CROSSRAIL INFORMATION PAPER

A4 – VENTILATION AND INTERVENTION SHAFTS

This paper outlines the planning assumptions for the provision of Crossrail tunnel access and ventilation.

It will be of particular relevance to those in the vicinity of the proposed Crossrail stations and tunnels.

This is not intended to replace or alter the text of the paper itself and it is important that you read the paper in order to have a full understanding of the subject. If you have any queries about this paper, please contact either your regular Petition Negotiator at CLRL or the Crossrail helpdesk, who will be able to direct your query to the relevant person at CLRL. The helpdesk can be reached at:

Crossrail
FREEPOST
NAT6945
London
SW1H 0BR

Email: helpdesk@crossrail.co.uk
Telephone: 0845 602 3813

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Information Paper

A4 – VENTILATION AND INTERVENTION SHAFTS

1. Introduction

1.1 This Information Paper outlines the planning assumptions for the provision of Crossrail tunnel access and ventilation.

2. Objectives

2.1 The objectives to be met in planning the tunnel access and ventilation systems for Crossrail are as follows:

- to enable the smoke produced in the event of a fire in a tunnel or station to be extracted in a controlled manner and to provide fresh air in order to create smoke-free evacuation routes;
- to provide access for the emergency services to the tunnels and evacuation of trains;
- to meet the comfort requirements of passengers and staff in tunnels and stations by keeping the air quality and temperature within prescribed limits, even at times when train services are congested; and
- to ensure that the piston effect of trains passing into and out of stations does not create excessively high air velocities or pressure pulses.

3. Station Ventilation and Intervention Shafts

3.1 The following ventilation and intervention shafts are provided in the Crossrail station design:

- at both ends of each new below ground station there will be a ventilation shaft, located just beyond the end of the platforms. These ventilation shafts will be fitted with fans capable of supplying or extracting large volumes of air and controlling the environment in both the stations and the tunnels;
- draught relief shafts will be constructed at both ends of each new below ground station with ducts connecting to the running tunnels just beyond the headwall at the end of the platforms to relieve the piston effect of train movements; and
- wherever possible, these shafts will be constructed as part of the ticket hall structures and will be incorporated into the redevelopment of the station sites.

4. Between Station Ventilation and Intervention Shafts

4.1 Shafts are required between stations for three reasons:

- to allow access for the fire and rescue services in the event of an emergency underground;
- to allow control of smoke in the event of a fire in the tunnel; and
- to maintain the tunnel air quality and temperature within prescribed limits during periods of train service congestion.

4.2 The distance between shafts is determined by:

- operational considerations — so that an effective ventilation response can be made to an incident by drawing smoke away from the direction of escape, only two trains can be present in a tunnel section between shafts. Therefore, the spacing between the shafts has to be such that it can support the frequency of train service proposed; and
- reducing the time needed for the emergency services to reach an incident on foot carrying breathing apparatus and other equipment.

4.3 The guidance on access provision for emergency services, as set out in the Health and Safety Executive document 'Railway Safety Principles and Guidance', states:

> "Current practice indicates that distances between access points should be in the order of 1 km where there are twin single-bore tunnels with adequate intermediate cross-passages. In other circumstances this distance may need to be reduced."

Although this guidance is not prescriptive, any alternative solution must be approved by Her Majesty's Railway Inspectorate (HMRI) and the London Fire and Emergency Planning Authority (LFEPA) and provide a functionality that is at least as good. After careful consideration and discussions with the HMRI and LFEPA, they have accepted that for Crossrail, intervention shafts at 1km spacing is an appropriate solution.

4.4 Provision of these ventilation and access shafts depends upon a suitable site being available along the route of the track alignment. For instance, the stretch between Paddington and Bond Street is likely to have two shafts, because although the distance between stations is 2.2km, the midpoint in Hyde Park would have been environmentally intrusive and potentially difficult to reach in an emergency.

5. Comparison with other Schemes

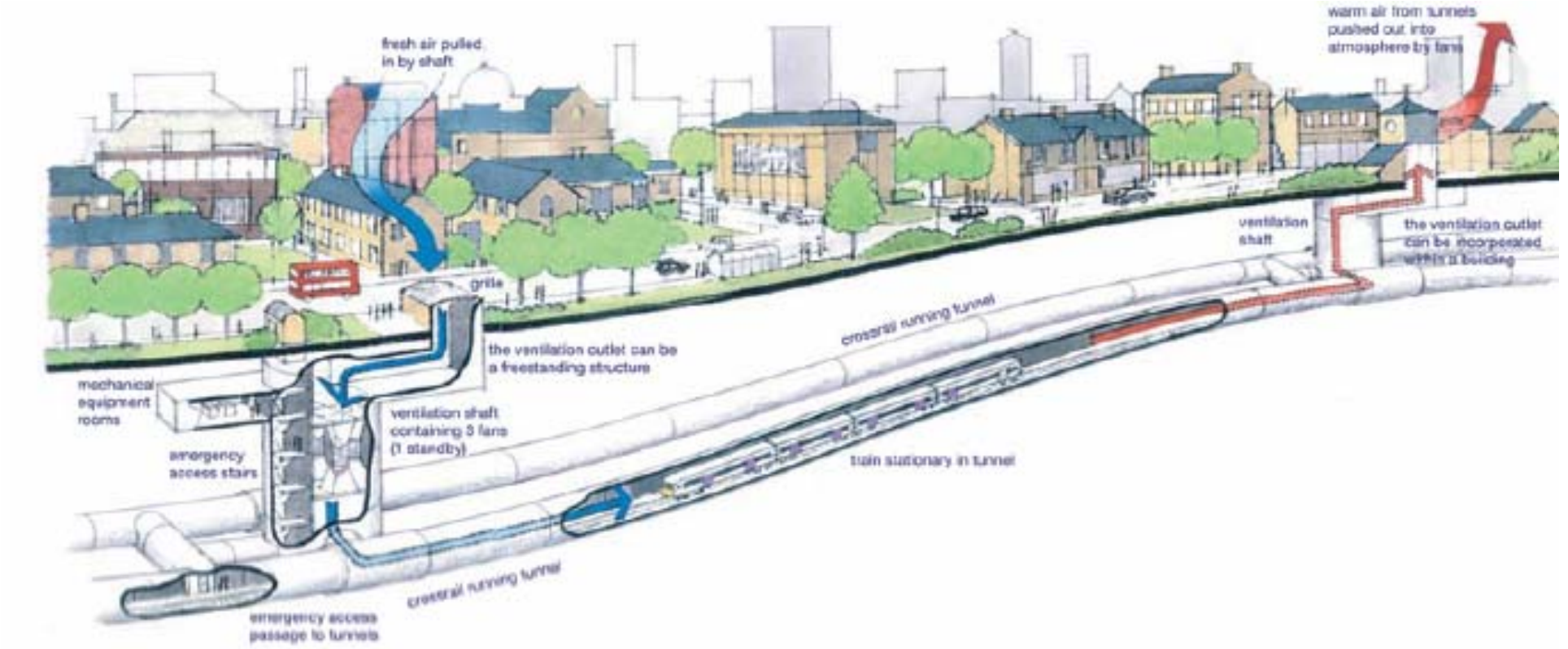
5.1 Since 1987, four major railway schemes in tunnel have been completed in London. These are the:

- Heathrow Express;
- Docklands Light Railway extensions to Bank and Lewisham;
- Jubilee line extension; and
- Channel Tunnel Rail Link (CTRL).

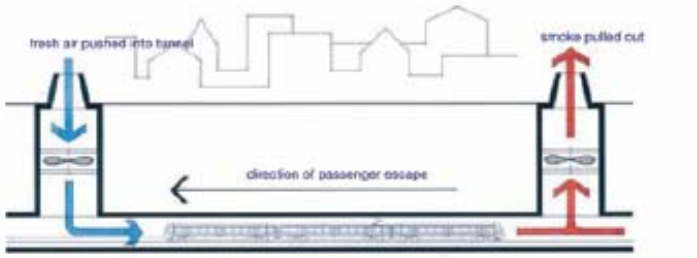
5.2 The 1 km interval between intervention shafts has been used on all schemes except on the CTRL which has adopted a different approach to the management of emergencies. CTRL will have a less frequent service than on the other lines and in an emergency trains in both directions will be halted and passengers evacuated through the second tunnel bore via cross passages. It has been concluded that for a metro service such as Crossrail which has frequent trains

and relatively short distances between stations, there should be intervention shafts every 1 km in common with the other schemes listed.

Diagram Showing a Typical Crossrail Shaft



Intermediate Ventilation Shafts: Typical Arrangement (showing fans operating in tandem to cool a stationary train)



Fans Controlling Smoke in an Emergency