London Victoria Structural Assessment

Frankham Consultancy Group were appointed to carry out the Inspection for Assessment (IFA) and a Level 1 Structural Assessment of London Victoria Station's Western Concourse trainshed roof, to determine its current load carrying capacity, whilst taking into consideration the current condition of the structure.

Client:
Network Rail

Services:
**Inspection for Assessment
Drone Survey
Level 1 Structural Assessment
STE5 & STE2 competency
Engineering assurance: CRE
(Assessment) competency**

Start and End Dates:
Oct 2023 – Jan 2024

Overview

As part of Network Rail's process for safeguarding the railway, structural assessments of assets are undertaken periodically to preserve and protect this heritage, while ensuring the safety and integrity of the station for future generations. London Victoria Station is a gateway for millions of tourists and commuters annually, facilitating access to iconic attractions like Buckingham Palace, and major transport links such as London Underground and Victoria Coach station.

The station was built in two halves in the 19th century by rival railway companies, and is an example of Victorian infrastructure that has survived two World Wars. The Western, or 'Brighton side' of the station, rebuilt in 1898-1908, was integrated under Southern Railway in 1923, into the London Victoria we know today.

The IFA collated visual and measured data using tactile inspections via Mobile Elevated Work Platforms (MEWPs) and drone surveys, which informed both the condition report to support Network Rail's maintenance plans, and the Level 1 assessment. The Level 1 Structural Assessment comprised analysing two dimensional (2-D), elastic models of the roof and calculating the utilisation of the members.

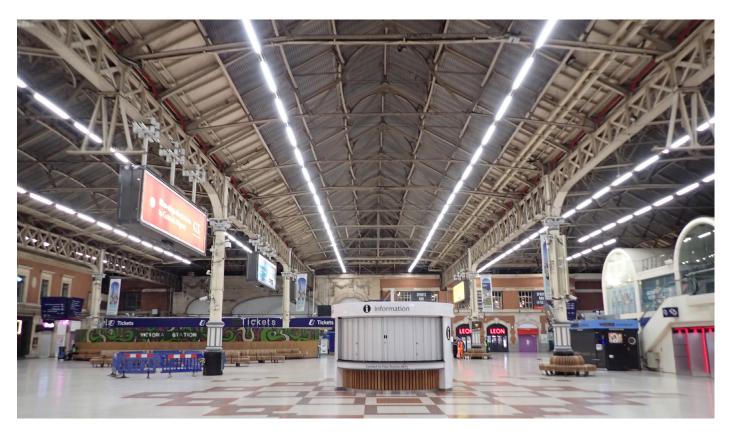# Knowledge Sharing & Project Development

Frankham clearly stated the objectives, scope, and methodologies of the assessment to align with and manage the client's expectations.

The previous assessment was reviewed and used as a reference for comparison of dimensions and other details recorded during the IFA. Logistics for conducting the IFA; the best way to capture all the information required for the expanse of roof and how busy the station is were considered.

Once the IFA was complete, reported and recommendations had been made, the information was harvested to build the models to represent the main structural components of the roof. Information was verified, and any gaps identified were closed by referring to archive information, drone survey recordings, and cloud point data taken by the drone.

The methodology for the Level 1 structural assessment was straight-forward. 2-D, elastic models of the roof (broken down into transverse, triangular trusses and longitudinal truss girders spanning between columns) were built and loaded in a structural analysis programme. The rigour arises in assessing and applying the loads appropriately and in recognising the limitations of this type of analysis, assessing how sensitive the structure is to simplifications, and when the structure will benefit from further assessment.

The reports generated via the software installed on tablets in real time, were organised and comprehensible. We were therefore able to share them fairly swiftly with the client on a weekly basis, so that the client was getting early and progressive sight of the condition of the roof, long before a final report of findings and recommendations.

Challenges

London Victoria Station is one of the busiest railway termini in the city, serving millions of passengers annually. The inspection was conducted without disruption to daily operations, requiring meticulous planning to ensure commuter safety and maintain transportation services.

Navigating around the London Victoria West Concourse Station roof was a challenge as the structure has large roof trusses and a canopy with an overall length of 85m and width of 70m, reaching heights of up to 25m above concourse level.

Sustainability

By conducting these condition surveys and assessments for National Rail, we enabled National Rail to make decisions on the protection and continued, safe use of these historic assets, well beyond their original, intended, design life. This is sustainable asset management – appropriately eking out the life of these structures.

Innovation and Added Value

Areas of the roof were identified as suitable for 'touch survey' from MEWPs. To provide efficiency and speed of reporting, data from this part of the IFA was conducted using innovative software on tablets on site. This advanced tool facilitated the systematic recording of every identified defect on each truss, precisely noting its location and corresponding structural element.

The utilisation of the form filler software not only streamlined the inspection process, but also significantly reduced the post-inspection workload. The software had a function of automatic report generation at the end of each inspection shift, thus minimising the hours traditionally spent in the office compiling data.

The remainder of the roof was video surveyed using drones. Drones provided a versatile and agile platform for capturing high-resolution images and data from locations that were challenging or unsafe for manual access with a MEWP. Additionally, we were able to record point cloud data for the entire roof; effectively developing a dimensional survey of the whole of the Western Concourse roof.

Our approach enhanced the speed and accuracy of the assessment and exemplified our commitment to leveraging innovative technologies and an efficient and productive workflow. This enables the successful evaluation and preservation of historical structures like the London Victoria Station Western Concourse trainshed roof.