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ISBN 978-0-7277-6341-9

<https://doi.org/10.1680/cpidc.63419>

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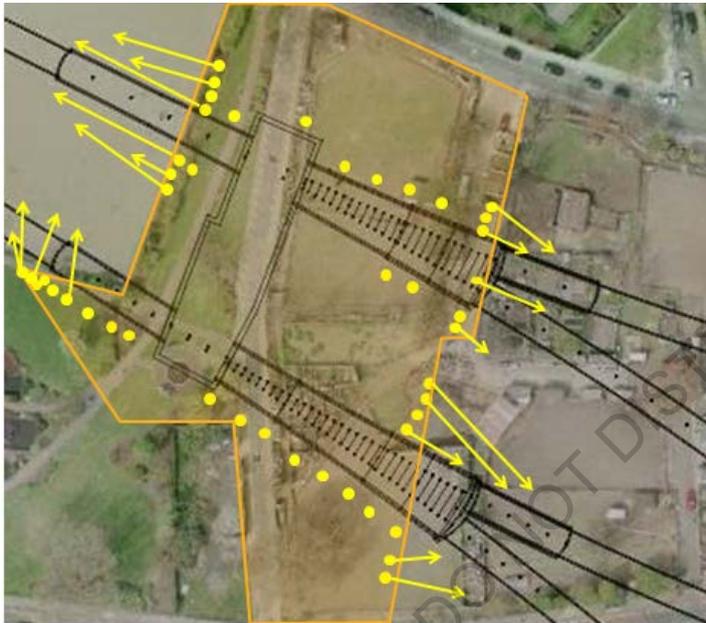


Figure 3 - Plan view of Stepney Green site showing the location of surface ejector wells ^[2]

Crossrail works at Stepney Green

Overview of works

The eastbound and westbound SCL tunnels at Stepney Green have been divided into sections A-G.

Figure 4 is a plan view of the SCL works at Stepney Green. The lengths of the SCL tunnels and the locations of sections A-G are labelled in Figure 4. Numbers 1-4 refer to the order of excavation works (see Table 1 and Table 2).

Figure 5 is another plan view of Stepney Green. In Figure 5, the dashed arrows represent TBM drive Z and the solid arrows represent TBM drive Y. The TBM paths are also labelled 1 to 6, representing the arrival/re-launch sequence of the Stepney Green TBMs. Table 3 summarises the arrival/ re-launch sequence of Stepney Green TBMs.

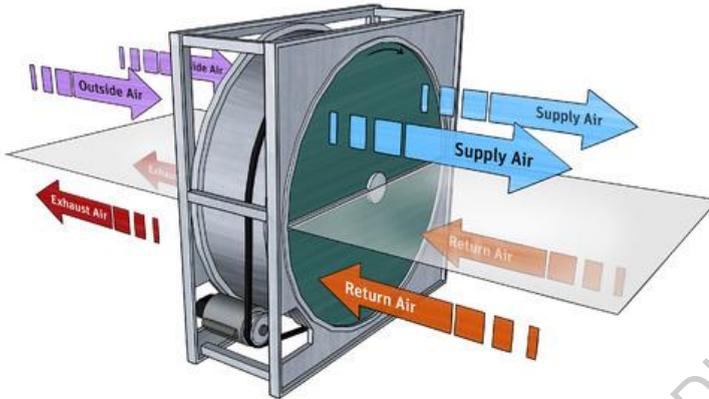


Figure 3- Thermal Wheels

Energy reduction of approximately 0.5% of the energy use for HVAC in the reference station can be achieved through the implementation of the enhancement initiative. The energy saving is contributed by the replacement of run around coils in the preliminary design with recuperators which have a higher heat reclaim efficiency.

Omission of pressurisation system for evacuation stairs and smoke clearance systems

In the design review, pressurisation systems for evacuation stairs and smoke clearance systems have been included in the stations design in many instances. This is over and above the Crossrail baseline requirement. These provisions were removed from the design after consulting the London Fire Brigade and clarifying the technical requirements in the station fire safety report. Although there are significant savings in capital and maintenance costs, saving in energy consumption is small because they are intended for emergency use only. It is estimated that an approximate 0.005% reduction in the energy use can be achieved through the implementation of the enhancement initiative.

Omission of Platform Cooling System

Preliminary stations' design allowed for chilled air to be supplied to the platform to maintain temperatures at a comfortable level, on an assumption that the full height platform screen doors will limit air movement between the platform and tunnel. As the design of platform screen doors progressed, it was apparent that there is a much higher infiltration rate through the screen doors. The cooling strategy is no longer feasible and would not work without significant station redesign, which will inevitably lead to a much higher station energy need. In a subsequent platform temperature analysis, it was found that by relying on natural ventilation for the platform the absolute maximum heat index experienced at any public area on the platform is no greater than 32°C with a mean platform dry bulb temperature of no greater than 27°C for 97.5% of the hours in a design summer year as defined by CIBSE^[4]. On the basis of the ventilation study, the provision of platform cooling system was omitted from the design. The peak platform temperatures and the number of hours per year that over-heating occurs will generally increase with time. These increases are driven by climate change and predicted rises in tunnel temperatures. The platforms may require additional cooling for limited scenarios after many years of operational use. The station designs have retained space proofing for an air-conditioning system with the view of retrofitting later during a ventilation system refurbishment, should it be required.

This design methodology has been undertaken for both secondary lining sprayed and cast concrete in all SCL stations. Design methodology is in accordance with the following standards: RILEM [6] and Eurocode 2 [4]. The aim of the methodology is to evaluate the structural behaviour of the most critical cases, according to the ground properties, depth, geometry and boundary conditions of the following types of junctions in all SCL tunnels:

- Single junctions: Platform tunnels to cross passages. Figure 1
- Single junctions: Access passage to shafts, for both top opening and bottom opening. Figure 2
- Double junctions type 1: concourse tunnels to cross passages. Figure 3
- Double junctions type 2: concourse tunnels to cross passages and headwall. Figure 4
- Double junctions type 3: wraparound where platform tunnels are the child tunnel. Figure 5
- Double junctions type 4 (Twin openings): Launch Chamber to ventilation ducts. Figure 6

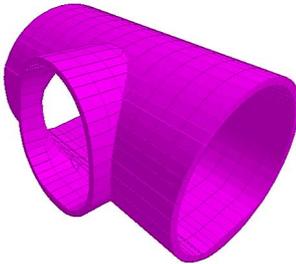


Figure 1 – Platform tunnel to cross passage

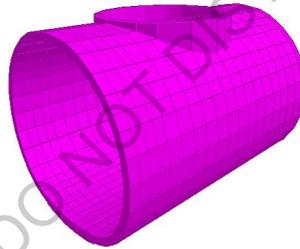


Figure 2 – Shaft to tunnel



Figure 3 – Concourse tunnel to cross passages with headwall

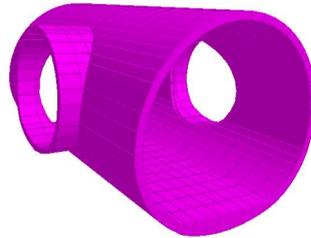


Figure 4 – Concourse tunnel to cross passages

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the looser tolerances of the structural frame. In the platform tunnels, the large tolerance envelope of the tunnel lining surrounds the PES, which is set out to cladding tolerances.

The PES-frame designers faced the additional challenge of designing a structure that can be constructed and maintained in proximity to moving trains and the 25kV overhead electrification.



Figure 1. The length of the PES on a typical Crossrail platform

Contractual Set-up

The C100 Architectural Component Design contract is a cross-station design package^[1]. Components are drawn, performance-specified, mocked-up, prototyped, and tested as generic engineering, architectural, lighting and wayfinding solutions. Once approved, these common design solutions are passed on for station-specific design, integration, manufacture and installation by the main contractors. The Platform Screen Doors (PSDs) including the glazed infill panels are delivered by a separate contract (Fig.2). They are a specialist mechanical element, common to all sub-surface Crossrail Stations.

The role of C100 was not just to produce a detailed design, but also to undertake stakeholder engagement with the organisations that will operate the stations and the railway – namely London Underground and Rail for London. This process involved reviewing design drawings, 3D BIM models, and physical prototypes. As a result, a coordinated Access and Maintenance Strategy was issued to station contractors alongside the RIBA F1 design. In this way, the common components approach created a harmonised maintenance strategy across all mined stations, yielding operational savings throughout the design life of the railway.