

# ACCURATE PLANNING AND INSTALLATION OF GIRDERS

The combination of sophisticated software applications and lifting innovations were used for the first time on a project globally to accurately plan and install steel girders.

The combination of sophisticated software applications and lifting methods were successfully used to accurately plan and install steel girders. The high accuracy achieved during planning eliminated both the need to bring the load back to the ground, reducing rework and the need for workers to be located close to the load.



Live survey monitoring during installation of steel girder

## The Situation

Construction required 465 main beam lifts, including single girder, on-ground combined/spliced girders and steel portals, ranging in weight between 3 and 500 tonnes. These included complex lifts constrained by water, road or rail, with limited access and time constraints due to occupation periods.

During high complexity steel girder installations, on ground steel rectification and rigging adjustments can be required in order to compensate for variables such as thermal changes and differences between design and actual weight measurements within fabrication tolerances. If the girders do not line up, the girder must be grounded again, and the rigging length manually adjusted.

Standard methodology exposes surveyors and riggers to potential safety risks, due to required physical proximity to the suspended load and during any on ground rework.

## The Solution

Models of each girder were developed using 3D Finite Element Analysis (3DFEA) software. During fabrication, weight data and surveyed deflections were fed into the model for calibration. CPBJH provided calibrated load cells to the steel girder and portal fabricators to obtain measured weights and centres of gravity and eliminate uncertainty when planning the lifts.

The accuracy of modelling resulted in only very minor adjustments needing to be made during the lift to line up the girder angle with the previously installed girder splice face. This allowed for SyncHoist rigging equipment to be used which adjusts the rigging length mid-air. Magnetic prisms were pre attached to the girders before lifting and SpatialAnalyzer software used by the survey team to monitor the lift in real time.

## Benefits and learnings

This process has been successfully used on girders and portals. The accuracy enabled the girder to remain secure for the entirety of the lift through to final load release.

The survey team monitored lifts from a safe distance. Adjustments of rigging using the SyncHoist eliminated the safety risks associated with surveyors, riggers and other workers in proximity to a suspended load and during any on ground rework.

The requirement to work in tight restricted spaces around the installed girder was minimised by knowing the exact installation requirements. Teams could focus on specific areas, eliminating delays associated with rework during occupations.

## Cost Benefit

The estimated cost to resolve a girder not fitting into position is approximately \$350,000.

This method eliminated the need to perform a series of pre-shift checks, taking 3 to 4 hours, which generally requires an extra shift.

Total saving estimated at approximately \$11 M.

**Program Office:** West Gate Tunnel Project  
**Work Package:** East Zone  
**Principal Contractor:** CPBJH

**Solution Vendor:** 3DFEA software, Spatial Analyser (SA) software, SyncHoist  
**Contact:** Cain Ewin  
 0419 868 895  
 cain.ewin@wgtp.com.au