EXPLANATORY MEMORANDUM TO

THE RAIL VEHICLE ACCESSIBILITY (LONDON UNDERGROUND VICTORIA LINE 09TS VEHICLES) EXEMPTION ORDER 2008

2008 No.

1. This explanatory memorandum has been prepared by the Department for Transport and is laid before Parliament by Command of Her Majesty.

2. Description

2.1 The Order exempts certain specified rail vehicles, which were built for use by London Underground Limited ("LUL") on the Victoria Line from four requirements of the Rail Vehicle Accessibility Regulations 1998 (S.I. 1998/2456, amended by S.I. 2000/3215) ("RVAR"). The Order sets expiry dates for the exemptions except those relating to step-free access at Pimlico station.

3. Matters of special interest to the Joint Committee on Statutory Instruments

3.1 None.

4. Legislative Background

4.1 Section 46 of the Disability Discrimination Act ("DDA") 1995 empowers the Secretary of State to make rail vehicle accessibility regulations to ensure that it is possible for disabled persons, including wheelchair users, to travel in safety and reasonable comfort in those vehicles to which the regulations apply. The regulations, which were made in 1998 and amended in 2000, apply to rail vehicles constructed or adapted for passenger use, and first brought into use after 31st December 1998.

4.2 Section 47 of the DDA enables the Secretary of State, on receipt of an application for exemption from particular requirements of the RVAR, to make Orders authorising specified regulated rail vehicles to be used in passenger service even though they do not conform to the requirements of the RVAR with which they are required to comply. Such Orders may contain conditions and set time limits.

4.3 The Rail Vehicle Accessibility Exemption Orders (Parliamentary Procedures) Regulations 2008 are being laid before Parliament at the same time as this Order. Those regulations set out the basis on which the Secretary of State will decide which Parliamentary procedure is to be adopted when making an exemption order. Changes introduced in the DDA 2005 have required all exemption orders since 30 June 2005 to be considered under the draft affirmative resolution procedure, until those regulations are in force.

4.4 Section 6(1) of the DDA 2005 introduced a new paragraph, 46(4A), into the DDA 1995 which requires the Secretary of State to set an "end date", of no later than 1 January 2020, by which time all rail vehicles must comply with accessibility regulations. These provisions have not yet been commenced. However, the Rail Vehicle Accessibility

(Interoperable Rail System) Regulations 2008 (SI 2008/1746), which came into force on 7 July 2008, have already set an end date of 1 January 2020 for vehicles operating on the interoperable rail system. This comprises the major lines of the mainline rail system in the UK. The regulations were prompted by the coming into force of new European standards for the accessibility of heavy rail vehicles, and the consequent need to disapply RVAR for those vehicles, in order to avoid dual regulation. The Department intends to bring forward further regulations later this year which, subject to consultation, will set an end date for rail vehicles used on metro, underground, tram and light rail networks and will, additionally, bring older rail vehicles introduced into service prior to RVAR into scope when they undergo refurbishment.

4.5 In addition, the Government intends to incorporate some minor changes, subject to consultation, to the technical requirements of RVAR itself, in the light of operator and passenger experience since they were first introduced in 1998 and reflecting their reduced scope in light of the new European standards. These changes, many of which are designed to add legislative clarity, will not compromise accessibility for disabled people or make the regulatory regime more onerous for operators.

5. Territorial Extent and Application

5.1 This instrument applies to Great Britain.

6. European Convention on Human Rights

Tom Harris has made the following statement regarding Human Rights:

In my view the provisions of the Rail Vehicle Accessibility (London Underground Victoria Line 09TS Vehicles) Exemption Order 2008 are compatible with the Convention rights.

7. Policy background

7.1 The policy objectives of the DDA 1995 are to ensure that all rail vehicles first brought into use after a certain date are designed in accordance with the specific requirements of the RVAR, so as to enable disabled persons to travel in them in comfort and safety. However, the Act also provides the Secretary of State with a power to exempt specified vehicles from particular requirements, on application by the operator. Each application is considered on a case by case basis. The Order is made in the terms requested in the application, with some limiting conditions.

7.2 In this instance LUL, the operator, is taking delivery of 376 new vehicles (09 Tube stock, known as “09TS”). These vehicles are part of the broader Victoria Line Upgrade project which also includes upgrades to signalling and stations with the aim of increasing capacity and reducing delays. There will also be associated work at stations as part of LUL's wider 'Step Free Access' programme which aims to provide full step-free access at a third of all London Underground stations by end 2013.

7.3 LUL has identified a small number of areas where RVAR creates a challenge to its existing operations, together with some new ideas which could be beneficial to disabled passengers but which are not, at present, permitted under RVAR. LUL has therefore applied for exemptions from four regulations. A copy of LUL's application can

be found at **Appendix A**. Since the exemptions sought are specific to the physical restrictions of the Victoria Line, LUL's operational requirements, and certain experimental provisions, they would lapse if the vehicles were used on another network.

7.4 The new 09TS vehicles are the first LUL trains to be subject to RVAR and will progressively replace the existing 67TS stock. The existing 67TS stock is not subject to RVAR because it was built before the regulations came into force, and therefore does not meet the RVAR specifications in a number of ways. The 09TS fleet will be phased in as new vehicles are delivered. However, the last 67TS vehicle will not be withdrawn from service on the Victoria Line until November 2011 when all the new vehicles will have been delivered. This means the two fleets will operate alongside each other for an interim period.

Audible door closure warnings

7.5 The audible door closure warning on 67TS stock begins to sound 1.75 seconds before the doors begin to close. This is the standard warning period used on existing LUL trains. However, on vehicles subject to RVAR, such as the new 09TS stock, a longer audible door closure warning is required which starts 3 seconds before the doors begin to close. LUL contend that passengers could be confused by vehicles operating on the same route having different durations of audible warning, depending on whether they were subject to RVAR or not. Passengers would not know how long they had until the doors closed. This would increase the risk of them being trapped in the doors and potentially increase dwell times (the time between train doors opening and closing at a platform) as the doors would have to be reopened.

7.6 Although the 09TS vehicles are capable of providing a 3 second warning of door closure, LUL has requested an exemption from this requirement until the last 67TS vehicle has been withdrawn from service in November 2011. A 3 second warning which complies with RVAR would be introduced on 09TS vehicles after that date. This would initially be a trial to see whether the increased warning time can be incorporated on a metro service without compromising safety and the frequency of the train service (which is a core target of the Victoria Line Upgrade). The Rail Vehicle Accessibilty (B2007 Vehicles) Exemption Order 2008 (S.I. 2008/925) grants an exemption to vehicles operating on the Docklands Light Railway for similar operational reasons.

7.7 The Order requires LUL to maintain an audible door closure warning of 1.75 seconds as a minimum to ensure that there is consistency with the older vehicles and no reduction of existing standards. The Order grants the exemption to 31 December 2013 to allow LUL to properly test the 3 second warning in passenger use and revert to a 1.75 second warning if the longer warning proves unworkable. A further exemption order would be required if the trial showed that the 1.75 second warning needed to be retained beyond the expiry date.

On-board announcements

7.8 LUL also wishes to use the new 09TS vehicles to trial a revised series of on-board announcements which could potentially be more useful in the context of a metro service than those currently required by RVAR. RVAR requires both the 'next stop' and 'terminating station' to be announced, audibly and visually, on the train while it is

stationary at a station. The original requirement was included in RVAR so that passengers boarding at a station knew whether a train to a particular destination was a "fast" service which skipped several stations, or a "stopping" service which called at all intermediary stations. However, as the Victoria Line has no branches or junctions, and does not have a mixture of "fast" and "stopping" services, LUL believes that the 'next station' and 'terminating station' announcements effectively serve the same purpose in assuring passengers they are on the right train.

7.9 Allowing LUL to provide only one of the two mandated announcements while the train is at the station would allow alternative information to be given instead about connections and places of importance at the current stop, during the limited time available at the station. As part of the trial, LUL intend to establish whether passengers find it more useful to have the next station or the terminus announced. They have therefore requested an exemption that would allow the information provided to be varied over the course of the trial.

7.10 The Order grants this exemption on the condition that whichever of the announcements is omitted while at the station must be made while the train is en route to the next station instead, and that an announcement is made that the train is on the Victoria Line.

Passenger information system

7.11 LUL intends to use thin film transistor (TFT) screens on its new 09TS vehicles to display internal public information rather than the more traditional dot-matrix displays. TFT screens allow greater flexibility, including the use of pictures, colour-coding and sign language, which could not be displayed on the older technology. RVAR requires at least a 35mm height for the first (upper case) letter in regulated announcements made within the passenger saloon. LUL would like to use a smaller letter height to enable station names to be displayed in full without scrolling across the screen and additional information, such as pictures, to be included. The use of pictograms is likely to be particularly useful for people with learning disabilities or those who do not have English as a first language.

7.12 The Guide Dogs organisation has taken part in research which has informed LUL's application. The first letter of each station name will be at least 25mm and a 35mm letter height will be maintained where practical. Given that the maximum viewing distance for anyone in a carriage to the nearest screen will be 3 metres, a 25mm letter height would still be larger than recommended in RNIB best practice on viewing distances which is incorporated in the RVAR guidance. To ensure that the information is easily readable, the Order sets minimum heights for upper and lower case letters, and numbers, depending on the name of the station and the type of information displayed. It also requires this information to be displayed in a "TrueType" font[1]. LUL has undertaken not to display third party advertising on the screens.

[1] "TrueType" font technology was developed by Apple Inc. in order to replace bitmapped fonts which had previously been used for display and printing. The use of bitmapped fonts was becoming a problem since making these larger or smaller than they were intended to be resulted in the outlines of individual letters becoming very jagged and difficult to read. TrueType fonts do not suffer from this issue since they remain in the original format regardless of the size to enable individual letters to remain as smooth and legible as possible.

Boarding devices

7.13 RVAR requires new trains to be wheelchair accessible. Each new 09TS train will have 4 wheelchair spaces, which is more than required under RVAR. However, because of the limited space on platforms and impact on dwell times, LUL believes it would be impractical to use manual ramps when wheelchair users board the train. Instead, LUL is intending to install platform humps, positioned to allow level access to those vehicles with wheelchair spaces. The wheelchair spaces will always be in the middle two carriages of each train so that they are always adjacent to the platform humps when the train arrives in the station. Level access between platforms and trains is preferred by wheelchair users
over the use of manually deployed ramps as this allows for independent travel, without the need to involve staff.

7.14 LUL wants to link the installation of platform humps with its on-going 'Step Free Access' programme so that work to ensure level access between the platform and the train is carried out alongside work to give step-free access to the street or to other platforms. This would reduce the risk of a disabled passenger being stranded at a station where there is no step-free exit and minimise the disruption caused by engineering work.

7.15 However, in order to facilitate this, LUL will require exemptions from the requirement to provide step free access at wheelchair accessible doorways for each station on the Victoria Line until work to provide step-free routes is carried out. These exemptions will reduce progressively as step-free routes are provided at each station and will be phased to complete in 2013. The exemption will not apply at Brixton and Tottenham Hale stations as these already have step-free access and platform humps will be installed there before the new 09TS vehicles enter service. Pimlico station is not currently included in LUL's step-free access plan because Victoria and Vauxhall stations are nearby. However, if a step-free route from the street to the platform is provided at Pimlico in the future, the exemption will lapse.

7.16 Section 47(3) of the DDA 1995 requires the Secretary of State, as part of the consideration of an application for exemption, to consult the Disabled Persons Transport Advisory Committee ("DPTAC") together with any other appropriate persons. DPTAC was established under section 125 of the Transport Act 1985 to advise the Government on the public passenger transport needs of disabled people. DPTAC has been consulted on this application, along with HM Railway Inspectorate ("HMRI") and London TravelWatch (as the relevant passenger authority for LUL's services), and supplied comments.

7.17 DPTAC, HMRI and London TravelWatch all supported the exemption application, although HMRI had some comments about the provision of handrails in wheelchair spaces. A copy of DPTAC's comments are attached to this Memorandum at **Appendix B**; HMRI's comments and the Department's response to them are attached at **Appendix C** and London TravelWatch's comments are attached at **Appendix D**.

8. Impact

8.1 An Impact Assessment has not been prepared for this instrument as it has no impact on business, charities or voluntary bodies.

8.2 The impact on the public sector is negligible.

Regulating small business

8.3 This instrument does not apply to any small businesses.

9. Contact

Nathan Cole at the Department of Transport (tel: 020 7944 4916 or e-mail: nathan.cole@dft.gsi.gov.uk) can answer any queries regarding the instrument.

London Underground Limited - Application for exemption from some of the requirements of the Rail Vehicle Accessibility Regulations 1998

Introduction

London Underground (LU) is committed to improving the accessibility of our services for all of our customers.

Our aim is to provide a service that can be accessed by anyone safely, easily and independently, regardless of their age, impairment or encumbrance. As far as possible providing the same or equivalent levels of service to all our customers, whilst recognising customers' service requirements vary.

London Underground is currently undertaking an extensive investment programme to modernise and improve our stations and trains. One of the largest single investment projects is the Upgrade of the Victoria line.

As part of the Victoria Line Upgrade project, a fleet of 47 new trains (known as the 09TS) will replace the current 40 year old fleet of 43 trains (known as the 67TS). These new, modern trains will be faster, have great capacity and improved accessibility. They will be London Underground's first fleet of fully Rail Vehicle Accessibility Regulations 1998 (RVAR) regulated trains.

To ensure the smooth continuation of service, the new trains will be introduced gradually between August 2009 and November 2011 at a rate of approximately one new train every two weeks. A pre-production test train will enter passenger service in December 2008.

London Underground is requesting exemption from the RVAR in relation to the following clauses of RVAR:

- **Regulation 4(3)(b)**
  - Audible Door Closure Warnings

- **Regulation 13(4)**
  - Announcements to be made whilst at a station

- **Regulation 13(7)**
  - Letter heights of passenger information displays

- **Regulation 23(1)**
  - Boarding devices at wheelchair accessible doorways

Background

The Victoria line was opened in stages between 1968 and 1971 and is one of the only 2 LU lines which are completely underground. The line provides a fast and frequent service to 16 stations from Walthamstow Central in north London to Brixton in the south. It includes a number of key transport interchanges such as Victoria, Oxford Circus and King's Cross St. Pancras.

The existing 43 train fleet provides a service of 28 trains per-hour, carrying over 175 million passengers a year. When the Victoria Line Upgrade is completed in August 2013, the combination of new trains and new signalling and control systems will enable LU to run around 33 trains per-hour, increasing capacity by 16%. It is estimated that by 2025 the Victoria line will be carrying 213 million passengers a year.

Accessibility has been a key feature of the 09TS design process since the very beginning. In addition to the requirements of RVAR, London Underground has its own additional stringent standards. LU has sought to go beyond best practice and has demanded even greater consideration of accessibility from our suppliers, including Metronet (our Infraco partner) and Bombardier who are designing and building the vehicles.

From an early stage in the design process we have worked with officials from the Department for Transport (DfT), members of the Disabled Persons Transport Advisory Committee (DPTAC) and Transport for London's own Independent Disability Advisory Group (IDAG). In summer 2006, DfT officials, DPTAC members and representatives of organisations of/for disabled people, such as RNIB and RNID, were invited to view and comment on a carriage mock-up as part of the LU Customer Acceptance Testing process.

In addition to fully complying with all RVAR requirements (apart from the 4 exemptions listed above) the new 09TS fleet incorporates a number of additional accessibility features:

- **Fourth RVAR compliant wheelchair space:** there will be 4 wheelchair spaces in every train, 1 more than the 3 spaces required by RVAR for a train of this length. These spaces are located in the middle 2 carriages – known as "D" cars.
- **12 multi-purpose areas per train:** located in the middle of both the front three and rear three carriages, these will provide a space where passengers with luggage, prams, buggies or shopping can stand comfortably. They also contain 2 tip-up seats which passengers can use if the space is not in use.
- **Four times the priority seats required per train:** we have allocated and signed a priority seat next to every doorway. Each train will have 96 priority seats, 72 more than the 24 required by RVAR.
- **Low level floor lighting across door thresholds:** although there is no regulated step on the 09TS we have recognised the need to assist visually-impaired passengers identify the gap between the train and the platform. Therefore we have installed low level lighting to illuminate the edge of the vehicle in each doorway to assist all passengers as they board or alight.
- **Visual door closing indicators:** the 09TS does not have any door controls for use by passengers. However, we recognise the need for hearing impaired passengers to know that the doors are about to close. Therefore, we have incorporated illuminated (flashing) visual indicators in each doorway, which are synchronised with the audible door closure warnings.
- **Push-button passenger emergency alarms throughout**: RVAR only requires push-button alarms in wheelchair spaces. We felt that this easy-to-use design would benefit all passengers, and so have provided push-button alarms in every doorway, enabling all passengers to easily summon help if required. Each alarm provides visual reassurance of activation and enables direct voice communication to the train operator in addition to a link with the CCTV system.

We believe that we have designed the most accessible trains possible within the constraints of our service and infrastructure. If granted, a number of the exemptions will enable us to improve the service we provide to our disabled passengers – meeting the spirit if not the letter of the RVAR. With this background in mind, London Underground is seeking exemptions from the following aspects of the Rail Vehicle Accessibility Regulations 1998 under Section 47(3) of the Disability Discrimination Act 1995:

Regulation 4(3)(b) - Audible Door Closure Warnings

1. Full name of applicant and address

London Underground Limited
55 Broadway
London
SW1H 0BD

2. Description of Rail Vehicles

Victoria line 2009 Tube Stock - Vehicle numbers:

11001 to 11094 12001 to 12094 13001 to 13094 14001 to 14094

3. Circumstances in which exemptions are to apply

At all times in passenger service

4. Relevant requirements from which exemption is sought

Regulation 4(3)(b)

4(2) Each passenger doorway in the side of a regulated rail vehicle shall be fitted with an audible warning device which shall emit warning sounds in accordance with paragraph (3) inside and outside the vehicle in the proximity of each control device for that doorway or, if there is no such control device, adjacent to that doorway.

4(3) the audible warning device shall -

(b) if the door is operated by a member of the operator's staff, emit a different distinct sound commencing not less than 3 seconds before the door starts to close.

5. Technical, economic and operational reasons why exemption is sought

All London Underground trains currently give an audible door closure warning starting 1.75 (+/- 0.25) seconds before the doors begin to close. We believe this is sufficient and appropriate to the nature of our service.

The new 09TS vehicles can comply with the 3 second warning required by RVAR, however, we have a number of safety and operational concerns which are outlined below. We are requesting a short-term exemption in order to maintain continuity with the existing 67TS vehicles during

mixed fleet running when both vehicle types will be in use and conduct a trial using the 3 second warning. This will enable us to obtain accurate, quantifiable evidence and evaluate the impact of the additional time on the operation of the Victoria line and any changes to the safety and behaviour of passengers.

Safety Concerns

LU understands the significance and importance of the 3 second duration to disabled passengers, especially those with visual impairments. We have worked closely with the DfT on their "Design and Use of Rail Door Warning Systems for Sensory Impaired People" research – contributing funding towards Stage 1 of the research and hosting a trial at Charing Cross underground station as part of Stage 2.

However we have concerns about the safety of this duration in the Underground environment.

The existing 67TS vehicles on the Victoria line, along with all other vehicles currently in service on the Underground, use the 1.75 second warning.

As the both the 67TS and the new 09TS vehicles will be running alongside each other on the Victoria line for 3 years during the phased introduction of the new vehicles, LU believes that it is important for passenger safety and confidence that audible warnings are consistent across the whole line.

This will allow passengers to remain familiar with and recognise its meaning, minimising the risk of accidents. The use of varying warning durations across the two fleets would cause confusion amongst passengers and increase the risk of accidents and injury, especially amongst passengers moving between lines.

The current audible warning of 1.75 seconds has been in use on all LU trains for many years and we believe that it is appropriate to the nature of the service we operate.

On the Underground, the audible door closure warning is considered by most passengers as a 'hustle alarm'. During everyday service, the sounding of the alarm is used as the signal to run and jump onto the train as the doors are closing.

LU are concerned that extending the warning duration to 3 seconds will encourage additional passengers to attempt to board, increasing the risk of accidents and injury. It will also necessitates the re-opening of the doors which will delay the vehicles, causing service disruption and increased journey time for all passengers.

Operational Concerns

In operational terms, extending the warning would increase the dwell time at each station, which would have a cumulative effect along the entire journey.

The overall effect of these longer journey times across the whole fleet would mean that we would be unable to run the intended 33 trains per hour which would greatly reduce the benefit gained from the Victoria line Upgrade improvements.

6. The effect which non-compliance would have on a disabled person's ability to use rail vehicles of the description to which the application relates

LU considers that due to our existing standard operating procedures outlined in Section 7, the shorter audible door closure warning will have no effect on disabled passengers' ability to board the train safely.

The duration of the current warning has not been raised as a problem by individual passengers or during meetings with organisations representing visually impaired passengers, or during the recent LU 'Towards an Accessible Tube' public consultation.

The 09TS vehicle also have a new 'sensitive door edge' system which re-opens the doors if it detects a person or object in the doorway. This will ensure that people won't get trapped in the closing doors.

7. Any measures which could be taken to enable disabled persons to use the rail vehicle if exemption sought is granted

The door closure mechanism on Victoria line trains is operated by the train driver. Drivers are required to ensure that it is safe to close the doors by using the platform CCTV cameras via their in-cab monitors, which give an exterior view of the full length of the train at the platform. Drivers are trained to hold the train on the platform with the doors open if they see that someone is still boarding.

At stations where customer service assistants are present on the platform, they will not give the all clear for departure signal if they can see that someone is still boarding a train.

All of our staff are trained to identify when passengers may need assistance and receive disability awareness training to enable them to give appropriate assistance when necessary. If required station staff guide visually impaired passengers from the ticket hall to the platform and onto the train.

For LU staff, giving such assistance is an everyday occurrence.
London Underground regularly receives positive feedback and praise, including an award, from visually impaired passengers about the assistance given by staff.

8. Any proposals for later modification of rail vehicles to secure compliance with RVAR within a stated period

The system installed on the 09TS vehicles is capable of giving a 3 second audible warning before the doors start to close.

As part of the Victoria Line Upgrade, we will conduct a trial using the 3 second warning duration once the last 67TS vehicle has left service.

This trial will enable us to get accurate information about the impact of using a 3 second audible door closure warning on the operation of the Victoria line and any changes to the safety and behaviour of passengers.

If the trial shows that the 3 second warning is safe and causes minimum disruption on the service, the 3 second warning will remain in use.

LU is requesting this exemption as a precaution in case the trial shows that the 3 second warning is not appropriate in the Underground environment or causes an additional safety risk. In this situation the current 1.75 second warning would be reinstated.

9. Unless permanent exemption sought, the period during which exemption is to apply.

London Underground is requesting an exemption until 31st December 2013.

We believe this will give us enough time to undertake and evaluate the trial. Due to the above safety concerns, the trial will not start until the last 67TS train has left service in 2011.

During the mixed fleet running dual running LU will monitor the Victoria line and gather data and statistics on any incidents or accidents relating to the audible door closure warning.

We will then be able to compare this information against the data and statistics obtained during the trial of the 3 second audible door closure warning to give us a better understanding of the impact on the safety and behaviour of passengers.

Regulation 13(4) - Announcements to be made whilst at a station

1. Full name of applicant and address

London Underground Limited
55 Broadway
London
SW1H 0BD

2. Description of Rail Vehicles

Victoria line 2009 Tube Stock - Vehicle numbers:

11001 to 11094 12001 to 12094 13001 to 13094 14001 to 14094

3. Circumstances in which exemptions are to apply

At all times in passenger service.

4. Relevant requirements from which exemption is sought

Regulation 13(4)

Whilst the vehicle is stationary at a station or tram stop, the systems inside the passenger saloon and on the exterior of the vehicle shall be used to announce the destination of the vehicle, or, if the vehicle is following a circular route, the name and number of the route, and, in the case of systems inside the passenger saloon only, to announce the next stop.

5. Technical, economic and operational reasons why exemption is sought

London Underground is committed to providing sufficient timely, accurate and accessible customer information to enable our customers to be confident during their journey, make informed decisions and to minimise the impact of disruption.

Victoria line trains provide a fast, frequent service with short station stops. This greatly limits the amount of information we are able to give.

LU is seeking an exemption that would allow the removal of either the “next station” or ’terminus station’ information inside the saloon whilst the train is stationary at a platform.

The information systems in the new 09TS vehicles are capable of complying with this Regulation; however we strongly believe that we can provide a better service to passengers by reducing the amount of regulated information given. This would allow us to give additional information about service disruption, interchange with other transport modes or LU lines, and where appropriate high-level local and tourist information.

All regulated information will still be given inside the train between stations in both audible and visual formats. Passengers on the platform will be able to get information from a range of sources including audible station announcements, platform ‘next train’ display indicators, visual displays on the external side of the vehicle and fixed signage such as network maps.

The Victoria line runs on a direct route between Brixton and Walthamstow Central with no branches or junctions. Given this simple and straight forward route, LU believe that the 'next station' and 'terminal station' announcements serve the same purpose in providing reassurance to passengers that they are in a train heading in the right direction.

Stations on the Victoria line are close together, the vast majority are less than 3 minutes apart. If a passenger gets on a train headed in the wrong direction, they can usually turn around within 2-3 minutes.

Currently we are required to give the following information

> "The next station is Highbury and Islington. This is a Victoria line train to Walthamstow Central."

We would like to be able to just give either:

> "This is King's Cross St. Pancras; the next station is Highbury and Islington. This is a Victoria line train." or
>
> "This is King's Cross St. Pancras. This is a Victoria line train to Walthamstow Central."

This would enable us to give additional information which we believe is very important for people to make informed decision such as:

> "This is King's Cross St. Pancras. Change here for the Northern, Piccadilly, Metropolitan and Hammersmith & City lines, National and International Rail services. This is a Victoria line train to Walthamstow Central."

The new trains will also link to an intelligent service disruption system which will give updates to passengers about potential disruption to their journey. This integrated system will ensure that passengers are not given misleading information about interchange options that are not currently available to them.

Where necessary, to maintain the appropriate message length, the system will not give tourist/local information. For example:

> "This is King's Cross St. Pancras. Change here for the Piccadilly, Metropolitan and Hammersmith & City lines, National and International Rail services.
> There is currently no service on the Northern line from this station, please see staff for help with your onward journey. This is a Victoria line train to Walthamstow Central."

LU will consult with disabled people and their representative organisations to agree whether information about next station or terminus is more useful and meaning.

6. The effect which non-compliance would have on a disabled person's ability to use rail vehicles of the description to which the application relates

LU does not believe that this non-compliance would have any effect on a disabled person's ability to use the Victoria line. We firmly believe that it would in fact enable us to provide a better service to passengers.

We believe that there are a number of other audible and visual sources, both inside the train and on the platform, which enable a disabled passenger to be confident in the direction of the train and next station that the train will call at.

7. Any measures which could be taken to enable disabled persons to use the rail vehicle if exemption sought is granted

LU does not believe that this non-compliance disadvantages passengers on this line.

We believe that the main aim of this regulation is to give passengers information about heavy rail services where an express 'non stop' and a local stopping 'service' are being operated on the same route, or where a train may split during its journey to serve 2 different locations. In these situations there are usually much longer journey times between stations, so any error would have a much more significant impact on a disabled person's journey.

All of the regulated information will be provided in both audible and visual formats within the train between stations. The information is also available from a variety of sources on the platform before the train arrives and when it is stationary.

In addition, the stations on the Victoria line are close together, the vast majority are less than 3 minutes apart. If someone were to get on a train headed in the wrong direction, they would be able to quickly correct this.

8. Any proposals for later modification of rail vehicles to secure compliance with RVAR within a stated period

If during the introduction and use of these trains, LU receives significant feedback that this exemption is causing a problem for our customers, we will review the information given and amend the messages. This could be done relatively quickly and easily due to the sophisticated nature of the information systems in the new 09TS vehicles.

9. Unless permanent exemption sought, the period during which exemption is to apply.

LU is requesting an exemption until 31st December 2013. We believe this will give us enough time to evaluate the use of these messages.

During this time LU will engage with passengers to gather evidence about the suitability of the information provided. The first stage of this would be decide which information is more useful, next station or terminus. To understand this, LU will consult with disabled passengers and organisations representing disabled people.

Regulation 13(7) - Letter heights of passenger information displays

1. Full name of applicant and address

London Underground Limited
55 Broadway
London
SW1H 0BD

2. Description of Rail Vehicles

Victoria line 2009 Tube Stock - Vehicle numbers:

11001 to 11094 12001 to 12094 13001 to 13094 14001 to 14094

3. Circumstances in which exemptions are to apply

At all times in passenger service.

4. Relevant requirements from which exemption is sought

Regulation 13(7)

The first letter of, and numbers used in, announcements on visual systems shall be not less than 70 millimetres high on systems on the front of the vehicle and not less than 35 millimetres high on other systems, and all letters and numbers shall contrast with their background.

5. Technical, economic and operational reasons why exemption is sought

London Underground is committed to providing sufficient timely, accurate and accessible customer information to enable our customers to make informed decisions, be confident on their journey and to minimise the impact of disruption.

We can comply with this Regulation by installing the traditional 'dot matrix' display units in the 09TS vehicles. However, we believe that the quality of the information can be improved by taking advantage of new and improved technology.

London Underground is requesting this exemption in order to install the more advanced 'TFT' flat-screen display systems in the Victoria line trains as we believe that by using this new and innovative technology we can provide a better service to all of our customers.

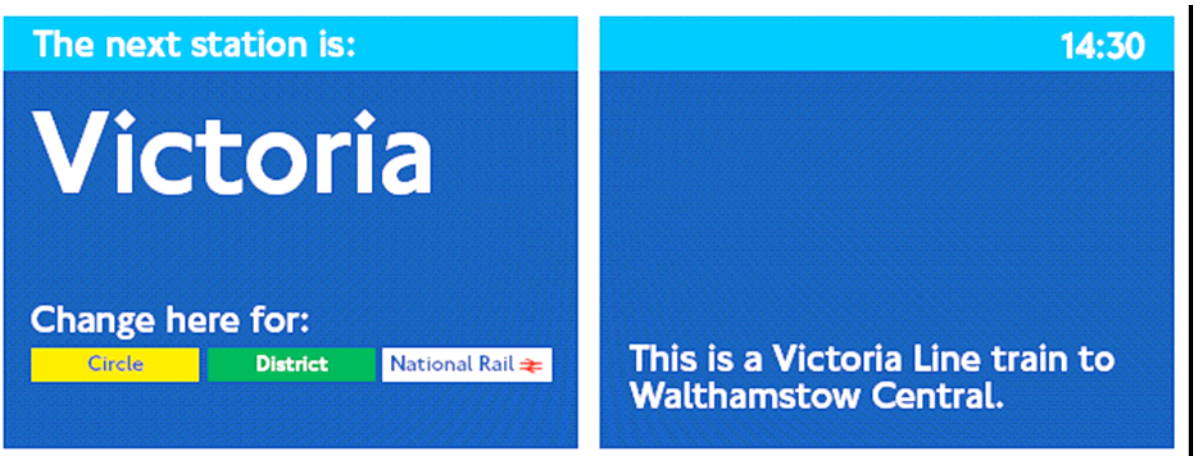
We believe that the quality, amount and flexibility of the information that the TFT screens can display is vastly superior to the dot matrix displays which are only able to display single colour, scrolling messages. Some of the many benefits of the TFT units are:

- They can display text in 'true' fonts, which means that the text is clearer and more defined.
- They can use a number of recognisable and familiar colours. For example using London Underground line colours e.g. Victoria line blue, Northern line black, District line green.

- They can use icons, pictograms and pictures – which will enable the information to be easily accessed and understood by passengers with a learning disability, dyslexia or whose first language isn't English.
- They can display large amounts of information at one time in a quick and easy to understand format.
- They can display words and messages in full, reducing if not removing the need for scrolling messages.
- They can display real-time service disruption information about LU lines, other TfL services and National Rail. This will assist passengers to make informed decisions about their onward travel.
- They can show video messages - LU is investigating the possibility of providing emergency information in British Sign Language (BSL) on the screens

The screens will have a standard layout which will allow passengers to become familiar with the location and meaning of information.

Due to the limited space available within these vehicles, we are restricted to using a display unit made up of 2 adjacent 12 inch display screens. We are seeking an exemption to enable us to display regulated information in a smaller font size where necessary to ensure that it can be displayed fully on the screen without the need for scrolling.



Example of the proposed screen layout on the TFT screen. More examples of proposed layouts are given in Annex A below.

We believe that due to the high quality of the displayed image and additional features such as colour and images, we can still deliver higher quality visual information using this smaller font size than by using the dot matrix systems.

Appendix A



A scrolling message provided on a Dot Matrix Indicator on the 09TS (as used for around 15 years).

Due to the structure and layout of the screen, the majority of information will be displayed in 4 different font sizes.

35mm Shorter Station Names
Brixton, Euston, Pimlico, Stockwell, Vauxhall, Victoria,

25mm Longer Station Names
Blackhorse Road, Finsbury Park, Green Park, Highbury & Islington, King's Cross St. Pancras, Oxford Circus, Seven Sisters, Tottenham Hale, Walthamstow Central, Warren St

13.5mm Emergency Information

11mm All other information

When considering the use of these screens, we have taken guidance from the RNIB best practice research on viewing distance, which is reproduced in the RVAR Guidance document. This guidance recognises the link between character height and the distance at which it is seen.

It shows that the 35 mm capital letter height is appropriate to be read by someone with 6/9 vision stood 10 metres from a display. (This is roughly the visual acuity required by the UK driving test). It also shows that a person with the same visual acuity should be able to see 11mm text from a distance of 3 metres.

The 09TS vehicles are considerably smaller that the mainline 'heavy rail' vehicles upon which the RVAR regulations were mainly based. In addition, due to the different internal lay out, the 09TS vehicles have more display screens per carriage. Six double unit displays in each carriage as opposed to the two usually found on mainline fleets. Passengers will therefore be considerably closer to the display screens.

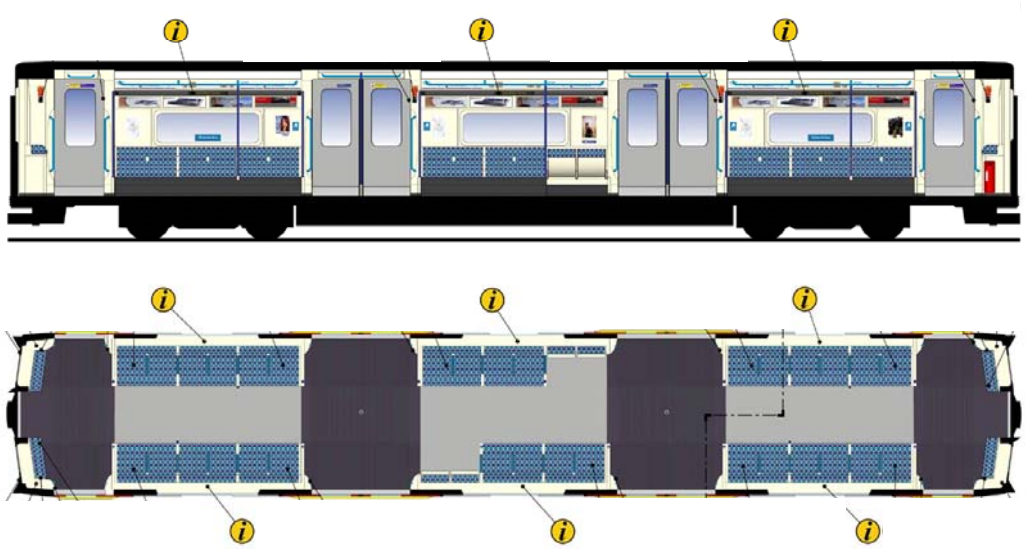


Diagram showing location of displays on the 09TS using either TFT screens or Dot Matrix displays.

The maximum viewing distance for anyone in a carriage to their closest display (TFT or dot-matrix) is 2.7 metres. This means that the proposed range of letter heights for all regulated information are larger than that recommended in the RNIB best practice guidance.

In addition, LU commissioned expert research and design guidance to ensure that the TFT screens in the Victoria line trains have the most appropriate and accessible format and screen layout.

Following a competitive tendering process the contract was awarded to Transport Design Consultancy (TDC). To ensure that the views and experience of disabled people were represented during the research and design process, TDC sub-contracted Guide Dogs for the Blind Association to hold a series of focus groups during the development of the screen design and layout.

These focus groups were made up of disabled people with a range of impairments, including those with visual and hearing impairments as well as people with learning difficulties and those whose first language is not English.

In addition to the specific designs and guidance for the Victoria line vehicles, TDC have produced an additional good practice guidance document for the design of information display screens which will be used to design information systems for future trains that may not have the same size and location restrictions as the 09TS vehicles.

A summary of the research process and findings is attached at Annex B of this application.

The system will not be used for 3rd party commercial advertising.

6. The effect which non-compliance would have on a disabled person's ability to use rail vehicles of the description to which the application relates

LU believes that the detrimental effect of this non-compliance on a disabled person's ability to use 09TS trains or to have equal access to the visual information provided would be limited.

We have met with DfT officials, and representatives of DPTAC, as well as members of TfL's own Independent Disability Advisory Group (IDAG) to demonstrate the TFT flat screen display system. We believe that the overall concept and potential benefits of the TFTs were warmly welcomed. However, we do accept that there are concerns about the reduction in character height, and have taken all of these comments and concerns on board.

We are convinced that the research and design guidance produced by the Transport Design Consultancy will enable us to produce the best solution to allow us to provide higher quality, more useful and accessible information to our customers.

7. Any measures which could be taken to enable disabled persons to use the rail vehicle if exemption sought is granted

LU believes that due to the high number of TFT display screens in each carriage and the relatively short viewing distances passengers would not be disadvantaged and would be able to make full use of the underground system.

As explained above, LU wishes to provide better quality, more comprehensive information in an accessible format to improve the service we provide to passengers.

The information provided on the displays will continue to be supported by an audible system, which will be of benefit to some passengers.

8. Any proposals for later modification of rail vehicles to secure compliance with RVAR within a stated period

LU will conduct market research into the accessibility and acceptability of the new displays with disabled passengers, especially those with sensory impairments and learning disabilities.

Given the large capital investment of at least £3.8m necessary to develop and install the TFT screens in the Victoria line trains along with the £20 million ongoing maintenance costs it is unlikely that LU would consider remove the screens and replacing them with the old fashioned dot matrix system. However, if the results of this research show that the TFT screens do not provide information in an acceptable and accessible way, LU will consider increasing the font size for regulated information. However such changes are likely to reduce the overall effectiveness of the system.

9. Unless permanent exemption sought, the period during which exemption is to apply.

LU is requesting an exemption until 31st December 2013. We believe this will give us enough time to undertake and evaluate the accessibility and effectiveness of the TFT flat screen visual display system in the Victoria line trains.

This exemption is only sought for the new display technology. Any dot-matrix indicators providing information in the saloon of a 09TS will continue to be compliant with this regulation.

Annex A: Examples of TFT Screen Layouts and Locations



Prototype TFTs installed in 09TS carriage mock -up

NB: this unit was temporarily fixed to demonstrate location within the carriage only and does not show the exact position. The sample text does not reflect the final font size or layout.



09TS carriage mock -up showing placement of TFT screen on right hand side and dot matrix on left.



TFT layout showing station name in 35mm



TFT layout showing station name in 35mm



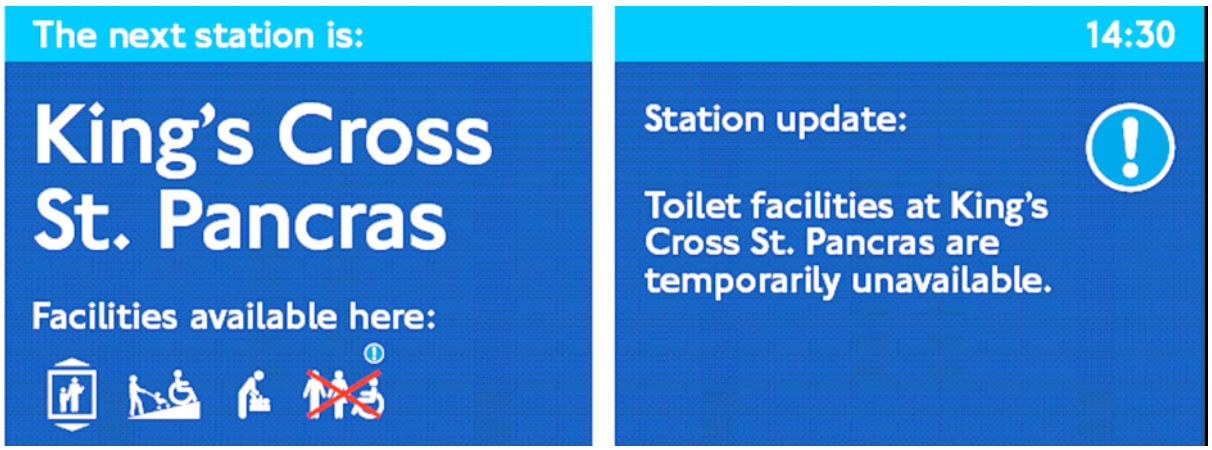
TFT layout showing additional interchange information



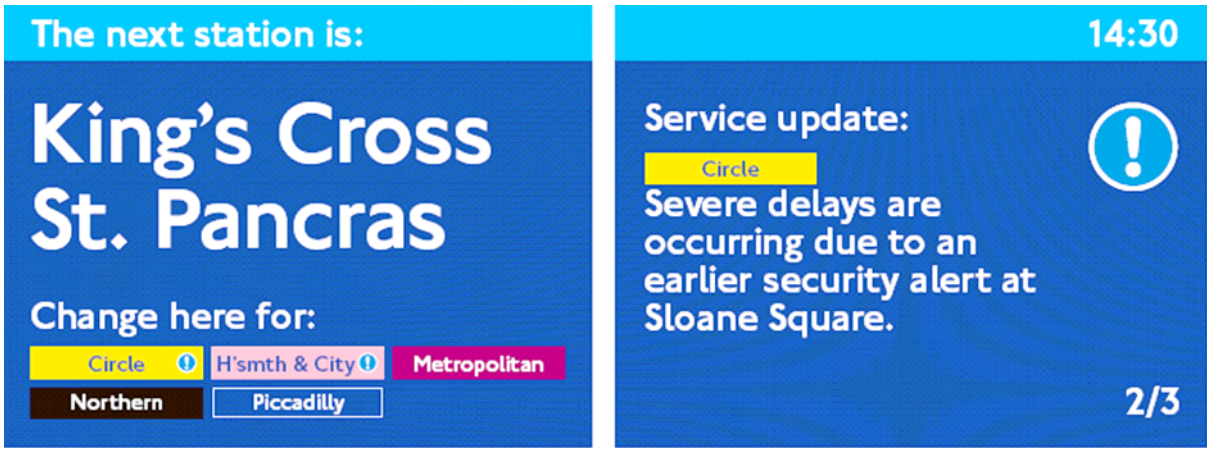
TFT layout showing additional information about facilities available



TFT layout showing additional information about facilities available



TFT layout showing additional information about facilities available and 'real time' information about out of order facilities



TFT layout showing additional 'real time' information about interchange between other LU lines and service disruption

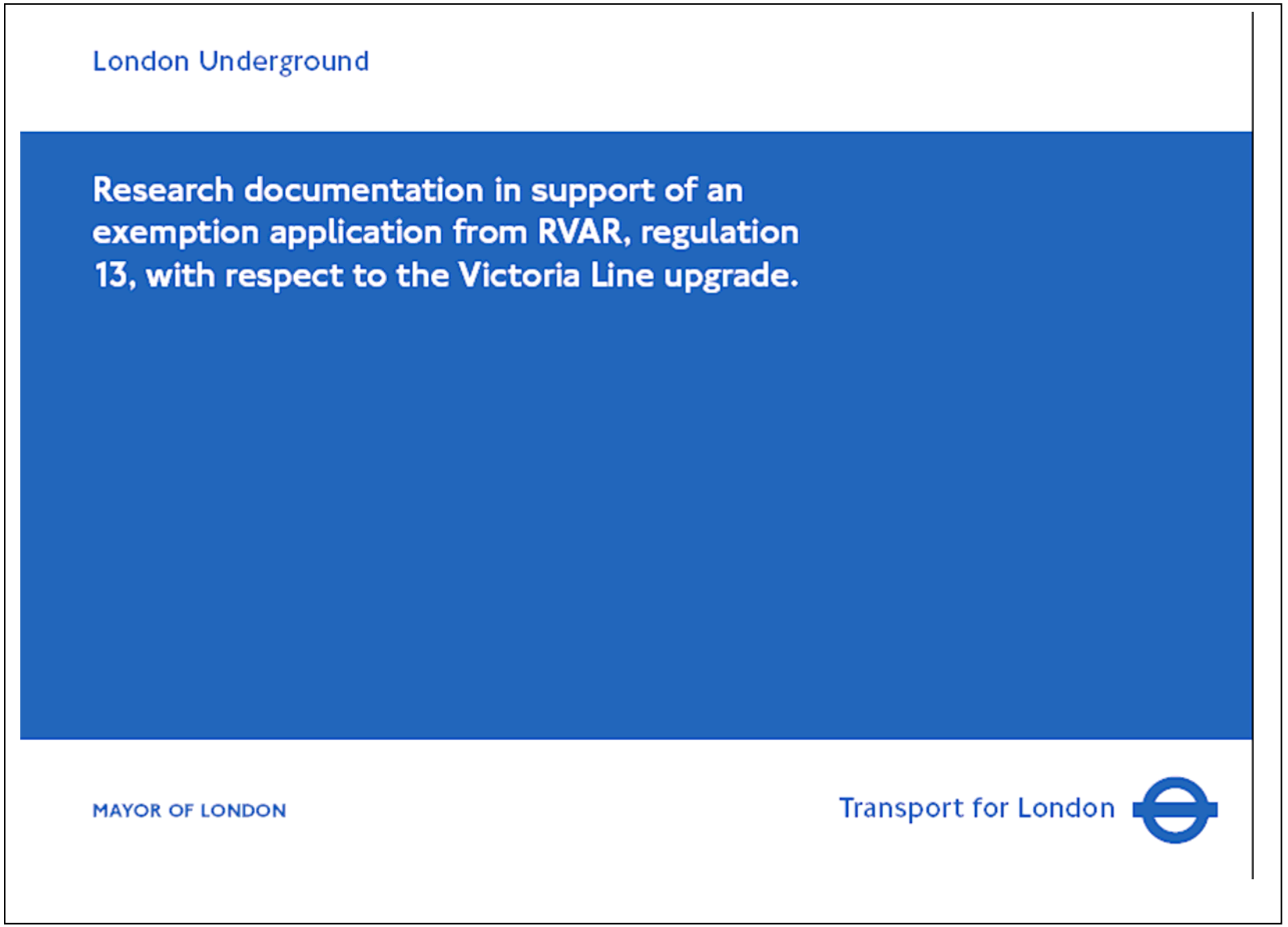


TFT layout showing additional 'real time' information about service disruption



TFT layout showing yellow Emergency Information screens

Annex B: Transport Design Consultancy - TFT Screen Research



Contents

1. Introduction

2. Project background

3. Exemption application summary

4. Placement of onboard electronic displays on VLU

5 Display types

6. Real-time disruption messages

7. Message Hierarchy

8. Reading distances

9. Text height

10. Colour use

11. Pictograms

12. Photographs

13. Emergency messages

14. Conclusion

1. Introduction

The purpose of this document is to support London Underground (LU) in their application for an exemption from the Rail Vehicle Accessibility Regulations 1998 (amended 2005) (RVAR), regulation 13 covering the provision of passenger information, for new Victoria Line trains.

Rolling stock upgrades on the underground network will introduce improved vehicle interiors. These will deliver greater access, enhanced safety and more comfortable environments for LU passengers. One aspect of the upgrade programme is to fit new TFT (Thin Film Transistor) or LCD information screens to replace the Dot Matrix Indicators (DMI) currently used. The proposed new screens will provide high quality displays of text and other graphic information with complete flexibility of content, including real-time updates on service information. TFT screens are fast becoming the standard public display format for text and graphics, achieving high resolution, fast display refresh, millions of colours, presenting symbols, photographs and moving images, if required.

The benefits of TFT display technology

The main advantage of the new screens is the amount of information they can display. The capacity for increased content means passengers are better informed about their journey, presented with regularly updated information concerning any service disruptions and alternative options as appropriate. Previously, there has only been the capability to announce disruption information audibly. In addition, TFT displays offer improved readability and visibility of on-screen text and graphics. The enhanced passenger information made possible by TFT screen technology should improve confidence and reduce anxiety among passengers, delivering a better quality journey for everyone.

The reason for an exemption application under RVAR

The design of the carriage interiors on LU is in many cases constrained by restricted ceiling height, which can limit the size of display screens that can be installed. On new Victoria Line trains six pairs of '12 inch' TFT screens will be positioned along the sides of each carriage. Because TFT screen technology is capable of displaying an increased amount of useful passenger information compared with the existing DMI system, its capacity to do so will be reduced if all text has to be shown at a height of 35mm as regulated by RVAR, given the limitations in screen size. The control system for the Victoria Line upgrade is more sophisticated than previously, allowing for improved accuracy and specificity of message depending on the situation where the train is located. Currently, it is unlikely fully compliant systems for the display of information inside trains will make full use of the potential improvements offered by this new functionality.

Consultancy project

Recognising the need to provide accessible customer information via TFT display technology, LU commissioned Transport Design Consultancy (TDC) to research and produce screen layout templates specifically for the Victoria Line upgrade and a generic good practice guide, documenting exemplary principles to inform the design of information displays for future upgrades on the tube network.

TDC are specialists in graphic design for transport services and have contributed to a number of studies for LU on accessibility, information presentation and legibility. For this project, the Guide Dogs for the Blind Association (Guide Dogs) was sub-contracted by TDC to facilitate a series of focus group events to discuss issues around accessible information display. Group participants included disabled people with a broad range of disabilities and representatives of potentially excluded groups whose first language is not English or who speak no English. Guide Dogs submitted a summary report of the findings from the groups which at each stage informed the development of the screen layout designs. Guide Dogs also contributed to the content of the good practice guide. Outcomes and recommendations from the project relevant to the RVAR are described on the following pages.

2. Project background

Objectives

The main aim was to establish good-practice criteria for the audio-visual presentation of customer information on underground trains to help ensure consistency across the network. Integral to the project's outcome were the principles that onboard information should be accessible by everyone, reflect industry best practice and maximise the benefits of digital displays.

Another aim of the project involved considering the optimum display of customer information within the constraints of the design for new Victoria Line trains, given the fixed hardware specification and installation of pairs of 12-inch TFT screens.

Methodology

The project comprised two main strands involving graphic design for onboard electronic signing undertaken in parallel with a series of focus group meetings to gain feedback on developments at each stage of the design process.

The emphasis of the focus groups was to consider the needs of disabled people in light of the existing legislation covered by the Disability Discrimination Act (DDA) (2005) Part 5, Rail Vehicle Accessibility Regulations (RVAR). Group discussions explored how the proposed information displays might benefit disabled people, particularly people with visual impairments. Questions were also raised concerning the current rules for electronic information displays and whether they will continue to be appropriate, given the advanced capabilities of new screen technology.

An additional focus group was held at the start of the project to establish whether people whose first language is not English or who speak no English have any specific needs which are different from disabled people, including people with learning disabilities who have problems with written English. Participants in the language group included representatives from the London Borough of Camden, Regional Language Network and Visit London.

The disability group consisted of a broad range of disabled people, including wheelchair users, a blind guide dog owner, a deaf BSL user, partially sighted people and people with learning disabilities. All members of the group travel on London Underground.

The aim of the first two focus groups covering disability and use of English was to consider the range of requirements the presentation of electronic information on trains needs to address. The issues discussed by the language group were in line with those raised at the disability focus group and responses showed no conflict with the concerns of disabled participants.

The disability participants took part in two further focus groups mid way through the project as well as a session at the end to review final design recommendations. The comments and concerns expressed at the initial and interim meetings were taken into account when fine tuning proposals for the presentation and content of electronic information on new Victoria Line trains alongside models indicative of best practice for subsequent upgrades.

Representatives from London Underground's Accessibility and Inclusion team attended all the focus group meetings. Comments from the focus group participants contributed towards the development of the good practice guide as well as the design of the screen layouts to be displayed on new Victoria Line trains. We are grateful to them for their assistance.

3. Exemption application summary

Electronic information displays on LU vehicles have been limited to single colour Dot Matrix Indicators or DMIs for the last 12 years. It is proposed TFT screens replace these older displays within the interiors of new or refurbished underground trains. As they currently stand, the RVAR in regulation 13 address the display of electronic information in trains using an illustration of a DMI to illustrate examples of good and bad text without reference to other information display technology. The regulation specifies text should be displayed at a minimum character height of 35mm. On LU vehicles, DMI displays are used primarily to announce the next station name and the end destination of the train journey. Currently, passengers need to rely on audible announcements for service disruption information.

For a readable DMI display on board underground trains, 35mm text has to scroll right to left to fit the message lengths into the limited width of the indicator casing, which can cause difficulties for people with low vision. Despite their superior display quality, TFT screens are also physically limited in size. On TFT screens proposed for LU vehicle upgrades as part of the good practice recommendations, the primary message announcing the next station name can be displayed at 35mm in height. The screens for the initial upgrade on Victoria Line stock have been fixed at 12-inch models, which means longer station names such as Walthamstow Central need to be shown at a smaller size if they are to fit on the screen without scrolling. Six station names can be accommodated at 35mm character height, including Brixton, Stockwell, Vauxhall, Pimlico, Victoria and Euston.

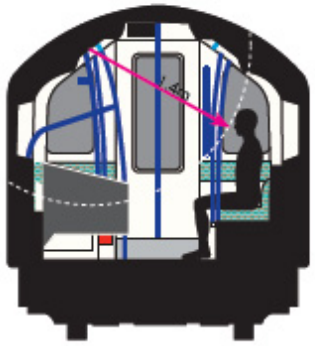
LU are seeking an exemption from this regulation for those station names on the Victoria Line that are too long to be displayed at 35mm.

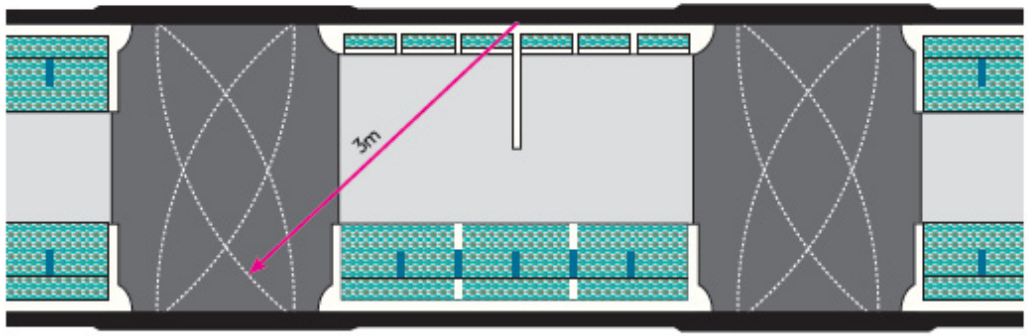
In addition, LU are seeking a wider exemption from the requirement for all regulated text to be displayed at a minimum of 35mm on the basis that:

- TFT screens offer much greater readability than DMI displays
- Smaller text height allows for the display of an increased amount of information
- Text sizes used on TFT screens conform to reading distance charts included in the RVAR guidance.
- Increased frequency of screens and shorter maximum reading distances on underground trains.

On the following pages, there are illustrations showing what is proposed for electronic signing on LU vehicle upgrades and screen layout displays recommended by TDC.

4. Placement of onboard electronic displays on VLU

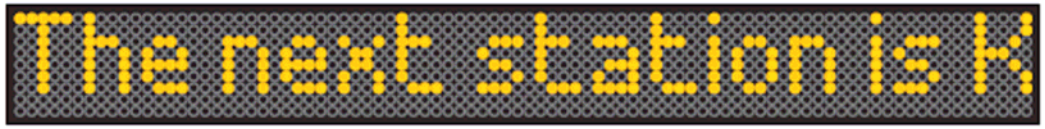


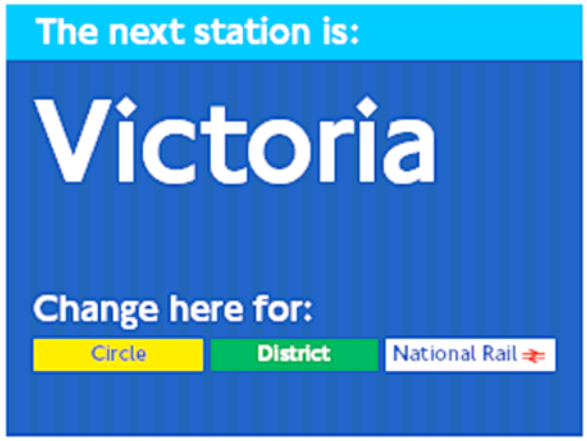


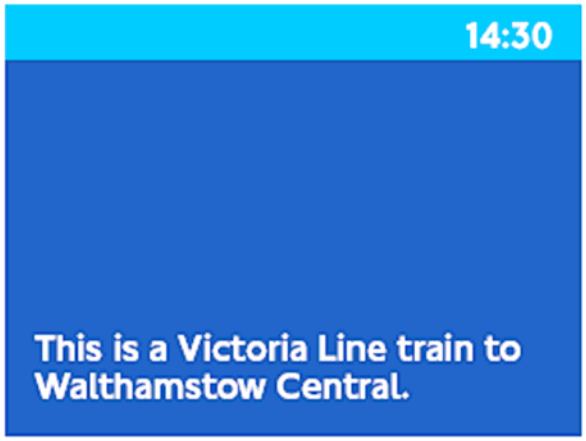
Almost all Underground trains have restricted head room, plus draught screens, poles and, not least, standing passengers. These can all restrict the view of the screens. In the Victoria line trains screens are positioned opposite each bank of seats, where the reading distance will be around 1.4 to 2.4m for seated passengers. In addition, each carriage is fitted with six pairs of screens compared to two screens on heavy rail vehicles which also have longer reading distances.

For passengers standing in vestibules, the maximum reading distance will extend to 3m. At this maximum reading distance, the supporting text shown on screen at 11mm in height will be readable by all passengers with average eyesight, following the reading distance chart based on the RVAR guidance shown on page 11.

5. Display types





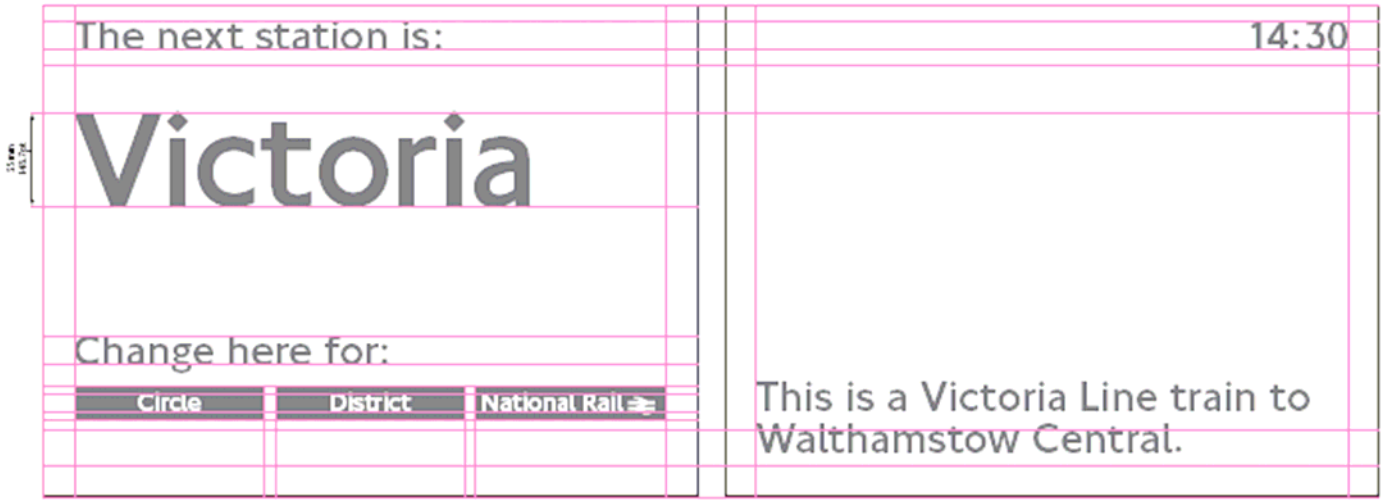


DMI displays on underground vehicles are limited in length and messages have to scroll. TFT screens can be used in pairs and are able to display much more information. The character shapes on the DMIs are clearly limited, with a maximum resolution of only 5 dpi (or 35 pixels per capital character). By contrast, the TFT screen allows for a minimum resolution of 82 dpi (9,400 pixels per capital character). In practice, DMIs would have difficulty defining characters at anything less than 35mm in height and the characters do not meet DfT/SRA standards or 'Good Practice' with regard to character shape, spacing, line weights, etc.

The TFT screens can use the New Johnston typeface which has been re-drawn for greater legibility on electronic screens.

Having to work with pairs of screens for the Victoria Line upgrade has informed good practice moving ahead. Pairs of screens enable the consistent flow of information concerning the next station and this station on the left screen, with more detailed and frequently changing information shown on the right. This approach to display screens received a positive response from the focus groups.

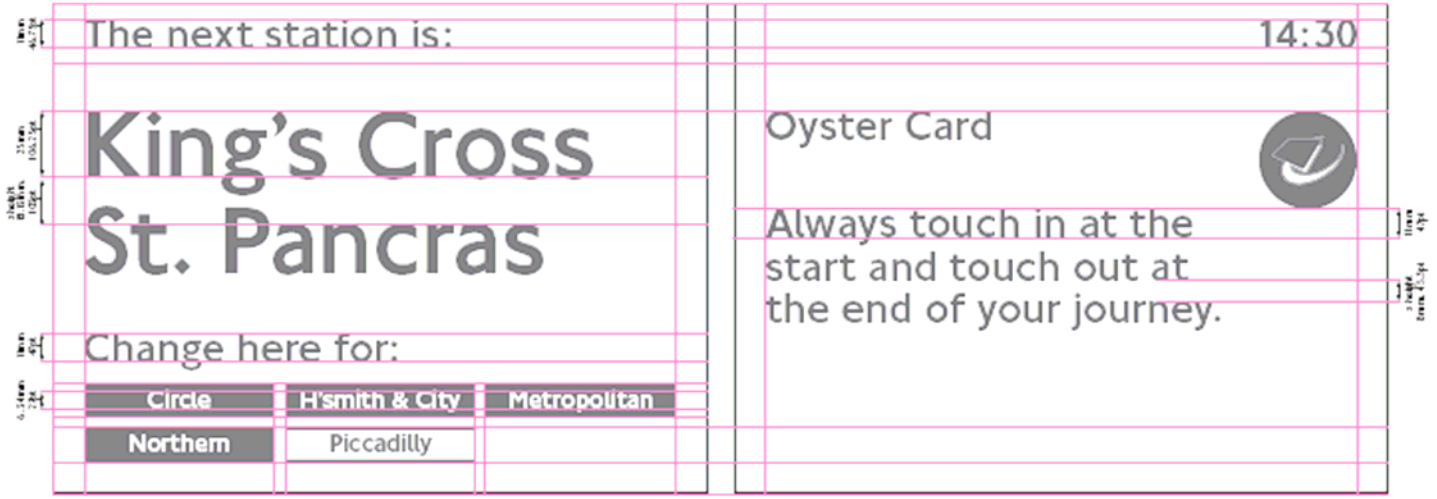
6. Type sizes



The primary message function of onboard displays is to announce the next station together with interchange information and any disruptions which may affect passengers' journeys. Combined with static line maps, the visual and audio announcements of station names provide for increased passenger confidence. Station names should be displayed as large as possible taking into account the length of the name and size of screens deployed inside trains. On the12-inch screens planned for the Victoria Line upgrade, station names on the Victoria Line can be displayed at either 35mm height or 25mm height, depending upon the length of name.

In accordance with the text readability notes included in the RVAR guidance, 35mm text height can be read from a 10m distance by someone with average 6/9 visual acuity. On the same scale, 25mm text can be read at a 7m distance. Disability focus group participants believed it was important to use a larger text size where the length of the station name allows, for example, Brixton and Victoria, despite the inconsistency in character size for longer station names such as Walthamstow Central.

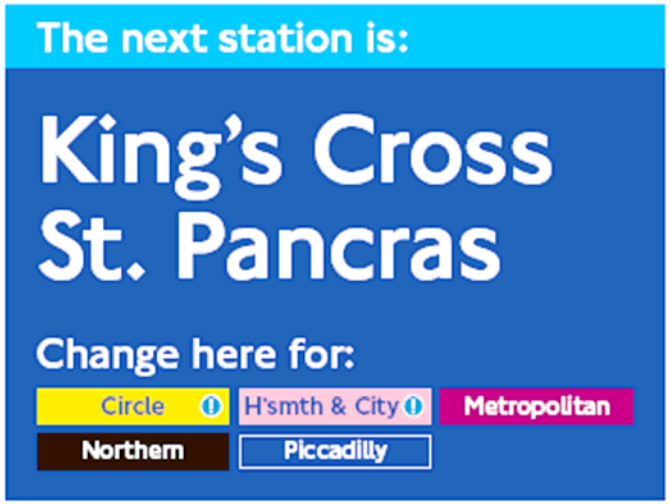
6. Type sizes (cont'd)

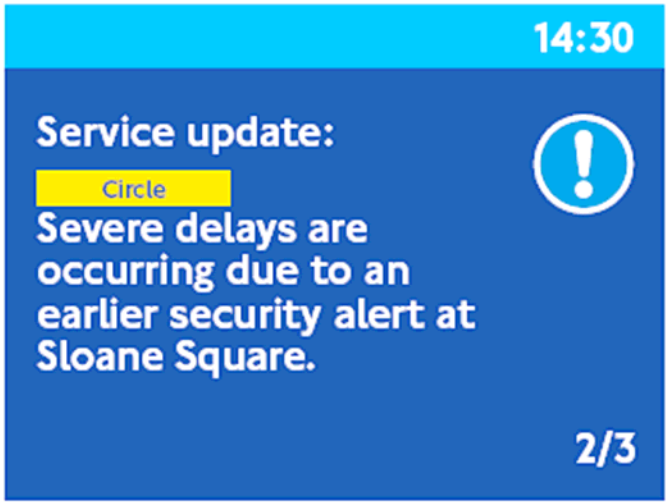


On Victoria line carriage screens most of the supporting text is displayed at 11mm character height, including the clock numerals. In accordance with the text readability statement in the RVAR guidance, 11mm text height can be read from a 3m distance by someone with average 6/9 visual acuity.

A smaller text size is used in the coloured line bars, on the basis that people tend to recognise the block of colour as referring to interchange lines, with text used only as confirmation. On emergency screens shown on '12 inch' TFT displays, a text size of 13.5mm is possible, achieving a balance between improved readability and the amount of text message that can be displayed.

7. Real-time disruption messages





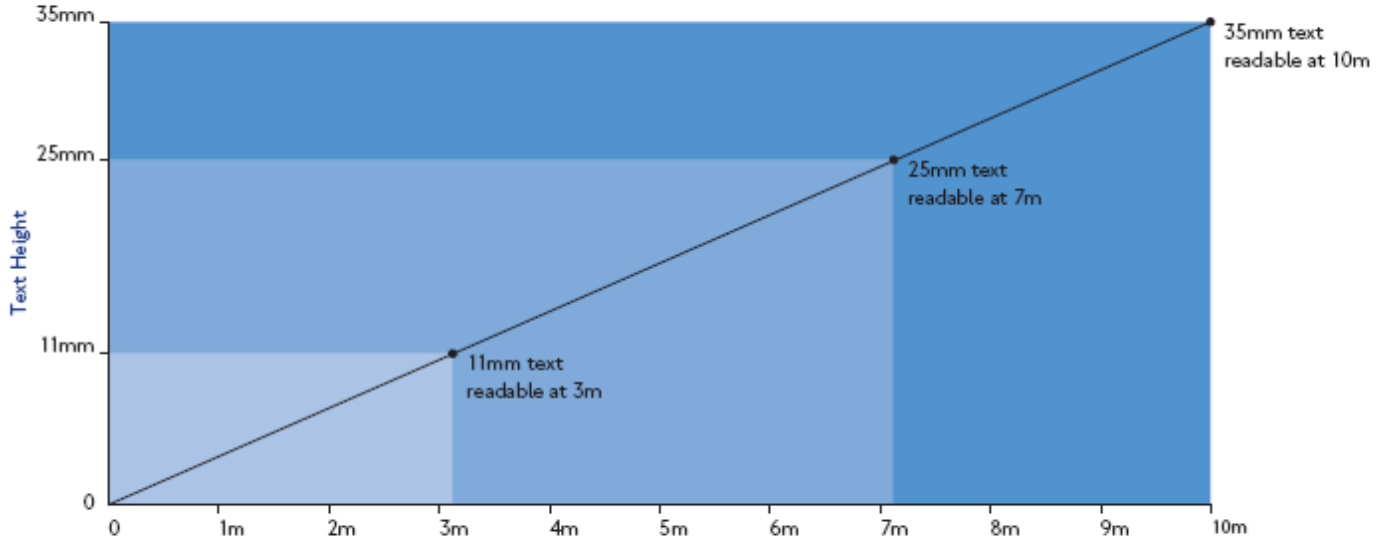
Disruption messages clearly demonstrate the advantages of TFT screens. Focus group participants confirmed that the provision of more detailed and timely information concerning the train journey can alleviate anxiety and provide reassurance. Disruptions that may affect the current journey or connecting services are particularly important and the TFT screens allow detailed text messages to explain the nature of each disruption.

The 11mm text height allows sufficient room for the standard disruption messages to be displayed on a single screen.

The messages need to be concise and easy to understand and if a longer or additional message needs to be displayed then additional 'pages' are used. Disruption messages are accompanied by the 'alert' icon (which pulses on and off at one second intervals) within the affected line colour band on the left hand screen.

Where messages run over more than one page or screen, the number of messages is indicated at the bottom right of the right screen, as shown.

8. Reading distances



Reading distances based on an average visual acuity of 6/9

The RVAR guidance states "A character height of 35mm can be read at approximately 10 metres by a person with a visual acuity equivalent to that required to pass a driving test". This allows for a readability chart to be constructed to determine the readability of different text heights. On this basis, text at 25mm in height can be read at 7 metres distance and a text height of 11mm can be read at just over 3 metres.

The RVAR guidance does not appear to take into consideration that text needs to be larger than the specified 35mm minimum character height to be capable of being read by someone registered as partially sighted, despite a person with average visual acuity being able to read text at this size from a distance of 10m, according to the above chart.

It should also be remembered, when considering the character height of text in relation to reading distances, audio announcements support the information presented visually on screen.

9. Text height

35mm

35mm text - readable at 10m

25mm

25mm text - readable at 7m

11mm

11mm text - readable at 3m

As a comparison - the three main text height sizes used on the VLU displays are shown above.

10. Colour use

	Piccadilly line Underground dark blue RGB 0R 45G 115B	Central Line Underground red RGB 223R 0G 44B	Victoria line Underground light blue RGB 0R 118G 189B	District line Underground green RGB 13R 105G 40B	Circle line Underground yellow RGB 247R 220G 0B	Metropolitan line Underground magenta RGB 139R 0G 76B	Bakerloo line Underground brown RGB 171R 102G 18B	East London line Underground orange RGB 243R 186G 34B	Hammersmith & City line Underground pink RGB 245R 166G 179B	Northern line Underground black RGB 0R 0G 0B	Jubilee line Underground light grey RGB 118R 123G 127B	Waterloo & City line Underground turquoise RGB 137R 203G 193B	Sign frames Underground dark grey RGB 56R 61G 66B	Underground white RGB 225R 255G 255B	Underground safety blue RGB 0R 79G 179B	Underground safety red RGB 223R 0G 44B
Background/screen																
Line colour strip	●	●	●	●	●	●	●	●	●	●	●					
Text colours	●									●				●		
Emergency screen background					●											
Icon/pictograms	●				●						●				●	●
National Rail interchange										●				●		
International Rail interchange													●	●		

A clear advantage of using TFT screens is the availability of full colour displays. For LU this is particularly important where the different lines are represented. Passengers generally rely more on the line colour than the name to distinguish between the different lines, using the name as confirmation. Adjustments were made to the way text was shown against the line colour background as a result of feedback from the focus groups. For example, the Piccadilly Line was originally illustrated using dark blue text against a white background. This was subsequently changed to white text against the line dark blue background for greater contrast, using a white keyline to separate the line colour block from the screen background. To aid constrast on Circle and Hammersmith and City Line graphics, text is shown blue against yellow in the first instance and against pink in the latter.

Colour displays allow a greater choice of contrast values and the ability to highlight messages or icons. The use of the Piccadilly line Underground dark blue for the screen background was generally considered to provide excellent contrast by the focus group.

11. Pictograms



The high resolution of TFT screens means that pictograms and icons can be clearly displayed, which is not possible using DMIs. These graphic images provide a useful 'shorthand' and can replace a longer text message. More importantly, they help passengers with learning disabilities, people who cannot read and people whose first language is not English or who speak no English.

Feedback from both the disability and English-language focus groups indicated very strong support for the use of pictograms. Wheelchair users appreciated advance notification of access and facilites available at approaching stations, particularly if they were unavailable for any reason.

12. Photographs



The introduction of TFT screens for electronic signing on trains means it is possible for the first time to include photographs to accompany on-screen messages. There was a very positive response from both the disability and English-language focus groups to using photographs as an aid to communication with passenges. Their introduction was considered to be of particular benefit to tourists and anyone whose first language is not English or who speak no English, visually impaired people and people with learning disabilities.

The screens layouts are designed so that photographs are always positioned on the right hand screen as supplementary information. Under no circumstance should photographs be shown as advertisements.

13. Emergency messages

Due to an incident this train is being held here for a while until additional staff come to assist.

1/3



During an emergency announcement the TFT screens are changed to yellow and a combination of short clear messages with appropriate icons are used on the left hand screens. The right hand screens are used for visual support and to clarify the message content. Images or instructional diagrams can be used, as well as short animation sequences or video.

14. Conclusion

The Rail Vehicle Accessibility Regulations are intended to support the best quality, clearest, readable text when used on electronic vehicle displays. When the RVAR were first introduced, crude single-line DMIs were the only type of display technology available. Consequently, a large text height was specified, presumably to overcome some of the limitations inherent in the dot matrix system.

For DMI displays to accommodate the full length of even simple text messages, the text has to scroll from right to left. Scrolling displays are very difficult to read by people with visual impairment, people with learning disabilities and people whose first language is not English. Feedback from both the disability and English-language focus groups endorsed this view. In addition, the way information is displayed without scrolling on the proposed new TFT screens was welcomed.

The RVAR state that text at a height of 35mm is readable from a maximum of 10m (supported by the reading distance table) and this provides a guide on how far from seated passengers the displays should be placed. This guidance while applicable to heavy rail vehicles is perhaps not always appropriate for underground trains which generally have different seating arrangements and smaller interiors with lower ceilings. For the proposed interior electronic signing arrangement on the Victoria Line upgrade, seated or standing passengers will not be more than 3m from the pairs of screens.

Using this guidance, it is not unreasonable to suggest that the maximum reading distance, as defined in RVAR be used to determine text size for new electronic displays on underground trains. For example, a 3m reading distance would require a minimum text height of 11mm, as explained earlier. Regulated messages such as station names should continue to be shown as large as possible where the viewable area on screens allows, up to a maximum of 35mm and a minimum of 25mm, depending upon the length of station name.

The disability focus group recognised this was a pragmatic approach to solving the problem of text size for regulated information on the '12 inch' screens for the Victoria Line upgrade. On '15 inch' pairs of screens recommended for future upgrades, all station names with very few exceptions are capable of being displayed at a character height of 35mm. Where station names are very long, such as Rickmansworth, abbreviations could be considered to maintain a text height of 35mm.

The reason for using TFT screens instead of DMIs is to improve both the quality of display and provide more comprehensive content. Using different text sizes provides a hierarchy for the type of content displayed, making messages and their relative importance easier to understand.

The Victoria Line upgrade is the first new train fleet on the LU system since 1996 and the first to have TFT electronic information displays installed inside the trains. The introduction of new screens as part of the Victoria Line upgrade also provides an opportunity for LU to test the rationale for the way messages are displayed while the train is in operation, obtaining feedback from passengers. The findings will then further inform recommendations on good practice for future operational upgrades looking ahead. It could also help set new standards applicable for emerging display technologies covering readability, message structure and clarity of layout.

Regulation 23(1) - Boarding devices at wheelchair accessible doorways

1. Full name of applicant and address

London Underground Limited
55 Broadway
London
SW1H 0BD

2. Description of Rail Vehicles

Victoria line 2009 Tube Stock trains – Vehicle numbers:

14001 to 14094

This exemption only applies to the 94 'D' cars which will be used as the middle two cars in each train. They differ in layout to the other cars in the train as they contain the wheelchair spaces.

The exemption relates specifically to the wheelchair compatible doorways in these carriages.

3. Circumstances in which exemptions are to apply

At all times in passenger service, when an 09TS train stops at a Victoria line station which does not have a step-free access route from the platform out of the station, or to platforms for other lines or rail services.

A phased programme of deadlines for compliance is set out below with details of the circumstances in which they will apply. This timetable corresponds with station infrastructure works programme and will enable step-free access throughout the stations.

A) During the period of mixed fleet running when both the existing 67TS and new 09TS trains will be in service on the Victoria line:

Station	**Exemption required until**
King's Cross St. Pancras	31st December 2009

B) During the transitional period following the removal of the last 67TS train whilst planned infrastructure works take place to provide step-free access route from the train out of the station:

Station	**Exemption required until**
Vauxhall	31st December 2011
Stockwell	31st December 2011
Green Park	31st December 2012
Highbury & Islington	31st December 2012
Finsbury Park	31st December 2012
Victoria	31st August 2013

C) During the transitional period following the removal of the last 67TS train at stations where step-free routes between platforms exist:

Station	Exemption required until
Seven Sisters	31st August 2013
Oxford Circus	31st August 2013
Warren St	31st August 2013
Euston	31st August 2013
Blackhorse Road	31st August 2013
Walthamstow Central	31st August 2013

D) Until such time as a station has a step-free access route from the platform out of the station or between platforms.

Station	Exemption required until
Pimlico	Until such time as the station is made step-free

4. Relevant requirements from which exemption is sought

Regulation 23(1)

When a wheelchair-compatible doorway in a regulated rail vehicle is open at a platform at a station or a tram stop a boarding device must be fitted between that doorway and the platform or stop if a disabled person in a wheelchair wishes to use that doorway, unless the gap between the edge of the doorsill of that doorway and the edge of the platform or stop is not more than 75 millimetres measured horizontally and not more than 50 millimetres measured vertically.

5. Technical, economic and operational reasons why exemption is sought

London Underground's aim is to provide a 'turn up and go' service which allows passengers the greatest level of independent access without the need for staff intervention and assistance.

We recognise that the step and gap between the platform and train can cause a significant problem for many passengers and have invested a great deal of time and money to develop appropriate permanent solutions.

On the Victoria Line we are intending to use 'platform humps' to raise relevant sections of the platform to the same height as the train to give permanent level access to the 2 central 'D' cars where the wheelchair spaces are located.

This approach will mean significant costs and infrastructure work; however we believe that it is the best solution for providing independent access to passengers.



Picture showing platform humps giving level access to 2 central wheelchair compatible doors on the Waterloo and City Line. More pictures illustrating platform humps can be found in Annex C.

We investigated other methods of achieving level access between the trains and platform, including the use of manual boarding ramps. However, these did not appear to give such a high level of permanent independent access to the Victoria line vehicles. In particular, manual boarding ramps are considered to be unsuitable for use on the Victoria line due to the limited space and high number of passengers on platforms, short platform dwell times and high number of trains - 33 trains per hour - in peak periods following the upgrade.

We are requesting a series of short-term exemptions to allow us to phase the installation of these humps in line with our existing Step-free Access programme. The Step-free Access programme will undertake major infrastructure works, such as the installation of lifts, to make accessible routes through stations without the need to use stairs or escalators.

We understand that this is not an ideal solution, as it does not give immediate independent access to all passengers at all stations on the Victoria line. However, we believe that this is a pragmatic and realistic solution. It takes account of the reality that many underground stations are not currently accessible to all passengers, especially wheelchair users and others with mobility impairments.
LU understands the importance of a seamless accessible route from the street through the station and on to the train. We recognise the confusion, inconvenience and distress that a passenger could experience if they got off the train using a platform hump only to find that there is no accessible route from the platform out of the station.

We are concerned that installing platform humps at stations where there is no step-free route from the platform out of the station would give passengers inaccurate and misleading information and would increase the risk of passengers being stranded on the platform.

It is our intention to link the two programmes of work together so that the works to give level access between the train and platform will take place at the same time as works to provide step-free access between the platform and street. This will enable us to provide a fully seamless step-free route from the train through the station and out to the street.

As part of the current LU Step-free Access Programme 9 out of the 16 Victoria Line stations will become step-free from street to platform by the end of 2013.

Currently only Brixton and Tottenham Hale stations are step-free. We aim to install platform humps at these 2 stations during 2008 to give a complete step-free route from the train and out of the station before the first 09TS vehicle enters passenger service.

We would then install platform humps at 7 other stations as part of their planned whole-station Step-free Access Programme works.

These would be completed as follows:

King's Cross St Pancras	31st December 2009
Vauxhall	31st December 2011
Stockwell	31st December 2011
Green Park	31st December 2012
Highbury & Islington	31st December 2012
Finsbury Park	31st December 2012
Victoria	31st August 2013

By linking the 2 programmes together we will also be able to minimise the necessary service disruption and station closures.

To install a platform hump we need to close the station for a weekend so that work can take place on the platforms. This obviously causes major disruption and inconvenience for all passengers. By linking the 2 schemes of work together we can limit the number of weekend closures required.

Once the last of the 67TS trains have been taken out of service in 2011 we will begin to install humps at other stations where there is an accessible route between the Victoria line and other lines. This will mean that passengers will be able to interchange between lines even if they may not be able to exit the station.

This programme of works takes account of the Olympic Games which will be taking place in London in 2012. Understandably, we will not be able to have any station or track closures during the lead up to or during the Games themselves.

Humps will be installed at all stations except for Pimlico by the end of 2013. There are currently no plans to make Pimlico station step-free, however installation of platform humps would be a key factor to any future plans.

6. The effect which non-compliance would have on a disabled person's ability to use rail vehicles of the description to which the application relates

LU does not believe that phasing the installation of the platform humps in this way will have a significant effect on disabled peoples' ability to travel.

As this short-term exemption relates specifically to stations where there is no step-free access route through the station, LU does not believe that it would be appropriate to provide any interim measures to give level access to the platform.

We believe that joining up the two programmes of work will provide the most appropriate, beneficial and passenger focused solution which will prevent passengers from getting stranded on platforms at stations where there is no step-free exit from the platform through the station to the street.

As mentioned previously, manual boarding ramps have been assessed as unsuitable for the Victoria line due to the constraints of the infrastructure and intensity of the service.

In the event of service failure or an emergency, passengers will be 'detrained' using the appropriate operational procedure and evacuation equipment.

7. Any measures which could be taken to enable disabled persons to use the rail vehicle if exemption sought is granted

This is a short term exemption to enable LU to phase the installation of platform humps. Our medium and long term solutions will provide an appropriate, accessible and sustainable solution to give greater independent access for disabled passengers.

The number of locations affected by this exemption will reduce as works are carried out to make stations step-free.

As part of the Victoria Line Upgrade, LU has developed an extensive information and communication programme. This has been very successful and effective in ensuring that customers are aware of the upgrade and any effect it will have on the service. For example the current campaign to ensure customers are aware that the Victoria line service ends at 10pm Monday – Thursday to allow the new trains to be tested and preliminary infrastructure works to take place.

Information about the improved accessibility of the Victoria line trains and stations will form a significant part of the overarching Victoria Line Upgrade campaign. In addition, an 'accessibility' specific campaign will run along side, giving more detailed information to customers about both improvements to the service and any ongoing access limitations. As well as existing customers, this information campaign will target disabled Londoners who live or work near Victoria line stations who may not previously have been able to access the Victoria line.

We will use this information campaign to give customers and local people more detailed information about the timescales and accessibility improvements at individual stations.

8. Any proposals for later modification of rail vehicles to secure compliance with RVAR within a stated period

LU have developed a programme of works which will deliver step-free access and RVAR compliance at Victoria Line stations when we provide step-free access between the platform and street or step-free interchange between platforms.

9. Unless permanent exemption sought, the period during which exemption is to apply.

London Underground is requesting short term exemptions in line with the timescale set out in Section 2.

Annex C: Images showing step and gap between train and platform

Without a Platform Hump





With a Platform Hump





These images show the ‘temporary’ platform humps installed as a trial on the Waterloo and City line platforms. A more permanent design has been developed for use on the Victoria Line Upgrade.

Appendix B

Ann Bates
Chair of the Rail Working Group
Disabled Persons Transport Advisory Committee

2/23 Great Minster House
76 Marsham Street
London
SW1P 4DR

Direct line: 020 7944 8013
E-mail: dptac@dft.gov.uk
Fax: 020 7944 6998
Website: www.dptac.gov.uk

Mr Nathan Cole
Rail Standards and Safety
4/34 Great Minster House
76 Marsham Street
London
SW1P 4DR

Dear Nathan,

Disability Discrimination Act 1995: Section 47 - Exemption Application by London Underground Ltd

Thank you for your letter dated 12 June 2008 seeking DPTAC's advice on London Undergrounds application for exemption under Section 47(3) of the Disability Discrimination Act 1995.

DPTAC have considered this exemption application from London Underground Limited to the Secretary of State for exemption from regulations 4(3)(b), 13(4), 13(7) and 23(1) of the Rail Vehicle Accessibility Regulations 1998.

After careful consideration of the full application, DPTAC recommend the following:

Regulation 4(3)(b) – Audible Door Closure:
DPTAC are broadly content with LU's plans for this but would point out that people with visual impairments use these sounds in a different way to the 'hustle' effect described. DPTAC would strongly resist any attempt to reduce these timings.

Regulation 13(4) – Announcements to be made whilst at a station:
DPTAC are happy with this dispensation request. Too much audible information can result in auditory overload. Information provision is crucial to all passengers and we rely on LU to monitor the effectiveness of this new announcement pattern.

Regulations 13(7) – Letter heights of passenger information displays:
DPTAC still have concerns regarding this exemption, many of which have been allayed by the LU presentation last week, however some members are still to be convinced that the units displayed will provide adequate and robust information. E.g. Monitoring the reduction in size of lettering with the increase in characters, and perhaps the potential for vandalism (discussed with LU directly).

In general however DPTAC are happy for this exemption to go ahead subject to continued monitoring and this exemption not being replicated on other stock until the robustness has been demonstrated.

DPTAC welcome LU's confirmation that these screens will not be used for advertising.

Regulations 23(1) – Boarding devices at wheelchair accessible doorways:
DPTAC are pleased at the amount of research and consultation undertaken by LU on this issue, and are keen, like them, to avoid an over complex manual ramp booking system. We are happy with this exemption providing LU continue with their research and targeted implementation.

DPTAC appreciate the time and the effort LU have put into these exemption applications and the consultation thereafter with DPTAC directly.

Yours sincerely,



Ann Bates
Chair of DPTAC Rail Working Group

Appendix C

Nathan Cole
Dept. for Transport
Rail Vehicle Accessibility
Zone 4/34 Great Minster House
76 Marsham Street
London
SW1P 4DR

Our Ref HMRI/LUL/PRM/1/08
Your ref DP 39/24/25
16th July 2008

Mike Holmes - Principal Inspector
Rail Vehicles National Expertise Team
Office of Rail Regulation
The Pithay, Bristol BS1 2ND
Telephone 0845 301 3566
Fax 0117 988 6093
E-mail mike.holmes@orr.gsi.gov.uk

Dear Nathan,

DISABILITY DISCRIMINATION ACT 1995: SECTION 47 EXEMPTION APPLICATION BY LONDON UNDERGROUND LIMITED.

With reference to your letter of 12 June.

We have reviewed the application and have no comments on the application itself. There is one issue that we feel should be brought to your attention. It is suggested that additional grab handles should be provided in the wheelchair area; so that when the wheelchair area is unoccupied, then standing passengers have something to hold onto.

Yours sincerely

Mike Holmes

Cc G. Turner ORR

Department for Transport

Nathan Cole
Rail Vehicle Accessibility
Rail Standards & Safety Division
Department for Transport
Zone 4/34
Great Minster House
76 Marsham Street
London SW1P 4DR

Direct Line: 020 7944 4916
E-mail: Nathan.Cole@dft.gsi.gov.uk

Web Site: www.dft.gov.uk

Our Ref: RGEN 39/24/25

4 August 2008

Mike Holmes
Principal Inspector
Rail Vehicles National Expertise Team
Office of Rail Regulation
The Pithay
Bristol BS1 2ND

Dear Mike,

Disability Discrimination Act 1995: Section 47 Exemption Application by London Underground Limited

Thank you for your letter of 16 July regarding the application by London Underground Limited (LUL) for exemptions from the Rail Vehicle Accessibility Regulations (RVAR) for the new Victoria Line 09 Tube Stock.

I note that you have no comments on the application for exemption itself but suggest that additional grab handles should be provided on these vehicles in the wheelchair space for use by standing passengers.

As you are aware, RVAR does not currently allow handrails to impinge on this space to ensure that wheelchair users can travel in reasonable comfort without other passengers leaning across them. However, we do recognise that not allowing handrails in this area can cause difficulties for standing passengers on some types of service. We have therefore been working with LUL to consider how additional handrails might be provided in this area on the new fleet.

LUL did develop a design incorporating an additional longitudinal handrail which intruded into the wheelchair space to a limited extent. Although this would have required an exemption, it was supported by the Disabled Persons Transport Advisory Committee (DPTAC), our statutory advisers on the public passenger needs of disabled people, as a pragmatic change. Similar allowances have been made in the past for Class 376 units operated by South Eastern Trains. In recognition of this, and subject to consultation, we intend to amend the RVAR to allow handrails to intrude into the wheelchair space by up to 250 mm.

In this instance, the additional handrail was not proceeded with following advice from human factors experts. They concluded that providing the additional handrail would increase the risk, given the limited dimensions of a Tube train, of someone hitting their head when getting out of the tip-up seats in the wheelchair space. LUL has therefore decided to provide an additional vertical handrail directly opposite the wheelchair space instead.

I am copying this letter to Ann Bates, Chair of the DPTAC Rail Working Group and Wayne Trevor and Michael Milner at London Underground.

Yours sincerely,

Nathan Cole

Appendix D

From: "John Hunt" <John.Hunt@londontravelwatch.org.uk>
To: "Nathan Cole" <Nathan.Cole@dft.gsi.gov.uk>
Date: 01/08/08 16:59:43
Subject: RE: LUL application for RVAR exemption

Dear Nathan Cole,

In response to the LUL application for RVAR exemption, our comments are as follows:

London TravelWatch is the official watchdog organisation representing the interests of transport users in and around London. Our Committee has 13 members who are appointed by the London Assembly. Members sit on sub-committees, one being the Transport Accessibility Committee that has six members with particular skills and experience in the accessible transport area and it is they who reviewed this application.

Our members were in agreement with the application by LUL, seeing particular sense in their request for an exemption for the 47 new 09TS stock trains on the Victoria Line. They felt there is no point in having 'platform humps' installed if there is no step-free access route out of the station. They saw similar sense in requesting an exemption from the three second audible warning device until a trial of its impact has been evaluated. Members felt that consistency was important for passengers and to have two different audible warning systems operating would raise a safety concern.

Members had no objection to their request to evaluate TFT screens which LUL believe will provide more accessible customer information than traditional 'dot matrix' display units. The benefits for passengers in providing accessible information through TFT screens does seem greater whilst taking into account the limited viewing space within the vehicles. Finally, no objection to the exemption from providing certain customer information while the vehicle is stationary at a station.

To conclude, members had no objection to the LUL application for exemption from regulations 4(3)(B), 13(4), 13(7) and 23(1).

I hope the above comments will be useful when considering the application for exemption.

Yours Sincerely,

John Hunt
Casework Officer (Transport Accessibility Issues)
London TravelWatch