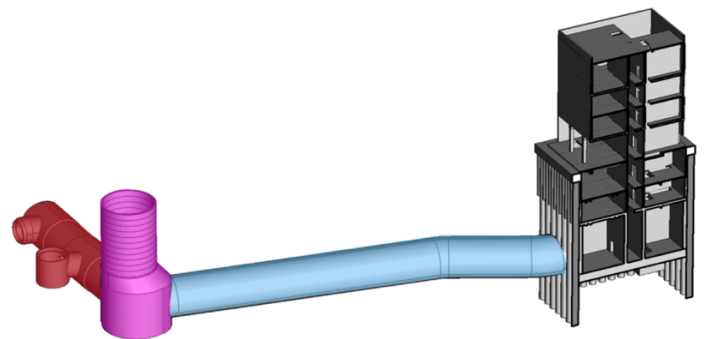


## Category 3 Check of LU Euston Station Replacement Substation, Ventilation Shaft and Tunnels HS2 Ltd.

<b>Location:</b> Euston, London
<b>Date:</b> Design 2019-2020 Construction 2020-2021 (planned)
<b>Structure:</b> Temporary Construction Shaft (pre-cast concrete segments, SCL), SCL Tunnels, Ventilation Shaft
<b>Length:</b> SCL Tunnels approximately 85m in length.
<b>Cross-Section:</b> SCL tunnels approximately 6.5m in excavated diameter.
<b>Geology:</b> London Clay and Lambeth Group
<b>Cost:</b> Est. £300 million
<b>Client:</b> Mott MacDonald
<b>Owner:</b> HS2 Ltd.

Gall Zeidler Consultants (GZ) has been commissioned to undertake the Category 3 Check of the design of a new London Underground Substation/Vent Shaft, Temporary Construction Shaft and associated Tunnels. The CAT 3 check comprises independent reviews, checks and check calculations of the detailed design (RIBA 4 stage) relating to the tunnel, substation/ventilation shaft and construction shaft and analysis of the structures.



**Figure 1:** 3D model image of the construction shaft, tunnels and ventilation/substation shaft structural elements. (Source: Mott MacDonald)

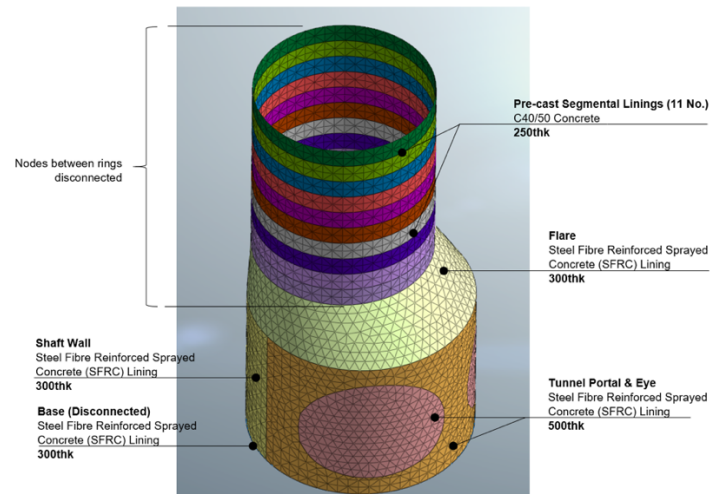
### Category III Check Design Services:

As part of the High Speed 2 (HS2) Euston Station enabling works, this project involves the construction of a replacement ventilation/substation shaft and associated tunnels including a temporary construction shaft.

The SCL tunnels connecting the new vent shaft with existing LU infrastructure will be formed with two linings, a fibre reinforced sprayed concrete primary lining and a cast-in-place concrete secondary lining. The tunnels will be constructed in advance of the main HS2 works and the tunnel vertical alignment allows for future excavation of the station box above the tunnels.

The temporary construction shaft is required to facilitate the construction of the tunnels and consists of 8.2m diameter segmental lining constructed to a depth of 11m, followed by SCL which flares out from the segmental lining to a diameter of 10.25m. The shaft forms a chamber from which the two tunnels are connected.

The ventilation and substation shaft will form a new multi-storey building housing LU equipment spread across five floors. The shaft will be constructed using secant pile walls and a bottom-up construction method with a footprint of 20m (W) x 20m (L) x 20m (D).



**Figure 2:** GZ developed a fully staged construction 3D finite element (FE) model for the analysis of the temporary construction shaft. (Source: Gall Zeidler Consultants)