured that rectifcation works were not needed.

To find out more - email info@aamgroup.com

The iconic roof of the West Kowloon Terminus and its complex steel structure.
Image captured onsite, during the installation and erection of the steel structure in June 2017.