

Case Study: Structural Steel Fabrication

Farringdon Station Redevelopment

Recommendations for future projects to improve the structural steel fabrication and installation processes

Structural steel fabrication and installation on the Thameslink Programme

Bourne Group had a long relationship with the Thameslink Programme as they were appointed the structural steel contractor at both Farringdon station, Blackfriars station and London Bridge station.

Their work at Farringdon lasted three years and included heavy structural steelwork; in particular Bourne Group fabricated and installed the new station roof.

Other structural steelwork at Farringdon included:

- The new London Underground ticket hall on Turnmill Street.
- The new ticket office and the refurbished entrance on Cowcross Street.
- The new staircases down to platforms.
- Underpinning and strengthening work in the tunnels.
- New modular train shed roof trusses.

The Farringdon challenge

The new ticket office structure had a very high tonnage and so the steelwork had to support between 500 and 1000 tons. The steelwork was largely installed adjacent to and over the live railway and so there were a lot of track possessions required which affected both Network Rail and London Underground's operations.

Before arriving on site, a lot of the steelwork had to be shipped around the country to have cast concrete added which added to the complex logistics. Each time the pieces of steel were moved, a large and co-ordinated engineering exercise was required to enable the trusses to be delivered to their final craneage and installation points on the structure at the perfect moment. Over many night-time lifts Bourne Group gradually formed the structure that the ticket office now sits on.

Farringdon Station's new roof

The new train shed roof was the biggest challenge for Bourne Group at Farringdon. The existing arched Victorian roof was to be extended and so the new section had to be built over the live railway lines. These lines would need to be kept open during the construction period.

The new roof was too large to try out the assembly in advance offsite. The huge curved trusses were manufactured in pairs but once on site, they could often only be installed one at a time per night during track possessions, so there was no room for error. As each curved truss weighed from 12 to 18 tonnes, it was paired up offsite as a pre-installation trial to ensure it would fit once on site.



A tight squeeze

The station's space limitations also meant parts of the roof had to be prefabricated in sections that were cladded, glazed and assembled off-site. This required very clear and informative communication between the various suppliers before the manufacturing process began.

The key for the success of the installation was the trial assembly off-site. At the factory, there was a moving bed in the yard which allowed the trial assembly. The company first manufactured one big curved truss and placed it in the moving bed. This was followed by the next one to ensure they would fit together.

The first one was then moved away to be painted by a specialist painter to Network Rail's specification. This also involved complex transport logistics before it was brought back to be cladded. By that time, the third section was manufactured and ready to be trial-fitted with the second one. This process was iterated with each new piece passing through the pre-assembly process which gave the team confidence that every piece would fit once they reached site.





One lesson from Farringdon – Design for constructability

A big problem encountered by Bourne Group was that the original design of the roof could not be built within the site's layout as per the design due to space limitations, access and possession times. After discussions between the designers and the contractors, the design had to be changed to achieve constructability which brought further time pressure.

A lot of extra space had to be found off-site for pre-assembly trials and with time pressures already high, this added unexpected pressure on the team. Against all odds, the finished roof structure was completed on time.

Author

Case Study produced by Howard Cox, Bourne Group, February 2019.

Further information

For more information on this Learning Legacy case study please email contact@thameslinkprogramme.co.uk