

Technical information for Train Operating Companies (TOC)

Heathrow Rail Engineering

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1. Purpose

This document is a high level description of the Heathrow rail estate. The information is intended to allow potential new Train Operating Companies (TOCs) to superficially determine if their offering is compatible with the constraints of the Heathrow estate before undertaking detailed investigation.

2. Heathrow networks summary information

Infrastructure / operational arrangements	Description	Reference documents
2.1.	Tunnel clearance (gauge) and infrastructure information	
2.1.1.	Construction Construction types <ul style="list-style-type: none"> Concrete segmental lined sections Steel ring lined sections Sprayed concrete sections with intersecting shafts. Average tunnel diameter of 5.675m in bored sections.	Tunnel interfaces
2.1.2.	Clearance gauge The current clearance gauge classification is W6a with derogations for clearance as noted in item 2.8 Vehicle types that currently use the tunnel are Class 360 (Heathrow Connect) and Class 322 (Heathrow Express). Crossrail services (commencing in 2018) are expected to be Class 345.	Typical cross section
2.1.3.	Layout and lengths See schematic diagram.	General arrangement
2.1.4.	Passenger walkway See schematic referenced 2.1.1.	
2.1.5.	Tunnel lighting Continuous emergency lighting for passenger access on foot to the nearest escape shaft and throughout the escape shaft.	
2.1.6.	Tunnel signage Continuous signing to identify the nearest escape shaft in the event of an emergency evacuation. Signing continues in each escape shaft to advise the number of stair flights to the surface exit point.	Tunnel signage
2.1.7.	Track Geometry details Maximum gradient 1:42	
2.1.8.	Indicative operating configuration General arrangement.	General arrangement
2.1.9.	Sidings There are no sidings on the Heathrow Rail System.	
2.1.10.	Track classification The track is classified as track category 2 to network rail standards. The track consists of a mixture of UIC54 and BS113A flat bottom rail.	
2.1.11.	Minimum radius 330m	
2.1.12.	Maximum cant 150mm	

2.1.13.	Lubrication	Conventional lubricators and 'friction modifiers' are installed throughout the tunnel.	
2.1.14.	Use of sand	Not allowed within the tunnel. All proposed rolling stock must be capable of preventing sand to be dropped automatically.	
2.1.15.	WC discharge facility	WC discharge is not permitted.	
2.1.16.	CTA to tunnel portal	Shepiston Lane emergency escape shaft, Shepiston Lane escape building Sipson Farm emergency escape shaft, Sipson Farm escape building Custom House emergency escape shaft, Custom House escape building	General arrangement
2.2.	Electrification details	Non-electric trains are not permitted to operate passenger services. Non-electric trains can be used for engineering purposes by prior agreement.	
2.2.1.	Power rating and delivery	Traction current supplied by 25kv AC overhead lines controlled from Romford ECR (control room).	
2.2.2.	Design height of OHLE	The nominal design height between the running rail and overhead contact wire is 4200mm	
2.2.3.	Electricity metering	This is currently through the supply point at Kensal Green, for which Heathrow Rail services are the only users. New TOC rolling stock will need to be metered.	
2.3.	Signalling	Train protection within the tunnel is provided by ATP. All vehicles must be compatible with ATP. ETCS is being fitted as part of the Crossrail service enabling works and is expected to become operation in October 2016. Future train operators will need to operate using ETCS.	
2.3.1.	Operation	The signalling is designed to operate with bi-directional running on all lines, which provides contingency capability in the event of isolated failures.	
2.3.2.	Driver only operation	Driver only operation was installed at CTA and T5 Stations in 2015. The facility is provided through CCTV equipment which allows the driver to check that the dispatch processes have worked correctly before moving.	
2.3.3.	ATP (Automatic Train Protection)	The requirement to operate services into Heathrow includes the provision of ATP.	
2.3.4.	European Train Control System (ETCS)	European Train Control System (ETCS) is the signalling component of the European Rail Traffic Management System (ERTMS).	

		The Heathrow railway infrastructure is scheduled to introduce ETCS level 2, providing the signalling component only, with the arrival of Crossrail services in 2018.	
2.3.5.	Signals	See diagram.	Signalling schematic
2.3.6.	Line signal spacing and speed signage	Railway Group Standard GK/RT0075 Issue Four Date September 2015	http://www.rssb.co.uk/rqs/standards/GKRT0075%20Iss%204.pdf
2.4.	Stations information - platform lengths, heights, lift capacities, station capacity		General arrangement
2.4.1.	Terminal 2 and 3 (Central Terminal Area (CTA)) platform	Operational platform length 203m Indicative configuration denoted by the schematic Station Interfaces. <ul style="list-style-type: none"> Lifts: 4 passenger lifts with a capacity of 42 persons per lift (3200kg) Escalators: one up and one down route 	Station interfaces
2.4.2.	Terminal 4 platform	Operational platform length 207m Indicative configuration denoted by the schematic Station Interfaces. <ul style="list-style-type: none"> Lifts: 4 passenger lifts with a capacity of 40 persons per lift (3000kg) Escalators: one up and one down route 	Station interfaces
2.4.3.	Terminal 5 platform	Operational platform length 217m Indicative configuration denoted by the schematic Station Interfaces. <ul style="list-style-type: none"> Lifts: 5 passenger lifts with a capacity of 53 persons per lift (4000kg) Escalators: one up and one down route (there are actually two down routes which leads to the same escalator to platform level) 	Station interfaces
2.5.	Communication within the tunnel and station		
2.5.1.	Driver / train communications	The HEx rolling stock currently uses Cab Secure Radio (CSR) for drivers and signallers to communicate. This is being replaced by GSMR, which as part of the network-wide upgrade. GSMR replacement had been scheduled for completion by 2017. In the first instance, GSMR will replace the voice element of communications provided by CSR in 2016, progressing to include the data element in 2017 to operate ETCS.	

2.5.2.	Trackside telecommunications	Trackside telephones integrated with signaller communication are provided by Network Rail.	
2.5.3.	Operational radio	<ul style="list-style-type: none"> Operational Radio – provides private mobile radio for Heathrow Express staff, emergency services coverage (channel 5, and TETRA for British Transport Police), and cellular coverage in the tunnels (links to mobile provider networks). The Radio system's function is to allow communication between the following personnel and locations: HECR to HEX staff; operational, maintenance and train drivers, in HEX stations, escape shafts and tunnels. HEX staff to HEX staff in HEX stations, escape shafts and tunnels. London Ambulance Service (LAS) position in HECR to LAS staff in HEX stations, escape shafts and tunnels. London Fire Brigade (LFB) position in HECR to LFB staff in HEX stations, escape shafts and tunnels, and in (Heathrow LUL stations). British Transport Police (BTP) officers to BTP officers in HEX stations, escape shafts and tunnels. Metropolitan Police (MP) officers to MP officers in HEX stations. GSM mobile telephones in HEX stations, escape shafts and tunnels to Vodafone, Orange, T-Mobile and O2 master units in HC. 	
2.5.4.	Operational telephones	Operational Telephones – provide fixed telephones for Heathrow Express staff with telephone points located at all shafts, stations, and 'help points'. These provide a direct line to Heathrow Express Control (HECR).	
2.6.	Heathrow Express Control Room (HECR) (Tunnel control including emergencies)		
2.6.1.	Ventilation	Smoke control and removal in the event of a fire in the tunnels is provided by mechanical ventilation with outlets at the surface. These are controlled by Heathrow Express Control Room (HECR) to minimise the volumes of smoke entering passenger evacuation routes. Draft relief for normal operation is provided through damper adjustment in the outlets.	General arrangement

2.6.2.	CTA to tunnel portal	Sipson Farm ventilation shaft and Sipson Farm ventilation building - 2 x 140 m3/s fans.	
2.6.3.	CTA	CTA north ventilation shaft and CTA north ventilation building - 2 x 140 m3/s fans CTA south ventilation shaft and CTA south ventilation building - 2 x 140 m3/s fans	
2.6.4.	Terminal 4	T4 north ventilation shaft and T4 north fan building - 2 x 90 m3/s fans T4 south ventilation shaft and T4 south fan building - 3 x 90 m3/s fans	
2.6.5.	CTA to terminal 5	T5D ventilation shaft and T5D ventilation shaft building - 2 x 140 m3/s	
2.6.6.	Terminal 5	T5 ventilation shaft 1 and T5 ventilation shaft head structure 1 - 1 x 280 m3/s T5 ventilation shaft 2 and T5 ventilation shaft head structure 2 - 1 x 280 m3/s T5 ventilation shaft 3 and T5 ventilation shaft head structure 3 - 1 x 280 m3/s T5 ventilation shaft 4 and T5 ventilation shaft head structure 4 - 1 x 280 m3/s	
2.6.7.	Fire escape process	Passenger and staff escape from the running tunnels is via the pedestrian walkway and the stairways in the escape shafts to the surface.	
2.6.8.	Fire main	All tunnels and station areas are served by a continuous fire main with frequent hydrant points. This is primarily for use by the emergency services and none of the tunnels include fire detectors, sprinklers, or other automatic fire systems.	
2.7.	Restrictions – Sub Surface Railway Regulations.	Must comply with regulations.	
2.8.	Derogations	<ul style="list-style-type: none"> • 15-071-DEV Regards installation of gap fillers at stations, reduced train to platform clearances. • 05-114-DGN Regards the provision of Overlaps, Flank Protection and Trapping, specifically trap points at the Heathrow branch line headshunt. • 02-196-DGN Retractable restraining device (RRD) in the headshunt at Heathrow Express Central Terminal Area, when locked in the down position, can extend as much as 66mm above plane of the rails when raised until restrained by the locking pin. • 07-058-DGN 	http://www.rssb.co.uk/Library/standards-and-the-rail-industry/deviations-register-pdf.pdf

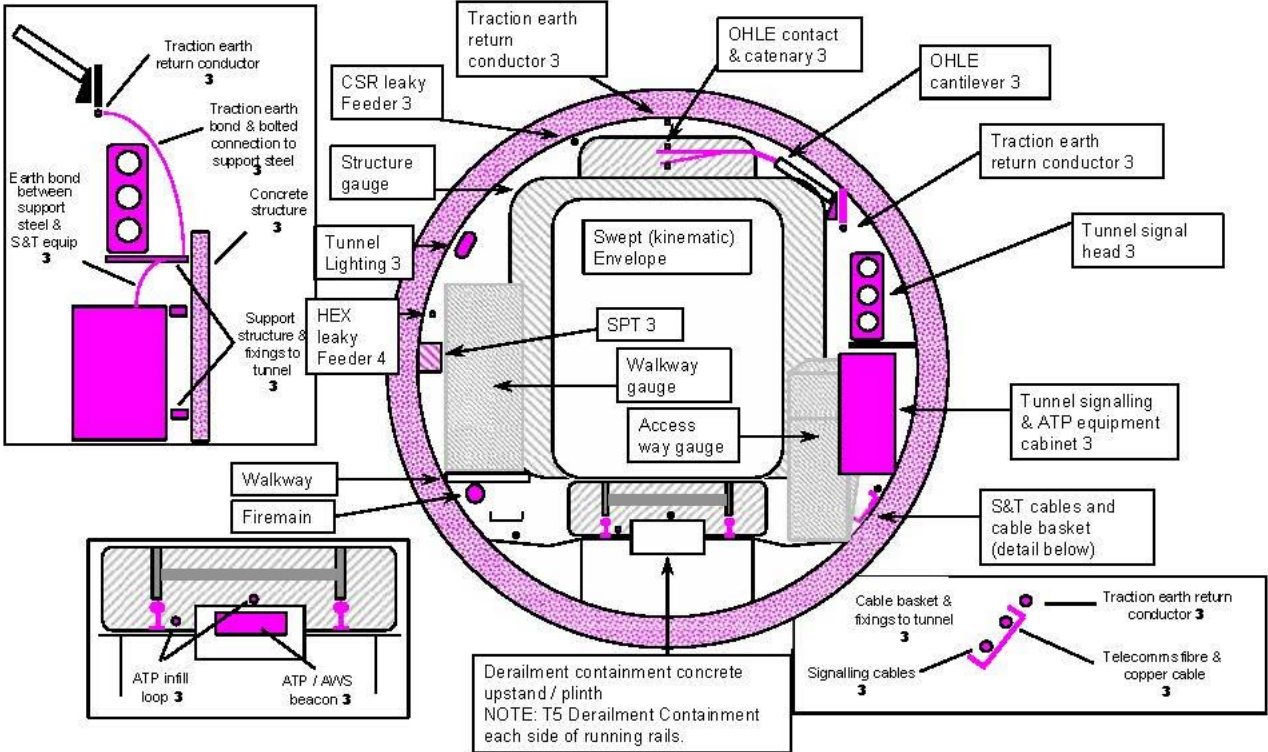
		<p>Non-Compliance with section B10. 1. 2 of GK/RT0031 "An indication meeting category 2 readability shall not be used with a category 3 signal. " and also reiterated in sections B10. 2. 2 and B28 Table 17. In the Heathrow Express tunnels there is limited space and trackside signal structures need to be kept to a minimum profile to ensure equipment attached inside the tunnels are outside of the rolling stock structure gauge. Therefore, for main line signals with alternative routes, and where position lights are required, one piece of equipment for the route indications will be installed for both the main line signal and position light signal i.e. full size category 2 alphanumeric standard route indicators are to be used in association with category 3 position light signals.</p> <ul style="list-style-type: none"> • 07-142-DGN Clause C4. 2 of GI/RT7016 contains specific rail offset dimensions for station platforms. The clause refers to GC/RT5212 Appendix 1 which gives a minimum offset of 1000mm at a height of 1100mm. The offset of platform edge to running rail at T5 stations - platforms 3 and 4 - is 773mm, which is 227mm less than permitted by the standard, and the platform height is 915mm, which is exceeded by 185mm, i.e. 1100mm above rail level. • 05-128-DGN The nature of the derogation is to eliminate the requirement to place detonators on the line as part of the process of bringing an assisting train under control before it proceeds to approach, then couple to the failed train. The derogation is proposed to apply in the tunnel sections on the Heathrow Branch Line. The proposed derogation serves to change the way that assures that an assisting train is brought under proper control before approaching the failed train. • 05-001-DGN Retractable restraining device (RRD) in the headshunt at Heathrow Express CTA, when locked in the down position, can extend as much as 62mm ARL when raised until restrained by the locking pin. Up to 62mm inside the structure gauge. • 14-174-DEV Clause C2 Table 2 provides definition of normal/reduced/special reduced clearances 	
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		<p>in the lower sector. Clause G4. 1 states that alterations to infrastructure should not cause reduction of clearances from one category to a more severe (smaller clearance) category. The current platform clearances comply with the RGS requirements. In this scenario there have been instances of passengers, especially those with a small foot size, stepping between the platform and the Class 332 and Class 360/2 stepping plate and getting their foot/leg trapped. HEx propose to trial the gap fillers to assess their benefits in reducing the number of such accidents on Heathrow CTA Platforms 1 and 2.</p> <ul style="list-style-type: none"> • 14-143-DEV <p>Clause C2 Table 2 provides definition of normal/reduced/special reduced clearances in the lower sector. Clause G4. 1 states that alterations to infrastructure should not cause reduction of clearances from one category to a more severe (smaller clearance) category. The current platform clearances comply with the RGS requirements. In this scenario, there have been incidents of passengers, especially those with a small foot size, stepping between the platform and the Class 332 stepping plate and getting their foot/leg trapped. HEx is trialling the gap fillers to assess their benefits in reducing the number of such accidents on Heathrow Terminal 5 Platform 4.</p>	
2.9.	HAL – Assurance Review Panel process	The HAL - Assurance Review Panel (HAL-ARP) reviews all projects introducing new equipment or projects that change the use of existing equipment where they may have an impact on other airport systems.	

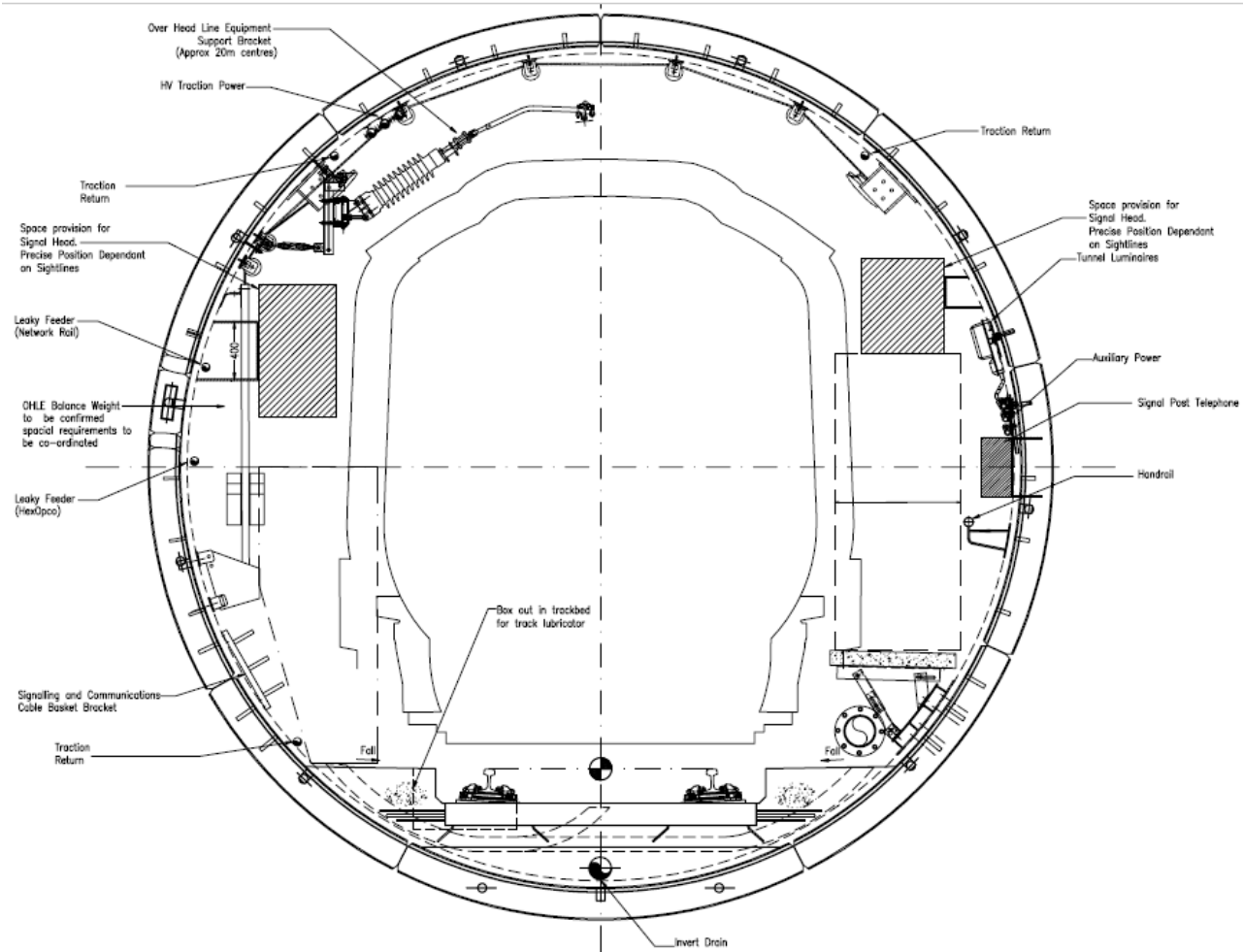
3. Appendices

3.1. Tunnel interfaces

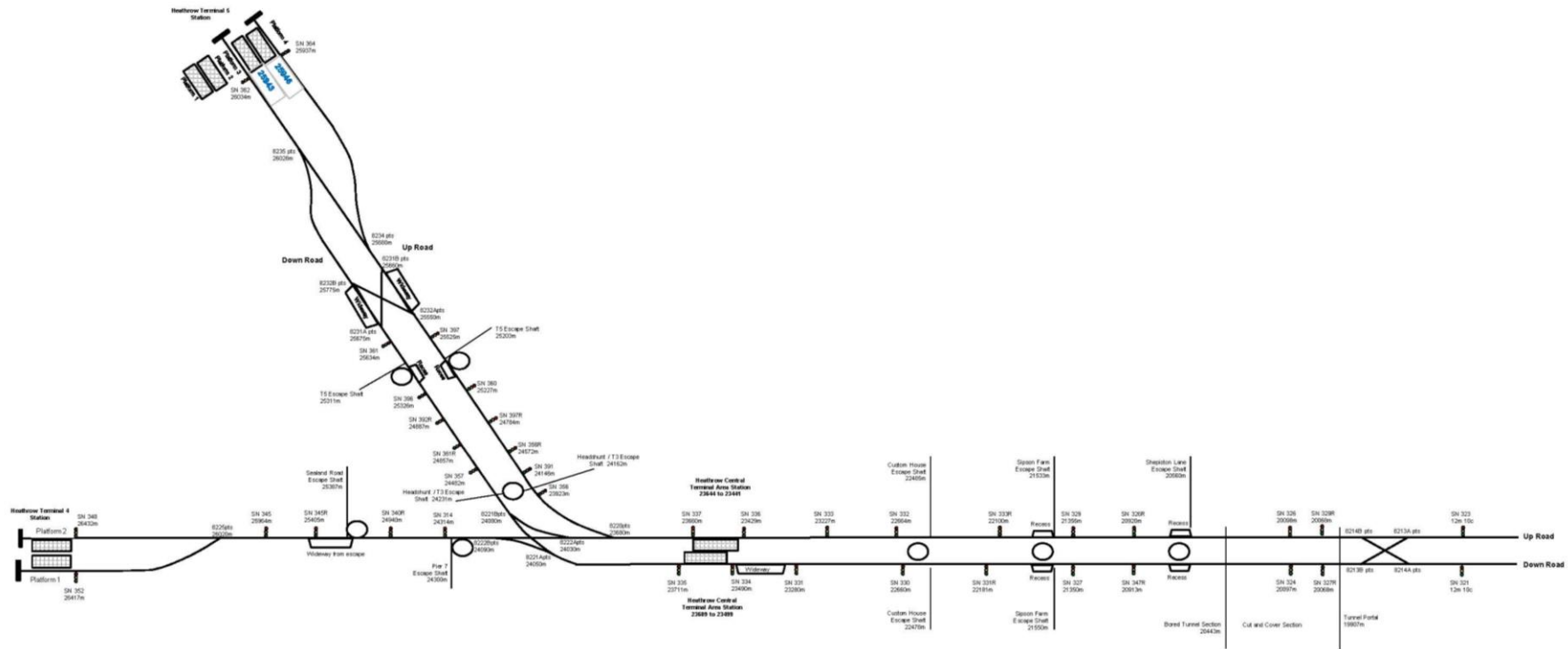
Tunnel Interfaces (v1.0 10 May 2016)



3.2. Typical cross section



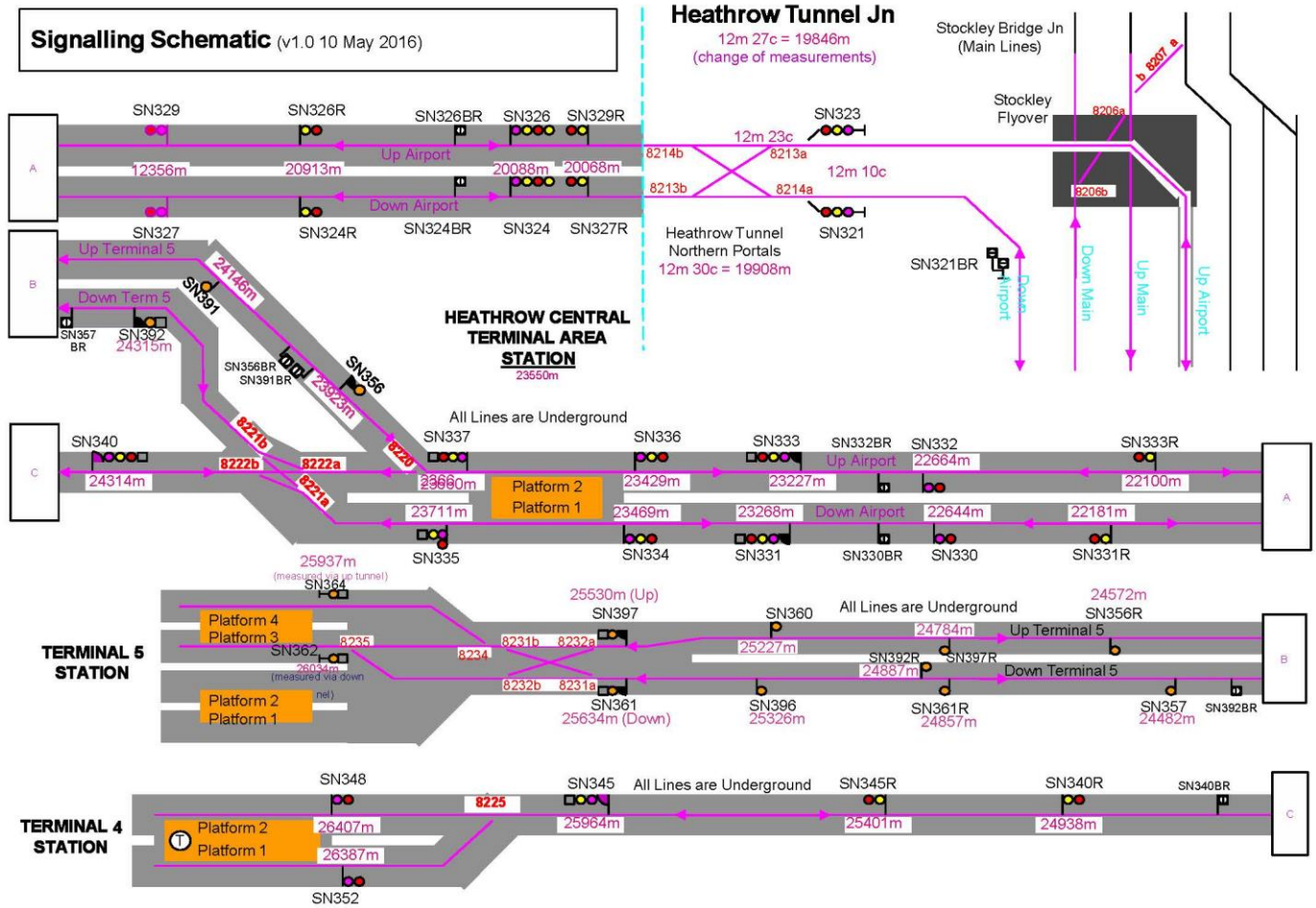
3.3. General arrangement



3.4. Tunnel signage



3.5. Signalling schematic



3.6. Station interfaces

Station Interfaces (v1.0 10 May 2016)

Note: The limit of the station platform is defined by the platform headwall end gates (inclusive) giving access to/from the running tunnel walkway.

