2.0 Existing Structure

2.1 The site is located in West Ham, London and is understood to have been constructed in 2008. It is composed of two wings, East Wing and West Wing. The proposed works are to be located within the East Wing only.

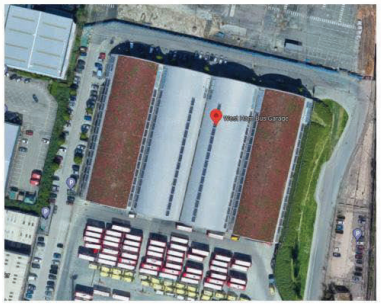


Figure 1 – Site location

[redacted]

2.2 As-built structural drawings, dated 2009, prepared by Arup have been made available to CCL. The drawings show the structure to be of steel framed and cross laminated timber construction to the main superstructure, steel framed offices areas, with a suspended reinforced concrete ground floor level structure in turn supported off a steel frame onto a main reinforced concrete founding level floor plate, in turn all supported off piled foundations. Relevant drawings are included in Appendix A of this report. Structural calculations relating to the design of the original structure were not available to us at the time of writing this report.

2.3 According to the structural specification provided by Arup titled *"TFL Bus Garage – West Ham: General Structural Clauses Issue 1"*, the existing structure has been designed to British Standards as opposed to the more current Eurocodes.

clancy consulting
Job No.: 2/10838
Rev: 00

Existing Suspended Ground Floor Level Structure

2.4 According to Arup drawing 121437-S431-C2 (see Appendix A), the ground floor is suspended on secondary steelwork with steel columns at 3m centres that support steel beams supporting 50mm thick precast concrete floor planks with a 150mm thick concrete structural topping. Refer to Figure 3 for a plan arrangement of steel work.

[redacted]

Figure 3 – Extract from Arup drawing 121437-S431-C2 showing plan of steelwork and concrete floor planks span

2.5 The structural maintenance pit floor level to suspended ground floor level is approximately 1.5m in depth and which is accessed via stairs down from the suspended floor. The purpose of the existing maintenance pits was to allow maintenance to the underside of buses. The line of the bus wheels would approximately coincide with the location of the 203 UC 46's beams provided around the perimeter of the maintenance pit.

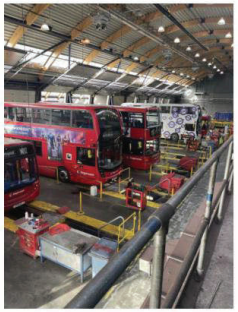


Figure 4 – Photo of buses positioned above maintenance pits to the West Wing. Taken during CCL site visit.

2.6 A recess formed of a 200x75 PFC fixed back to the 203 UC 46 beams and the 254x146 UB 31 at the column locations has been provided along the long edges of the pit – refer to Figure 6 for the structural as-built detail. The purpose of this recess is to support a jack that is understood to be a "20 Tonne manual twin ram commercial pit jack" by Autolift Ltd. Refer to Figure 6 for a photo of the jack. From our site visit, it appeared that there was one jack provided per maintenance pit.

Figure 5 – Extract from Arup drawing showing recess detail at edge of pit

Figure 6 – Photo of jack within maintenance pit. Photo taken by CCL during site visit.

2.7 According to the Arup drawings, the secondary steelwork is founded on 400xmm x 400mm x 105mm high concrete plinths on a 300mm thick ground bearing slab reinforced with 12mm diameter reinforcement at 200mm centres top and bottom. The as-built information does not prescribe an allowable ground bearing pressure.

Figure 7 – Section showing support of maintenance pit columns extracted from Arup drawings

2.8 Lateral stability of the suspended ground floor structure is understood to be provided by 60.3 x 4 CHS bracing elements provided vertically. The precast planks may also be providing stability to the frame by providing horizontal 'floor plate' action.

3.0 Loading Assessment for Proposed Maintenance Pit Infill

Loading Assessment Methodology

3.1 As part of our feasibility study, we have undertaken a loading assessment to compare the existing and proposed loading from the proposed infill of the maintenance pit and the racking loads. The purpose of this is to highlight, at a high-level, where infill proposals may cause possible increases in loading beyond the existing and as such strengthening and / or further investigation works may be required to justify structure.

3.2 CCL have not been provided with the racking loads and so we have made assumptions as to the proposed live load requirements that will be imposed by the storage of the lost and found items.

3.3 The Arup as-built drawings within the health and safety file have allowed us to confirm the structural member sizes and their capacities for the proposed infill loading. However, the Arup drawings do not confirm the bearing capacity of the soil under the ground bearing slab. Furthermore, even though the jacks (see Figure 6) within the maintenance pits are rated to 20 tonnes, and the foundations may have been designed to accommodate this load to some extent, without confirming the load combinations showing the simultaneously acting jacking load and the imposed load that the foundations have been designed for, we are not able to confirm that the foundation slab structure has been designed for the full jacking load when assessing the existing loads that are to be compared with proposed loads. As such, we have chosen to undertake an assessment of the existing loading on the foundation to not include the loading from the jacks and which, in our opinion, is conservative.

3.4 Based on the above, the load assessment for the proposed infill works will check the following: -

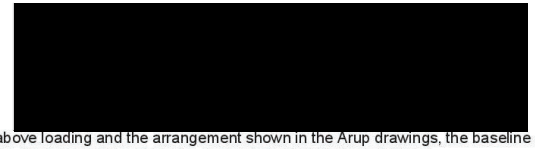
a) Check on the existing steel members with proposed loading – we are of the opinion that a check on the 203 UC 46 beams is sufficient.

b) Comparison on assumed existing loading on foundation slab with proposed loading.

Existing Foundation Loading Assessment

3.5 According to Arup drawing 121437-S431-C2 (see Appendix A), the existing suspended ground floor is designed for an imposed live loading of 7.5kN/m^2.

3.6 Existing applied loads are as follows: -



3.7 From the above loading and the arrangement shown in the Arup drawings, the baseline foundation load that the proposed works are to be measured against are as follows: -

Possible Savings in Structural Capacity due to Proposed Loading

3.8 The composition of the lost and found items is expected to vary significantly, from bags, jewellery, mobile phones, documents, etc. According to the TfL Lost Property Office transparency data (https://content.tfl.gov.uk/lost-property-office-transparency-data-fy-2019-20-21.pdf), approximately 115,000 items were found across the TfL network during 2020. As such, the density and weights of stored items do differ – see Figure 8. Due to the change in use from bus imposed loads to storage of lost and found property items, we would assume [to be confirmed by TfL] a reduced live load

allowance of **5.0kN/m²** is adequate on the existing floor slabs. Therefore, there is a minimum additional 2.5kN/m² capacity within the existing structure to accommodate overall load changes.

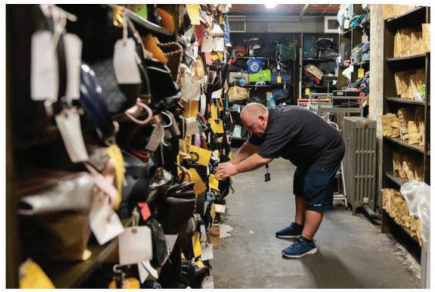


Figure 8 – Photo from within a TfL Lost Property Office showing the storage of lost property items (source: https://londonist.com/london/transport/tfl-s-famous-lost-property-office-is-moving-to-south-kensington)

3.9 Furthermore, as the original structure was designed to British Standards, additional capacity in the structure can be found by assessing proposals with Eurocodes load factors. See below a comparison of the load factors between the two standards.

	Dead Load	Live Load
British Standards	1.4	1.6
Eurocodes	1.35	1.5

3.10 The load increase from the proposed works will be calculated assuming 5kN/m² live load on the existing structure as well as the on the proposed infill. The dead load from the proposed infill will also be accounted for in the load comparison. Furthermore, we have allowed for an additional 0.15kN/m² nominal services loading on the infill.

4.0 Options for Infilling Maintenance Pit Openings

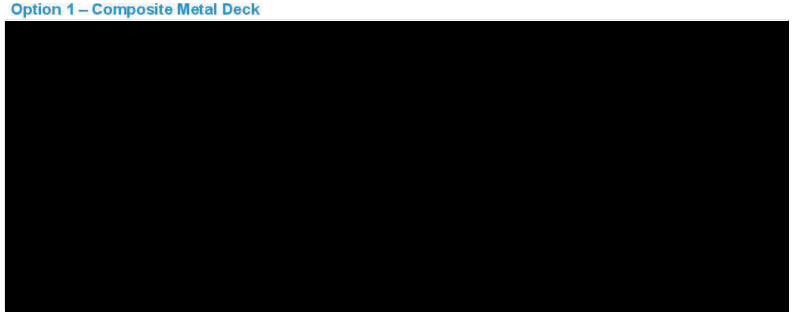
4.1 The proposed potential infilling options have been proposed based on the following criteria: -

- Top level of the new infill slab can be made to match the existing suspended floor slab with minimum modification to the existing structure such that a flush finish can be achieved to facilitate travel of trolleys, etc.
- Relatively lightweight floor construction to not overload existing structure and foundations.
- Capable of supporting proposed 5kN/m² live load from the lost and found property items that are to be stored.
- Ease of installation.

4.2 Pros and cons are listed for each of the options. We have not undertaken a costing exercise for the options.

clancy consulting Job No.: 2/10838 Rev: 00

Option 1 – Composite Metal Deck



4.3 This option proposes the use of a composite metal deck across the opening that is supported off the existing PFC at the edge of the maintenance pit opening. The composite deck is composed of a 0.9mm thick corrugated steel profile of which is filled with concrete that can be power floated to achieve a flush finish with the existing flooring. The concrete will be reinforced with a A193 mesh.

Pros and Cons

Pros

No temporary works needed for installation of composite deck as the steel work will effectively be the formwork.

Concrete can be power floated to achieve a flush finish and so no additional screed is required.

Simple reinforcement arrangement.

Quick installation, all deck can be laid, and concrete poured in one go (subject to access constraints for concreting)

Weight of the 0.9mm thick 900mm wide x 1250mm long steel component is approx. 10kg and so lends itself to being easily handled around site.

Flexible slab depth that can vary from 120mm thick to 200mm thick and so there is more flexibility in working around the existing structural elements to achieve floor levels.

Openings up to 300mm square for services etc. can be introduced with no additional reinforcement requirements.

Can achieve a minimum 60-minute fire rating without modification.

Cons

No significant disadvantages for this option.

Load Assessment – Check capacity of 203 UC 46

4.4 The 203 UC 46 was assessed as capable of supporting the proposed infill and the existing infill with the 5kN/m² imposed loading. As such, this option would be possible without any strengthening of the existing steelwork.