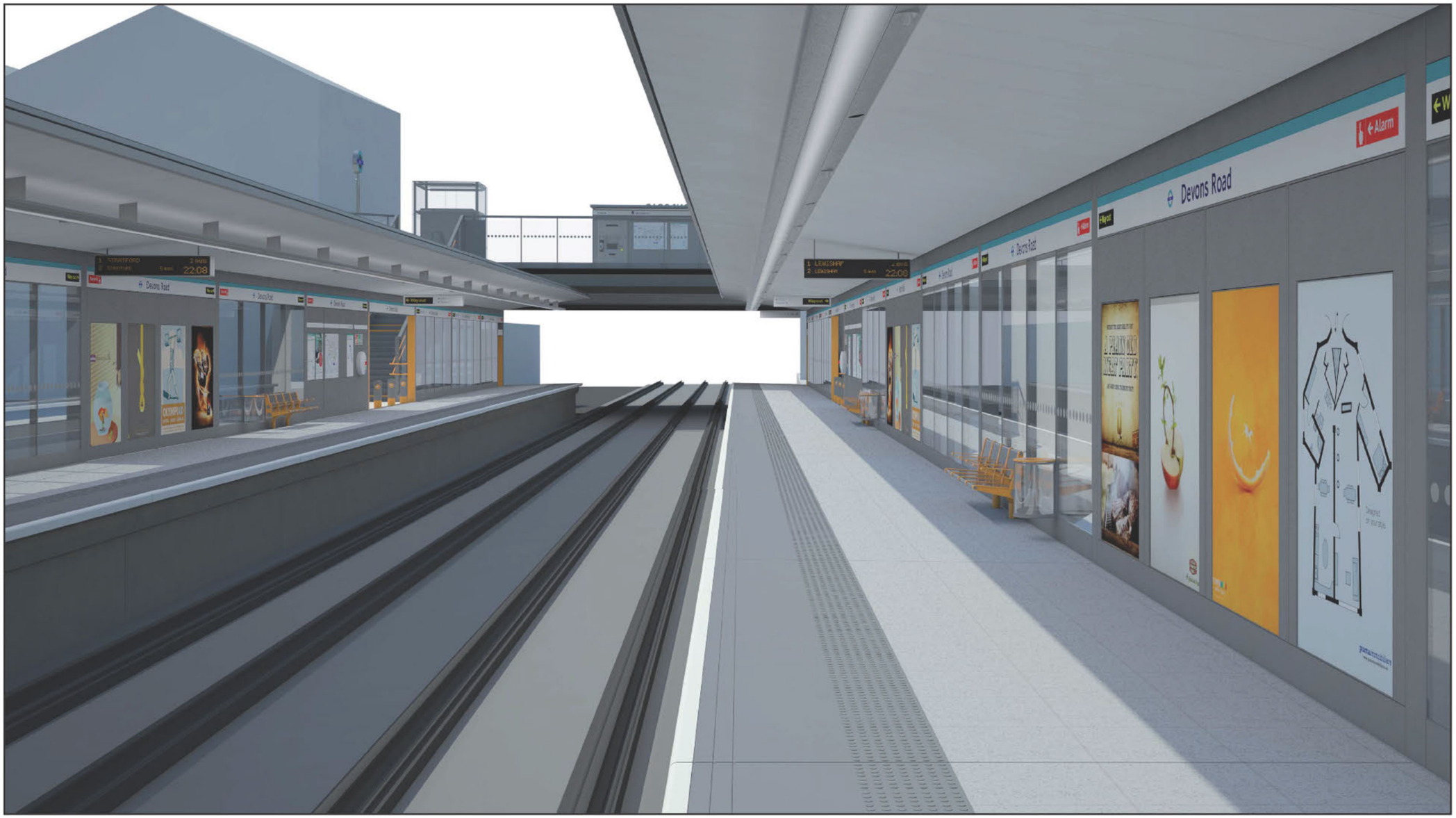
WestonWilliamson



DLR Station Design Guide
Stage 2 Report

Submission:
September 2009, Revision 05

For and behalf of:
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Project name:
DLR Station Design Guide

Report name:
Draft Stage Two Report

Document number:
536/0027

This report has been issued and amended as follows:

Issue	Description	Date	Prepared by	Reviewed by	Approved by
01	First Issue	24.03.09	AG	RN	CW
02	Revised to DLR DfL BB and CR comments	26.05.09	AG	RN	CW
03	Revised to final DLR, DfL, TfL comments	19.06.09	AG	RN	CW
04	Revised to DLR, GLA comments	28.08.09	AG	RN	CW
05	amendments to p33, 36, 37, 58 to DLR comments	03.09.09	AG	RN	CW

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1 EXECUTIVE SUMMARY

This design guide has been produced to establish a more consistent design identity throughout the DLR network. Each section of the guide document gives examples of current DLR locations listing things to avoid and then gives recommendations with illustrations as to how these elements can be improved.

The high level aims (section 2.5 page 5) should inform designs for each of the elements below. The key aims and recommendations for elements that will be considered are as follows:

1. STATION IDENTITY

   DLR should have a greater sense of coherence across the network. Key recommendations to achieve this are:

   - Establish a strong DLR brand identity relating to the wider Transport for London family.
   - Consistent and limited use of the DLR roundel and colour band.
   - Acknowledge differences but promote greater consistency between station typologies by using the common elements and design principles described.

2. STATION LAYOUT

   Stations should be laid out for intuitive wayfinding and good visibility across the station as a whole

3. FORECOURT & APPROACHES

   Forecourts & approaches should effectively tie the station to its context, but should also be pleasant places in themselves. Key recommendations to achieve this are:

   - Introduce a DLR Roundel in a highly visible location.
   - Develop a coherent forecourt design with common materials and elements.
   - Improve the accessibility, environment and convenience of station approaches.

4. RAILWAY CORRIDORS

   Railway corridors should be put to greater use so this section provides guidance for treatments to improve ambience, safety and interest along railway corridors.

5. CONCOURSES

   Concourse should have a clear centre, good wayfinding and be uncluttered. Key recommendations to achieve this are:

   - Raise consistency by organising layout and employing a palette of elements.
   - Maximise visibility for efficient wayfinding and a reassuring environment.

6. PLATFORMS

   Platforms should have a structured and consistent layout where everything is easy to locate. Key recommendations to achieve this are:

   - A consistent, hierarchical DLR platform layout with information and help points clustered at the entrance and a more uniform layout elsewhere.
   - A consistent module for setting out platforms is to be adopted.
   - Common DLR fixtures to be used throughout.
   - A standard and consistent canopy design which offers value for money on new-builds and replacements

7. LIFTS, STAIRS AND RAMPS

   Stations should be accessible to all. Lifts should be easy to locate, transparent and consistent across the network.

   - To this end a consistent family of lift types which are more transparent and recognisable is recommended.

8. CONCOURSE CLUSTERS

   Concourse elements should be collocated in order to reduce clutter and create a consistent and clear focus for concourses.

   - To this end information, ticket vending machines and other concourse items should be drawn together into a standard unit

9. FIXTURES & FURNITURE

   These should create a sense of belonging to the network and enhance the brand.

   - To achieve this a prescriptive, common palette of items should be used.

10. RETAIL

    Retail should improve the station environment at all times.

    - To this end well-designed retail units which are adaptable/movable should be used.

11. SIGNAGE, INFORMATION & ADVERTISING

    A structured approach should be used to consolidate and create clear locations for signage, information and advertising while reducing clutter.

    - Reduce the variety of formats of signage and coordinate signage heights.
    - Consolidate signage, information and advertising into coherent groups such as a frieze.

12. COLOUR

    Colour should form a common theme across the network while improving clarity and accessibility. To this end a common palette and application has been developed.

13. LIGHTING

    Lighting should support and enhance the station. Key recommendations to achieve this are:

    - Higher consistency, quality and integration of lighting.
    - Reduce glare and light pollution

14. PUBLIC ART

    Public art should be an integral part of the station experience, not added on.

    - To achieve this artists and designers should be involved at an early stage.

15.SUSTAINABILITY

    Designs should demonstrate that they minimise waste and energy use.

16.MAINTENANCE

    Maintenance should be considered at design stage.

    - Projects should include a maintenance manual to ensure whole-life value for money.

2 INTRODUCTION

2.1 Origins of this Design Guide

The DLR has been designed in several phases over a 20 year period by different designers, so it is to be expected that there are many differences. A design guide however, may have helped to encourage greater consistency and should be able to help do this in the future. That is not to say that all stations should be the same. The Jubilee line extension for example shows that individual stations can have a different identity but still fit together as an identifiable family. This is achieved by a series of common elements which unify the individual designs.

One of the key recommendations of the DLR Strategic Station Review (document number: 516-0028) was to establish a Design Champion or Design Review Group. This Design Guide document provides many of the guidelines for the designers to reference in order to prepare designs and for the Design Review Group to use in assessing the designs.

It is clear that many design issues on the DLR system arise because of the method of procurement. If a contractor is appointed on incomplete design information there is a risk that the least expensive option is proposed and if this meets the brief it is often accepted. This Design Guide will be issued to designer and design / build contractors at an early stage in order to demonstrate clearly the products / concepts / layouts etc. that are acceptable and help raise the standard of design whilst providing the best value for money.

2.2 Purpose

The overarching purpose of this document is to help designers involved in future DLR projects to work towards a more coherent design identity for the system by establishing specific guidance. It is expected that the DLR Station Design Guide will be:

- A guide for designers of DLR stations.
- A tool to set employer's requirements for projects and aid the Design Review Group in enforcing good design.

This document should be read in conjunction with the aims, guidance and standards referred to in sections 2.4 and 2.5 below.

2.3 Approach

Each section shows examples of current DLR locations listing things to avoid and then makes recommendations for improvement with appropriate illustrations. Some items are descriptive: We are not suggesting for example that all canopies look exactly like the recommendations. Other elements are more prescriptive: Bins, seats and signs for example should be limited in type to form a clear part of the DLR identity. The Design Review Group will update this document form time to time and designers can put forward their recommendations to the Design Review Group. The design guide can therefore change in response to new design influences and newer products.

2.4 Related Guidance & Standards

The DLR Station Design Guide establishes the high level aims for station designs in terms of layout, elements and feel. DLR guidance such as the Signage Manual, Cycle Strategy and Public Art Strategy which relate to passenger experience should use this document as their foundation in order to support a whole DLR vision. Designers should consult these additional documents for detailed information. There is a suite of other guidance and standards which should also be consulted in the design of stations. Some relevant documents are listed in Appendix A.

2.5 High level aims

Seven high level aims have been established to set the baseline for the recommendations of this document. The aims should also form the baseline for any station designs based on this guide and it should be borne in mind that the design guide provides recommendations which are intended to further the high level aims. The seven high level aims are:

CONSISTENCY & IDENTITY:

- Greater consistency
- A clear and modern brand identity

WAYFINDING:

- Good wayfinding to stations and within stations
- Uncluttered station environment

ENVIRONMENTAL QUALITY:

- Weather protected waiting areas
- Well maintained station areas and high quality elements where appropriate

ACCESSIBILITY & INCLUSIVITY:

- Stations which everyone can use[1]
- Stations consider context, surrounding urban realm and access routes

SAFETY & SECURITY:

- Design out crime and fear of crime

SUSTAINABILITY:

- Encourage walking, cycling and use of public transport
- Build for longevity, reduce waste, reduce energy use

MAINTAINABILITY:

- Low maintenance costs
- Coherent maintenance strategy

1 LDA's inclusive design principles are useful reference (appendix A page 73)

3 WORLD-CLASS PRECEDENTS

This section reviews existing world-class networks and guidance to raise the benchmark of design intent for DLR and identify best practices. The world-class networks show common design threads which tie the network together such as:

- A controlled palette and application of colour
- Prescribed platform paving
- Common fixtures
- Integration of stations with the public realm including the consistent application of the station identifier

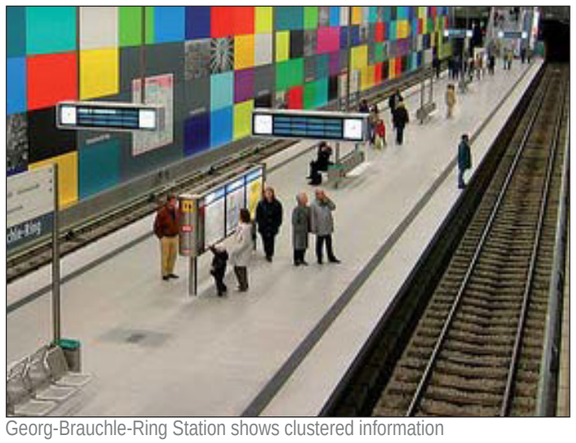
Since no network is ideal in every way, each is summarised in terms of the common threads that support the brand and demonstrate some aspect of best practice.

3.1 Munich Metro

The first impression of Munich Metro is that of an exciting transport environment enhanced by bold use of colour. On several stations lighting is used as an expressive and artistic element. Yet there is also a very strong sense of coherence across the stations that is difficult to identify at first but plays a baseline structuring role. The images of Munich Metro on the right show some design principles which are also relevant to the recommendations in this document. These design principles include:

- Platform paving colours and materials are standardised.
- All platform layouts are similar and clear with clustered information and distinct zones for seating and advertising.
- All signage is above head height.
- Fixtures are similar on all stations.

Westfriedhof Station shows distinct zones for signage, seating and advertising, with lighting used as an artistic element.



Georg-Brauchle-Ring Station shows clustered information

Am Moosfeld Station shows controlled paving materials and colours

An underground platform in Copenhagen that has clear ticket validator posts, clear signage

Fasanvej has a hard surface park above which improves local connectivity and an aligned road crossing and totem by the main road.

3.2 Copenhagen Metro

The Copenhagen Metro is widely used as a world-class precedent. It is a high quality network with a strong sense of identity and coherence. Some of the design principles shown in the images of the Copenhagen Metro on the left also apply to the recommendations of this design guide. These are as follows:

- Simplicity of geometry & colour scheme and uncluttered spaces create a common theme across stations.
- A high level of transparency along routes and to the street.
- All signage is above head height for good visibility in crowded conditions and contained on a frieze for clarity.
- Use of high quality fixtures and lift elements together create a sense of quality and commonality throughout the stations.
- Stations are well connected with their context by aligned road crossings and clear routes.
- Many stations having high quality forecourts which double as hard-paved public space.

3.3 Deutsche Bahn

Deutsche Bahn runs a large and diverse network across Germany. Its approach is highly prescriptive so that many station elements are selected from approved catalogues. Some images of Deutsche Bahn stations are shown on the right as well as Rimini station in Italy which uses a Deutsche Bahn catalogue canopy. Some aspects of the Deutsche Bahn approach and of the design principles shown in the images are similar to the recommendations of this design guide. These are as follows:

- Fixtures and most movable items are consistent as they are selected from catalogues which have the Deutsche Bahn stamp of approval.
- A condensed concourse element has been developed by Deutsche Bahn as a highly visible red box that may contain ticket machines and information. Deutsche Bahn has down-sized many stations, making use of the red boxes as a way of reducing the need for station building staff and maintenance.

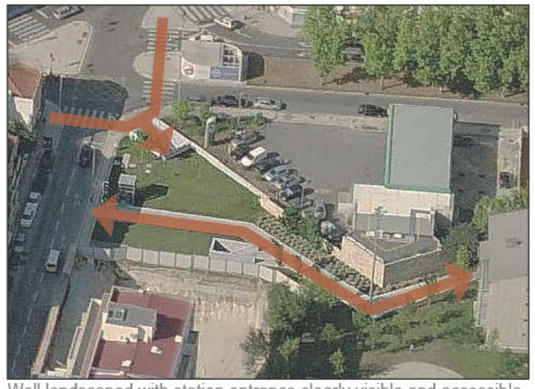
Though not implemented in this design guide the Deutsche Bahn approach to standardising large elements could be investigated. For larger elements on the Deutsche Bahn, such as canopies, it is possible to design the canopy to suit the station but there are also catalogue canopies which form a baseline to utilise. These standard canopies have been used internationally as for example at Rimini station shown here.

Rimini Station in Italy uses a Deutshe Bahn canopy

Deutsche Bahn “Red Box“Ticket Kiosks can contain ticket vending machines and information

A Porto Metro Forecourt which shows a highly visible Porto metro identifier.

An Island Platform on Porto Metro shows a controlled palette



Well landscaped with station entrance clearly visible and accessible.

3.4 Porto Metro

The Porto Metro is a highly consistent network with a strong sense of identity, leaving little doubt in the passenger's mind which network they are using. The images of Porto Metro on the left show some design principles which are also relevant to the recommendations in this document.

- Most stations have a single strategically located identifier in an uncluttered forecourt which assists in finding the station but also creates a coherent identity as soon as the station is identified.
- Where possible station entrances are located near junctions for good visibility.
- A limited palette is applied across the network: Light greys, yellow accents, blue signage. These colours do not give sufficient contrast but create a readily identifiable palette for all stations.
- Most station spaces are simple and uncluttered, and as this is repeated in the architectural styles and in the graphics this creates a cross network theme while improving wayfinding.

3.5 Jubilee Line Extension

The Jubilee line extension is widely cited as an exemplar of station quality and network coherence in London. While stations were designed by different architects several common themes tie stations together. The images on the right show some design principles which are also relevant to the recommendations in this document. They are:

- There is a grey colour scheme with yellow accents and occasional blues used throughout.
- Similar fixtures are used: Seats, PIDs, etc.
- Similar cladding is used on some stations.
- A signage convention is used.
- In terms of finishing a distinction is maintained between passenger areas and train areas.

3.6 Summary of World Class Precedents

There are a few best practices which run across all of the world-class networks and are related to the guidance in this document. These are described below:

- Platform paving colours and materials are fixed.
- Signage is shown at a height of 2-3m above floor level to ensure good visibility in crowded conditions.
- Fixtures are similar across multiple stations on each of the networks.
- A limited colour palette is used to improve line consistency.

There are also design principles shown in some but not all of the world-class networks. Where these design principles are particularly relevant to the recommendations of this document they are listed below:

- On the Munich metro, all platform layouts are similar with clustered information and distinct zones for seating and advertising.
- On the Copenhagen Metro, a consistently high level of transparency is maintained along routes and also to the street.
- Deutsche Bahn has developed a condensed concourse element as a highly visible red box that may contain ticket machines and information, reducing the need for station building staff and maintenance.
- Munich Metro stations have high quality forecourts which double as hard-paved public space.
- Porto, Copenhagen and Munich metros are all well integrated with the urban context and have high quality forecourts.
- Stations on the Porto and Copenhagen Metros have a single strategically located identifier on an uncluttered forecourt which assists in finding the station but also creates a clear brand identity.

London Bridge station uses similar cladding to other stations and common fixtures such as seats, boom and frieze

Waterloo station platform: common fixtures


Westminster station platform: uses the common colour scheme

4 THE DLR NETWORK + ITS CONTEXT

This section describes the varying characters and contexts on the DLR network. The following sections (section 5 onward) will demonstrate how this design guide will help unify these disparate design styles as and when the stations are refurbished or new stations built

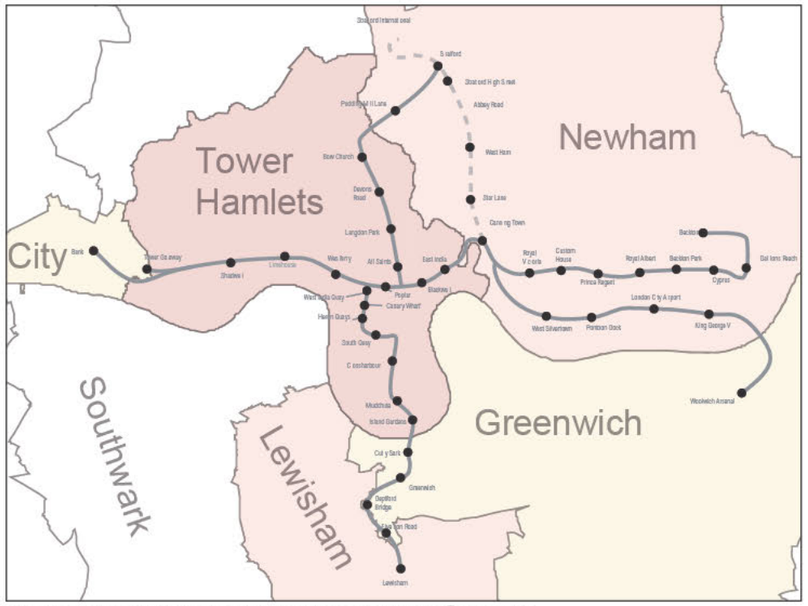
4.1 DLR Context

The DLR Network has stations in 5 Boroughs:

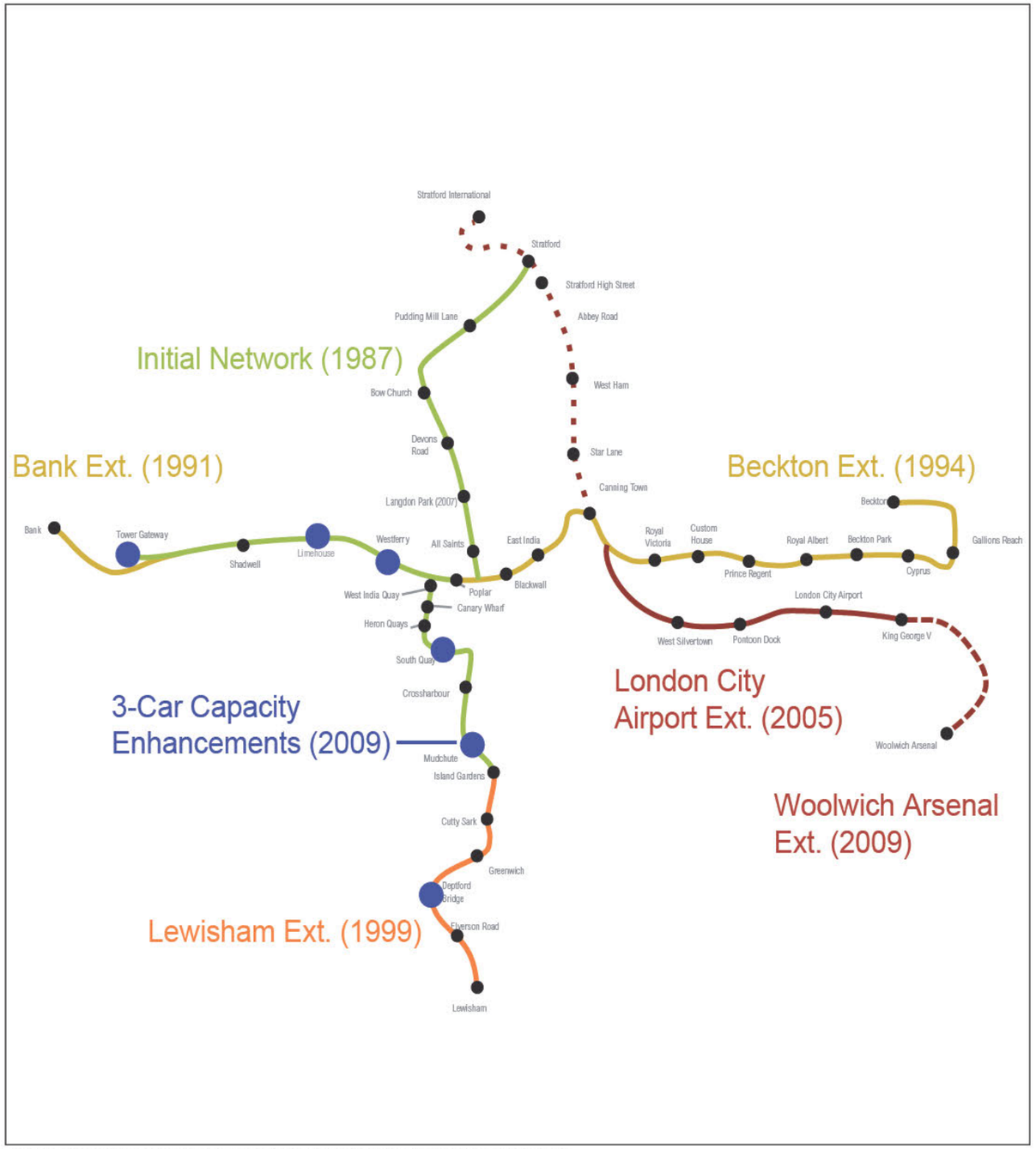
- City of London
- Tower Hamlets
- Newham
- Greenwich
- Lewisham

Each borough has its own standards for streetscape and its own planning authority to which the station may need to adhere. However, the DLR should develop a stronger design identity which suits location in each borough.

The map below shows how the DLR passes through 5 London boroughs. Context will be a key issue in the design of any station, but a robust design approach should be capable of suiting a large number of sites.

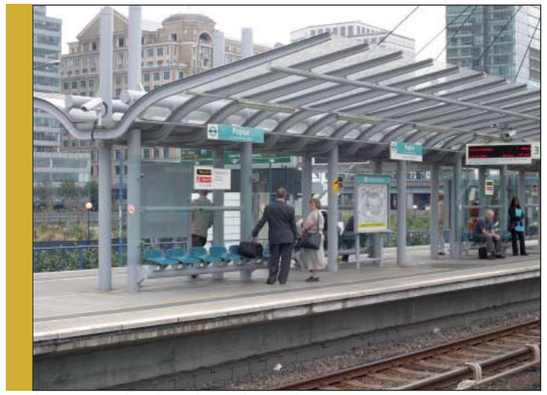


DLR Context - the DLR network currently passes through 5 boroughs



The DLR network was developed in a series of stages with different architectural styles

Initial Network (1987). Devons Road station


Beckton Extension (1994). Poplar station


Lewisham Extension (1999). Island Gardens station

London City Airport Extension (2005). King George V station

Canopy Replacements (2009). Tower Gateway station

4.2 Existing DLR Network

The DLR Network was developed in a series of distinct stages beginning in 1987 and has as a result developed a series of unrelated architectural styles. The map opposite shows the stages in the development of the DLR as a series of lines each with its own architectural style.

4.2.1 Initial Network (1987)

The first part of the network was built by Balfour Beatty and had arched canopies and strong red and blue colouring throughout.

4.2.2 Bank extension (1991) & Beckton extension (1994)

The network was extended west with an underground platform at Bank connecting the DLR network directly to the London Underground network in the centre of London and connecting Bank to Canary Wharf. Another extension was made from Poplar eastward to Beckton, and designed by ABK with distinctive red lifts, curved glass canopies and light grey colour scheme complemented by the DLR line colour and red.

4.2.3 Lewisham extension (1999)

The network was expanded in another extension from Mudchute to Lewisham which opened in 1999. Some stations had small shelters a few metres long while other stations had large covered stations with slightly arched canopies and a grey and blue colour scheme.

4.2.4 London City Airport extension (2005) & Woolwich Arsenal extension (2009)

A further extension eastwards was made from Canning Town to King George V in 2005 and Woolwich Arsenal in 2009. This extension was designed by Weston Williamson and had curved or flat metal canopies in light grey with dark grey or blue accents.

This will be complemented by a further extension from Canning Town to Stratford International in a similar style with flat canopies.

4.2.5 Three-Car Capacity Enhancements (2009)

Canopies on several stations on the original network and Lewisham extension have been replaced as part of 3-car improvements in 2009. These stations have a common canopy type.

Finally, some stations are one-off designs such as Heron Quays, Langdon Park and Stratford.

5 STATION IDENTITY

This section describes the principles which guide DLR branding and explains how the DLR roundel, station name and DLR colour should be used.

5.1 Existing DLR Identities

The images on the right show the station name, DLR roundel and DLR brand colour used in different ways at each location.

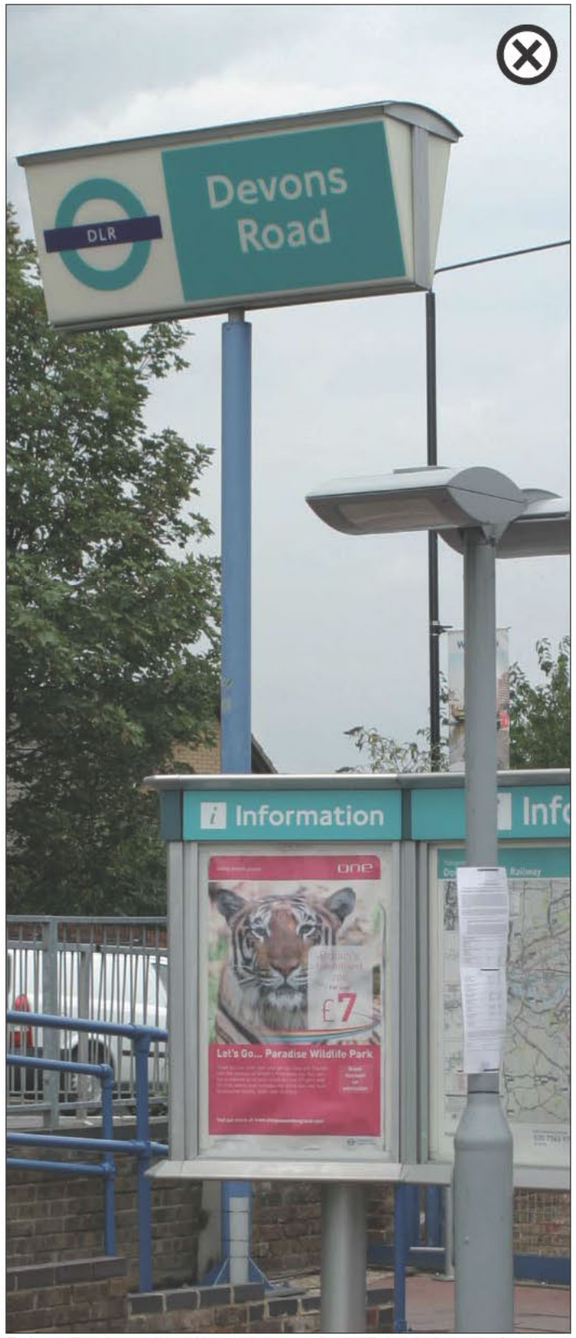
5.1.1 DLR Roundel

The DLR roundel is used in all 3 images and twice at the Canary Wharf information kiosk.

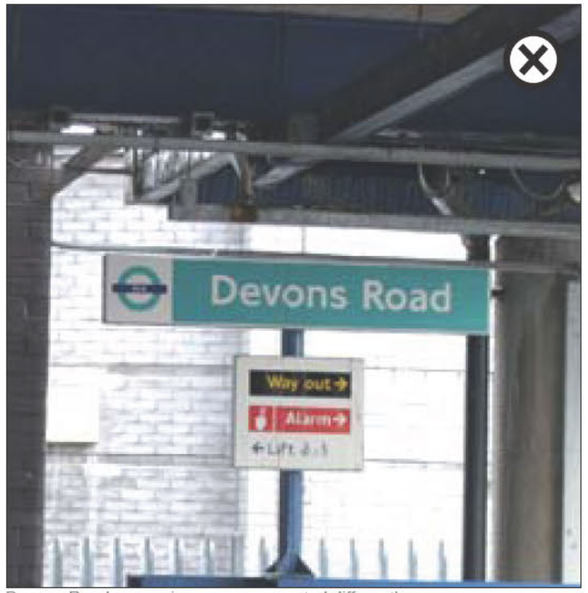
- Although the roundel is the most recognisable identifier for DLR, the variety of locations, scales and materials to which it is applied detracts from its strength as the first and primary DLR identifier.
- When it is used on the totem it has a size and status which is lost when it is applied to the information frieze band or decoratively to the roof of the information kiosk.

5.1.2 Station Name Sign

- At Devons Road the station name is shown on two lines on the totem outside the station, whereas it appears on one line on the station platform. The station name needs to be read at a glance from every angle and distance and from within the carriages. Passengers will be able to read the station name in full on each occasion if it is presented consistently.
- The station name is written in white on a DLR brand colour background which does not provide good contrast for visually impaired people.
- The information kiosk sign at Canary Wharf station and the information board band at Devons Road station are presented in the same way as the station name sign, diluting the uniqueness and recognisability of the station name.



Devons Road totem: station name presented differently from platform



Devons Road name sign: name presented differently on concourse

Canary Wharf station information kiosk: Roundel is applied in 2 ways

Interchange station

Non-interchange station

DLR Identifiers are to be limited to 2 types

5.2 Recommendations

DLR has strong service and network growth which should be supported by an equally strong but appropriate approach to branding. The core qualities which will guide the DLR branding strategy are a simple, clear, and modern appearance supported by high quality elements. This branding approach will reflect DLR's dependability, performance and achievements with an economy of means. The DLR brand will be signalled by the DLR roundel and the DLR colour band in selected locations. In particular DLR should:

- Develop a strong network identity through clearer strategic branding and by using common elements and themes. The DLR brand should project a simple, modern image which builds on the high-profile Transport for London brand as far as practicable.
- The DLR roundel and station name are kept separate. The station name sign should be independent and visible after the DLR Roundel which will be the first sign to be recognised from a distance.
- DLR station identifiers are limited to the two types shown.
- The station name will in the first instance be recognised as a shape and should always be presented in the same way: on one line, in the same font and in mixed case.
- The DLR colour should be used in bands on elements applicable to DLR only. A DLR colour band may be used on platforms or to identify the route to DLR platforms, but the colour band is not applied to ticket vending machines which could be used to access non-DLR services. This is consistent with the LUL approach.
- Encourage the use of the DLR line colour to show the way to DLR platforms throughout Transport for London.

6 STATION LAYOUT

Other sections of this document split the station into distinct areas and elements such as platforms or lifts. This section covers the layout of the station as a whole and describes the principles that govern how the various areas and elements described in this document relate to each other. It considers the station as a whole including concourses, lifts, stairs, ramps and platforms. The station layout recommendations include good visibility and clear wayfinding across the station as well as centralising information.

6.1 Existing Layout Typologies

Due to geographic constraints and the development of the DLR in distinct stages, there are several types of stations each with their own specific layout:

6.1.1 Underground – e.g. Cutty Sark

Some of these stations such as Bank and Cutty Sark have long and winding routes to platforms. The character of the routes to platforms and the way they reassure passengers is of particular importance to this station typology.

6.1.2 Grade/Cutting with bridge across – e.g. Royal Victoria

The extent of the concourse area is not usually well defined and the route to the platforms involves crossing a bridge. Wayfinding is more difficult so visibility should be maximised with clear layout and signage.

6.1.3 Concourse at end of platform – e.g. Beckton

At Beckton the platform is visible from the concourse but signage clutter confuses this visibility.

6.1.4 Concourse under viaduct – e.g. Gallions Reach

Concourses are usually expansive and the extent not well defined as at Gallions Reach. Most stations of this typology could be improved by condensing and expressing the concourse in different materials.

6.1.5 Concourse beside solid viaduct – Greenwich

The extent of concourses is not well defined and routes to platforms are underground such as at Greenwich. At these stations a condensed concourse area should be defined and routes to platforms should be as clear and pleasant as possible.

6.1.6 Concourse above cutting – e.g. Devons Road

These stations tend to have well defined concourse areas and clear routes to platforms. It would be possible to get views of platforms from the concourse with clear balustrades rather than the current solid ones.

Underground – Cutty Sark (6.1.1)

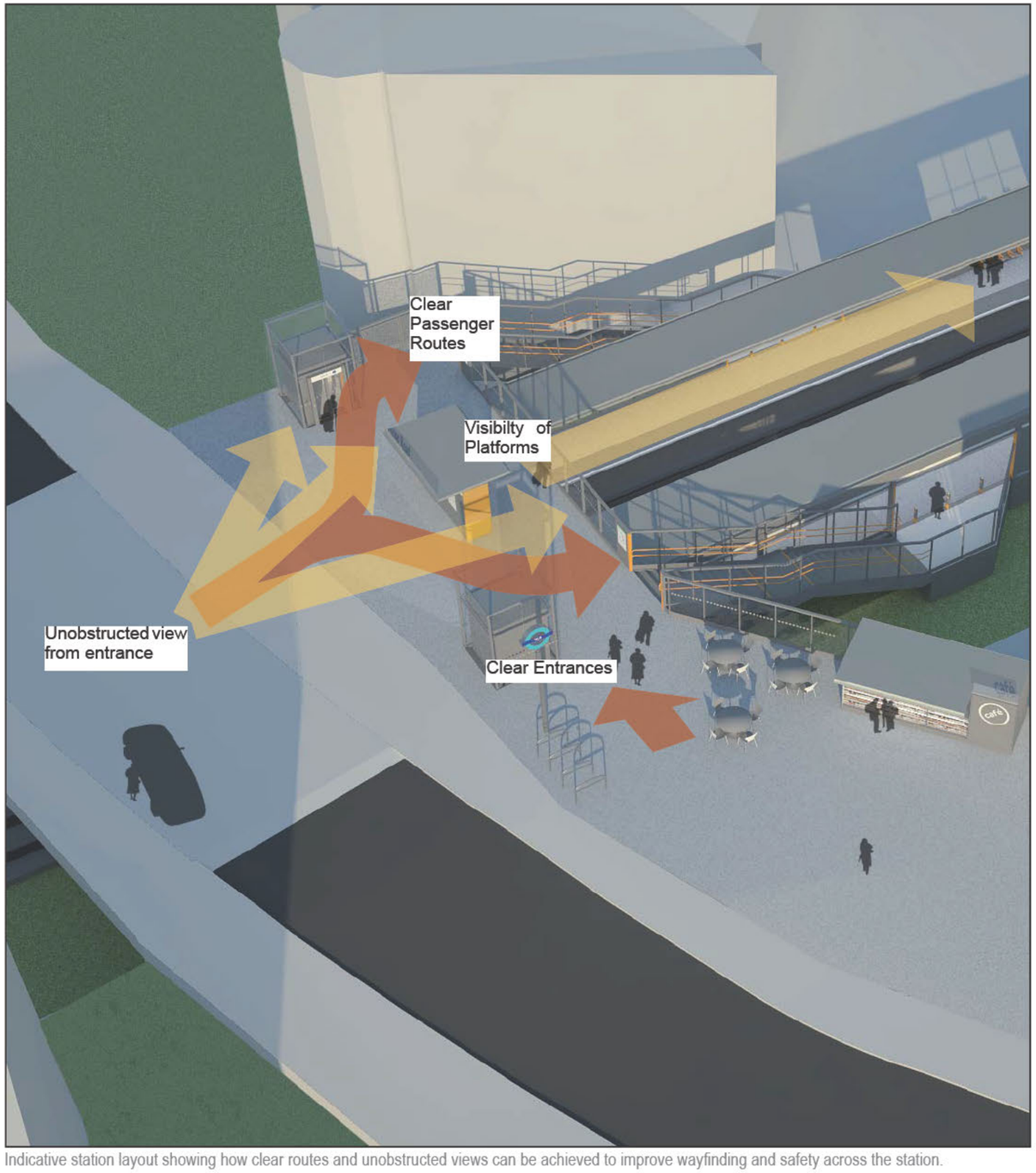
Grade/Cutting with bridge across – Royal Victoria (6.1.2)

Concourse at end of platform – e.g. Beckton (6.1.3)

Concourse under viaduct – Gallions Reach (6.1.4)

Concourse beside solid viaduct – Greenwich (6.1.5)

Concourse above cutting – Devons Road (6.1.6)



Indicative station layout showing how clear routes and unobstructed views can be achieved to improve wayfinding and safety across the station.

6.2 Recommendations

6.2.1 Good Visibility

To aid wayfinding and security, visibility needs to be maximised across and between parts of the station. The indicative station layout for a concourse above cutting shows good visibility between parts of the station enabled by clear balustrades and attention to layout of the concourse. Similarly, on stations where the concourse is underneath a viaduct, transparent backscreens and balustrades may be necessary to improve visibility. Visibility between parts of the station should be considered at an early stage in the design of station.

6.2.2 Unusable spaces

New station designs and alterations should consider context in order to avoid awkward and unusable spaces and improve the sense of safety.

6.2.3 Clear Entrances

The station concourses should have clear entrances marked first by a roundel on the forecourt then by a station name sign on the concourse. The key element will be a clearly visible roundel. The station name should then be readily visible if a passenger is unsure which station they are at. The example on the left shows a roundel on the forecourt which is clearly visible on approaches and a station name on a canopy at the centre of the concourse which passengers can read if they need.

6.2.4 Centralised Information

Information on concourses should be condensed and centrally located for good visibility from all parts of the concourse. The indicative station layout on the left shows a condensed concourse with centralised information.

6.2.5 Clear Passenger Routes

Routes through the station should be as direct as possible with short distances and fewer changes of direction. The image on the left shows platform staircases on either side of the concourse with direct routes to either from the centre of the concourse.

6.2.6 Appropriate Signage

Designs should aim to minimise signage by making routes as clear and intuitive as possible. If there are fewer points where passengers must choose between different routes or where it is unclear where they are heading, then there will be less need for signage. The indicative station layout on the left shows clear routes between platforms and to the street with a consequent reduced need for signage.

6.2.7 Intuitive Wayfinding

Each station will by necessity have its own unique layout, but similar station types should adopt similar layouts to enable wayfinding without relying on signage.

7 FORECOURT & APPROACHES

This section provides the principles for locating DLR identifiers, principles for the design of forecourts as well as some recommendations for approaches.

Forecourts are the areas around concourses which connect stations to the streetscape. These areas are sometimes not well defined and may be under multiple ownerships. Approaches include walking routes to stations, cycling routes and routes from bus-stops/drop-off points. These are usually not owned or maintained by DLR but are critical to the accessibility of the station. The design of forecourts and approaches will relate to the context of the station while also reflecting station access and the DLR brand identity on the forecourt.

7.1 Existing Forecourts and Approaches

The photographs on the right show some existing conditions. Many of these can be improved substantially by relatively minor improvements, better housekeeping and the implementation of clearer guidelines.

7.1.1 All Saints Station

- All Saints station suffers from a lack of local connectivity because of blind corners and highway parapets which obstruct visual links and desire lines.
- It is also flanked by a wall hiding potentially usable forecourt space.

7.1.2 Westferry Station

- Westferry station has a cluttered forecourt with uncoordinated posts, surrounded by guard railing and a lack of definition of where the concourse area starts.
- Cycles stands are not visible so bikes are locked to guardrails, so adding to the clutter.
- Routes through the forecourts at Westferry station are unclear and there are dark corners.

7.2 Boundaries & Interfaces

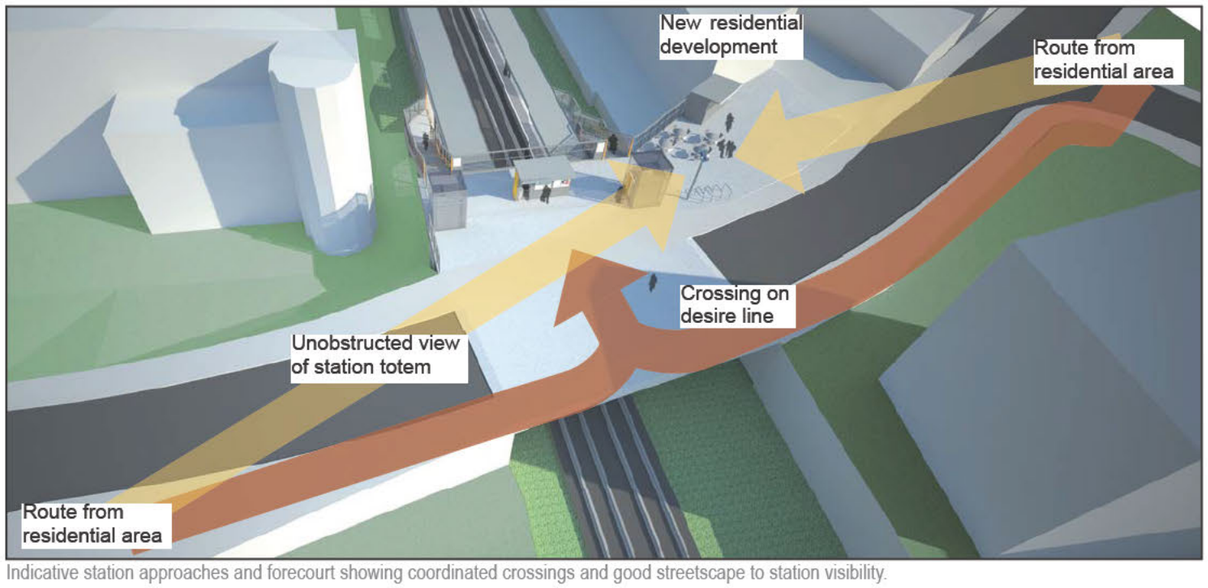
As they form the interface between the station and the streetscape, forecourts cannot by definition be designed in a vacuum. The DLR ownership boundary may run down the middle of a forecourt so that the forecourt is partly owned by another party. There will also be interfaces with the Local Authorities and potentially with TfL. Some coordination discussions that could arise include:

- Private owners: Adjoining owners may have their own interests and may also be required to contribute to DLR forecourts and approaches through planning obligations.
- Transport for London: Where major roads are present, TfL may have preferred materials and designs.
- Local Authorities: The borough may have its own preferences and should be consulted.
- Local Communities: Have a detailed understanding of the area and should be consulted at an early stage where possible.

All Saints Station: brick walls and highway parapets obstruct views.

Westferry Station: forecourt has cluttered street furniture and there are many blind corners.

An indicative station forecourt with a standard identifier placed for high visibility.



Indicative station approaches and forecourt showing coordinated crossings and good streetscape to station visibility.

7.3 Recommendations

The key recommendations in the design of forecourts and approaches are summarised below:

7.3.1 Station Identifier

Forecourts should contain a DLR identifier placed for maximum visibility from station approaches.

The images on the left show a totem which is located on a forecourt and oriented so that it is visible from approaches along the main road.

7.3.2 Coherent Forecourt Design

The extent of the whole forecourt should be identified and a coherent design should be developed for the whole area.

- The images on the left show a joint proposal where part of the forecourt is on DLR land and part belongs to an adjoining developer. The extent of the forecourt includes both spaces in order to ensure the continuity of station access with the surrounding urban fabric.
- The adjoining developer could contribute to the cost of the forecourt. This could be ensured by means of a section 106 agreement with the local authority.
- There is also potential to work with the local authority to rebalance the use of the surrounding areas, roads and pavements back to pedestrians and to give more support to the forecourt where it benefits the station and pedestrians.
- The forecourt is treated and designed as one space contiguous with both the station and the adjoining development. The extent of the forecourt is nevertheless clear because it has a distinctive identity across its entirety.
- Walls beside the forecourt have been removed to improve visibility and station access, and the forecourt has been designed so that there is a direct and high quality approach to the station from the West and Southwest.

7.3.3 Approaches and Crossings

Consideration should be given for the onward journey of passengers leaving the station with particular attention paid to crossings, guard railing and the urban realm immediately beyond the station.

- The image on the lower left shows a relocated and upgraded crossing – a raised table centred and better coordinated with the station access.
- Cycle parking located on a forecourt can improve station accessibility for cyclists.
- The adjoining owner (by means of a planning obligation) could contribute to streetscape improvements on approaches.
- Joint pedestrian studies should be conducted with the borough looking at borough lead and delivered streetscape improvements to approaches. The image on the lower left shows pavements widened and the area of the road junction reduced to improve walking routes.

8 VIADUCTS AND RAILWAY CORRIDORS

This section provides recommendations for the improvement of railway tunnels, viaducts, bridges and railway corridors in cuttings/at grade.

Railway corridors pass through large swathes of different communities. They have an impressive physical presence which can help integrate the DLR with the surrounding environment. They also provide DLR with a unique opportunity to engage with local communities.

8.1 Existing Railway Corridors

The DLR network runs on a variety of different railway corridors of different ages. Railway corridors run in the following ways:

8.1.1 Underground – Woolwich Arsenal

DLR tracks run underground in three locations – at Bank station, around Cutty Sark station and approach Woolwich Arsenal station. Tunnels are usually dark invisible passages, but can be more visible from DLR trains which have large windows including front and back. These pose opportunities for improving passenger experience and providing artwork.

8.1.2 At Grade/in Cuttings – Devons Road

Grade level railway corridors such as at Devons Road often have large unused areas which are not open to the public. They could be used for artwork or for sustainable energy production.

8.1.3 On Solid/Vaulted Viaduct – Westferry Station

The image of Westferry on the right shows a vaulted viaduct where although the viaduct arches have been put to use, the facades of the units are largely opaque and do not contribute to the sense of safety on the street. DLR has sections of old vaulted viaducts which are underused.

8.1.4 On Columned Viaducts – Gallions Reach

Columned viaducts such as at Gallions Reach station offer opportunities to use the areas underneath to improve connections between communities and to the station. They could be used for parks, cycleways or retail units.

8.1.5 Over Bridges – Limehouse

Railway bridges such as those at Limehouse form a highly visible part of the streetscape. The abutments of the railway bridges at Limehouse are in a poor state with water stains, moss, plants, and poorly lit streetscape underneath.

Underground – Woolwich Arsenal (8.1.1)

At Grade/in Cutting – Devons Road (8.1.2)

Solid/Vaulted Viaduct – Westferry (8.1.3)

Columned Viaduct – Gallions Reach (8.1.4)

Bridges – Limehouse (8.1.5)

Existing viaduct arches used as retail units at Shadwell station

Borough market makes good use of an existing columned viaduct.

8.2 Recommendations

Although there are many types of railway corridors on DLR, most railway corridors can be improved with retail, lighting or art work.

8.2.1 Underground

Railway tunnels are usually sterile spaces, but could provide a site for artwork which is visible from DLR trains moving through. Lighting could also add interest to tunnels. Alternatively, advertising could be applied to tunnels to improve the tunnel environment and raise revenue. Tunnels on Heathrow Express and several North American metro systems have been equipped with animated advertisements.

8.2.2 At Grade/in Cuttings

Grade level railway corridors often have large unused areas which are not open to the public. They could be used for artwork or for sustainable energy production. They can raise the profile and visibility of the DLR.

8.2.3 Viaducts

In some cases the areas under viaducts are also in DLR's property boundary. These areas provide an opportunity to improve routes to the station, engage communities, provide public art and create active frontage with units under the viaduct. The image of a retail unit in Shadwell station viaduct is an example of viaduct arches being reused for retail space with a glazed frontage which improves safety and business. Lighting and Art could also be used to improve under-viaduct environments. A study by J&L Gibbons commissioned by DLR in April 2007 verified the potential for Art and lighting to improve the under viaduct environment near West India Quay station. A similar approach could apply to other sections of DLR viaducts using simple landscaping, lighting and Art as a catalyst for these areas.

Columned viaducts do not cause as much severance as the other types of viaducts so there is ample opportunity to let the urban fabric flow through. They offer opportunities to use the areas underneath to improve connections between communities and to the station. They could be used for parks, cycle-ways or retail units.

Where new viaducts are being constructed, they should be consistent along their length. The portion of viaduct running between West Silvertown and London City Airport gives an example of how this could be done. However, new viaducts could also be designed to enhance the existing urban fabric by facilitating use and development of retail, leisure or other spaces.

8.2.5 Bridges

Bridges on DLR railway corridors provide opportunity for artwork, improved lighting and station wayfinding aids.

9 CONCOURSES

This section provides guidance for the design of concourses including station entrances, lifts, stairs, cladding and Concourse Cluster location.

The concourse is defined as the area between the forecourts and the platforms including any tunnels or bridges. It is therefore one of the most variable parts of the station.

9.1 Existing Concourses

Concourse areas are difficult to define throughout the network and particularly where they occur at grade level. Visibility and wayfinding on concourses is often poor due to clutter. Below are two examples:

9.1.1 Devons Road station

- The concourse is a few steps down from the pavement. This impedes access.
- The concourse at Devons Road station also has very poor visibility and is flanked by a brick wall which prevents views in or out of the concourse.
- At the rear there is an opaque, blue metal balustrade which prevents views down to the platforms.
- A large information board is located at the centre of the concourse which obstructs visibility of the ticket machines when you enter from the street creating a poor passenger experience.
- Clutter is extensive and confusing. Lighting poles are randomly located around the concourse. The salt box is bright green and highly visible as it is located beside the entrance to the concourse.
- The kiosk has a cluttered and untidy presentation.
- Four different kinds of balustrades are used on the back screen of the concourse, stairs, ramp and at the entrance to the station creating a poor station identity.

9.1.2 West India Quay station

- The concourse has a fence and level change which obstructs direct access to the stairs and is not conducive to mobility impaired passengers either.
- The colour scheme does not provide sufficient contrast for visually impaired people.
- Information boards are poorly located and obstruct views of each other creating a cluttered environment.
- There is little consistency in the design of the architectural elements e.g. balustrades, handrails, cycle racks, signage.

Devons Road concourse is difficult to navigate and has poor visibility due to extensive clutter and lack of visual hierarchy.

West India Quay station has awkward entrances and layout which prevent direct routes to information, ticket machines and platforms

Indicative station concourse layout showing good visibility and tabled street crossing.

Indicative station concourse layout at Devons Road showing centralised information and intuitive routes

9.2 Recommendations

9.2.1 Entrances

Station entrances are marked first by a roundel on the forecourt then by a station name sign on the concourse. The example on the left shows a roundel on the forecourt which is clearly visible on approaches and a station name on a canopy at the centre of the concourse which passengers can read if they need. At entrances where the concourse information and ticket machines are not readily visible, the station name should be applied so that the entrance is clear. Routes into the station should be clear of obstructions as shown in the images on the left.

9.2.2 Lifts

Lift structures should not obstruct visibility or wayfinding, but should be clearly identifiable. The Devons Road recommendations shown have lift structures transparent with this aim in mind.

9.2.3 Stairs

Entrances to stairs should be easy to spot from the main entrance or concourse information areas and marked in accordance with the recommendations in section 11 page 31 of this document.

9.2.4 Cladding of Blank Walls

Visible walls in tunnels, on substations and underground concourses should be clad where possible in the same way as the Concourse Cluster (described in section 12 page 33 of this report) with opaque panels on the 1450mm module used throughout.

9.2.5 Concourse Cluster Location

A Concourse Cluster (as described in section 12 of this document) should be installed in the main area of every station concourse such that it is readily visible on entry to the concourse. The images on the left show the Concourse Cluster located at the centre of the concourse where it would be visible to anyone entering or leaving the station. The Concourse Cluster will bring together information and ticket machines resulting in a coherent and consistent concourse.

The size, through-flow and layout of the station will determine how many and what layout of these units are needed.

9.2.6 Colours

DLR light grey pavers should be used for concourse areas with vertical obstructions in DLR dark grey for contrast. On poorly defined concourse areas these materials can help to define the extent of the concourse.

10 PLATFORMS

This section covers the zoning, layout and design of the platforms including entrances, information, signage frieze, fixtures, canopies and other platform items.

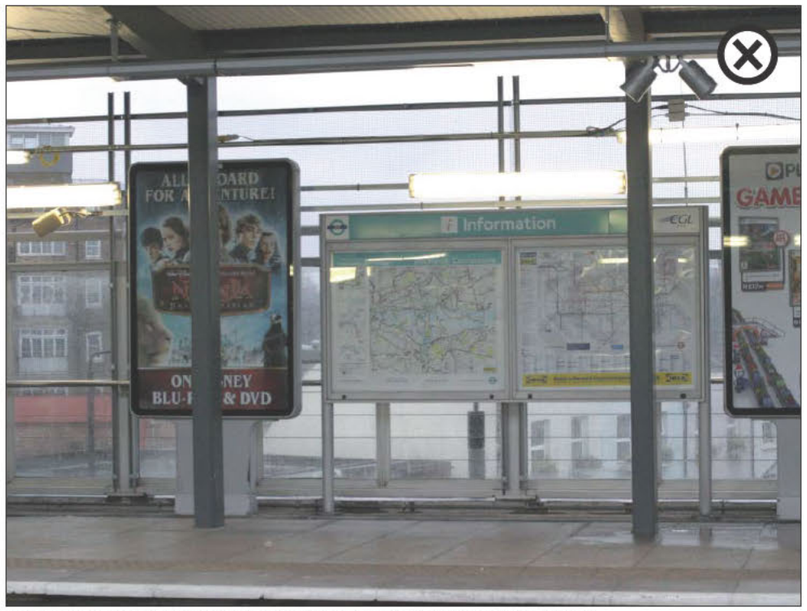
10.1 Existing Platforms

10.1.1 Devons Road Station

- The image shows a confusing array of signs, colours, materials and finishes.
- The overall effect is uncoordinated and has a poor quality feel.
- Cleaning and maintenance is difficult with many ledges and irregular surfaces.
- The boundary of the paid area is not clearly defined. Paid areas are not defined consistently across the network.

10.1.2 Deptford Bridge Station

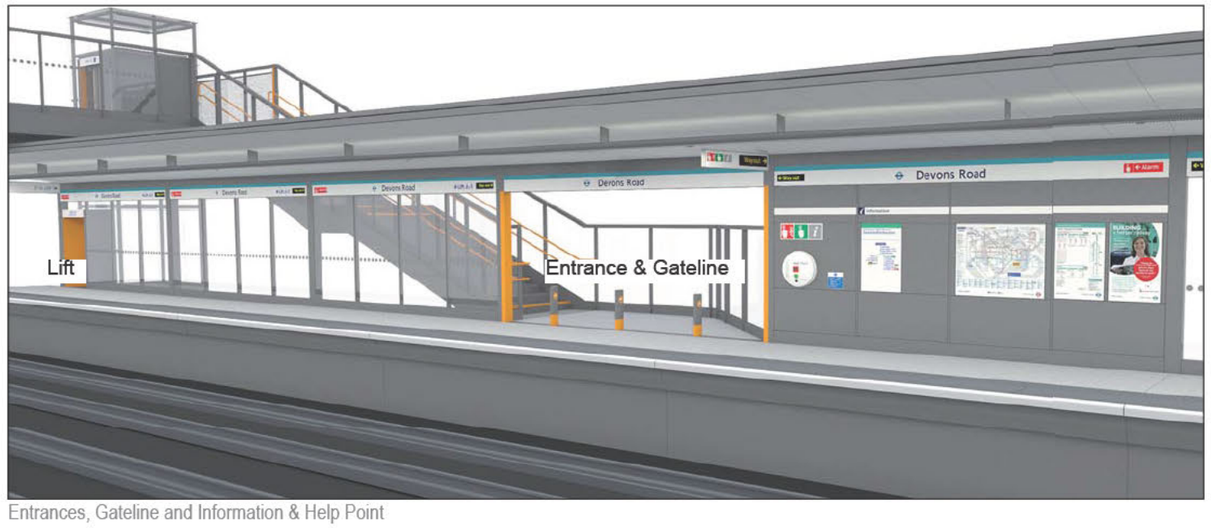
- The illustration shows a lack of coordination between the signage and advertising and the platform canopy structure resulting in information which is difficult to read.
- There is no coordination between the PA speakers and the canopy roof structure which produces an untidy image.
- The general effect does not enhance the DLR identity which is a key aim.



Deptford Bridge DLR Station: lack of coordination of elements on the platform

Devons Road platform: uncoordinated signage and loud colour scheme with too many elements competing for attention

An example of a coherent platform design for Devons Road station



Entrances, Gateline and Information & Help Point

10.2 Recommendations

The following images illustrate how platforms which are well laid out give a sense of clarity to the station and also reinforce the DLR brand. Particular emphasis is made on:

- Architectural consistency and minimum clutter for a high quality brand identity.
- Good visibility along the platform with signage consolidated for ease of use.
- Clear entrance and exit points including clear boundary to paid areas.

10.2.1 Entrances and Exits

- Entrances and exits are clearly marked with DLR yellow highlight to aid visibility along the platform.
- Directional signs on the frieze and beside the entrance avoid passenger uncertainty.
- Oyster card readers are located at the entrances to create a clear demarcation line for paid areas which is consistent across all stations.

10.2.2 Lifts

- Lift locations are clearly marked with DLR yellow highlight at the lift doors to aid visibility along the platform.
- Directional signs on the frieze and beside the entrance help to locate the lifts.
- A ticket validator is located at the lift entrance at platform level for clear demarcation of the paid area.

10.2.3 Ticket Validators and the Gateline

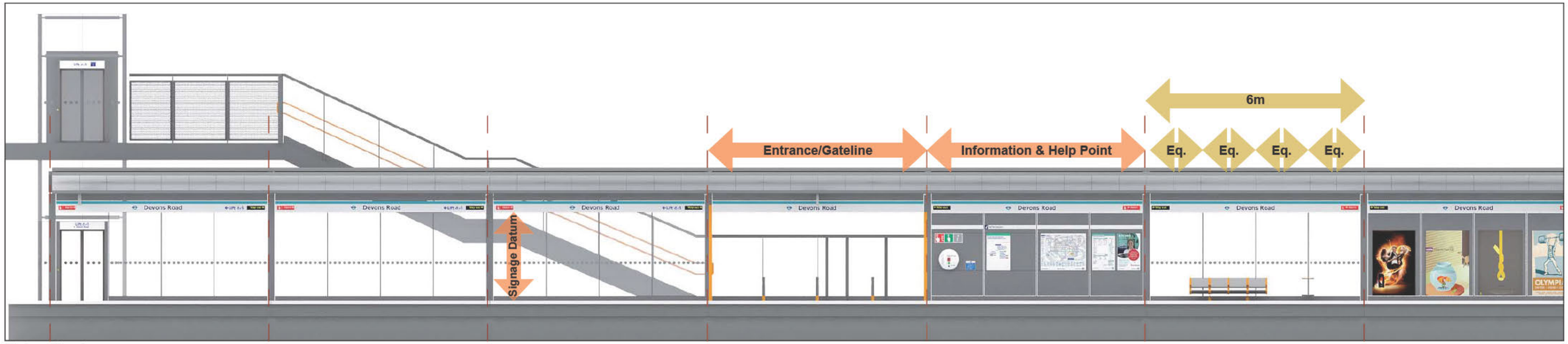
- DLR approved ticket validators will be used. Those described in section 13 page 37 are the recommended type for the long-term. These are designed for placement in passenger flows and should be spaced evenly at 2m centres forming a gateline. Alternatively, a reader can be placed on each side of the platform entrance where space is limited.
- Parts of the gateline without readers have glass balustrades to control access.
- The gateline is on a DLR dark grey paving strip that marks the boundary to paid areas. This will create a clearer boundary which is difficult to cross without touching in or out.
- Communication and power cables pass under the paving between ticket validators.

10.2.4 Information & Help Points (Platform Information Cluster)

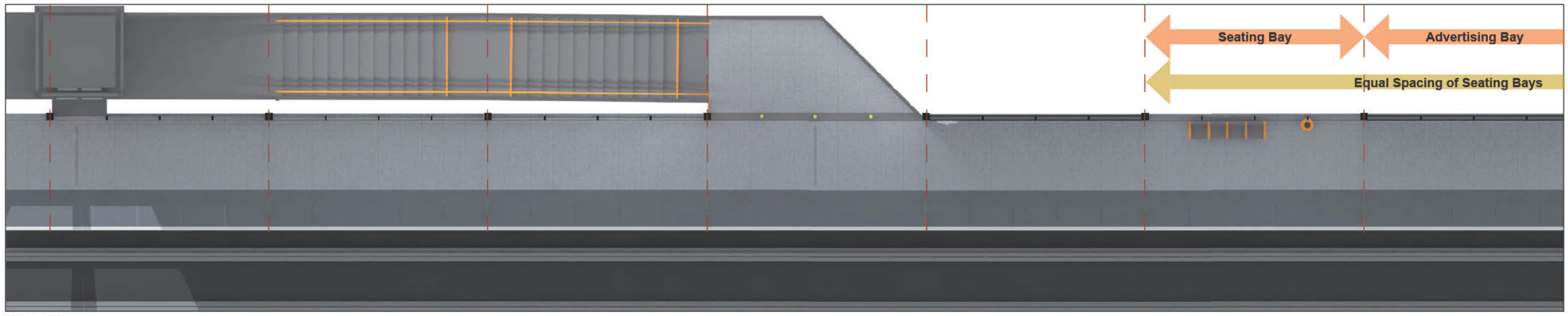
- Information posters, train stops and help points are grouped in structural bays to create a single point of reference for information and emergencies.
- These elements are mounted flush on DLR dark grey panels.
- They are located adjacent to platform entrances so their location is clear to passengers entering the platform for the first time and where they are also on the way out during an emergency.

10.2.5 Station Frieze & Signage

- The platform signage frieze is fixed at a height of 2.5m to its under-side.
- The platform signage frieze is located at the back of the platform above any platform screening and spans between the structural bays for the full platform length. Where there is no canopy, the frieze can be carried by independent structure.
- The station name is centred in each bay at approximate 6 metre centres.
- Way out and other signs are located on the frieze at either end. No signs are mounted on the backscreen.



Platform Elevation



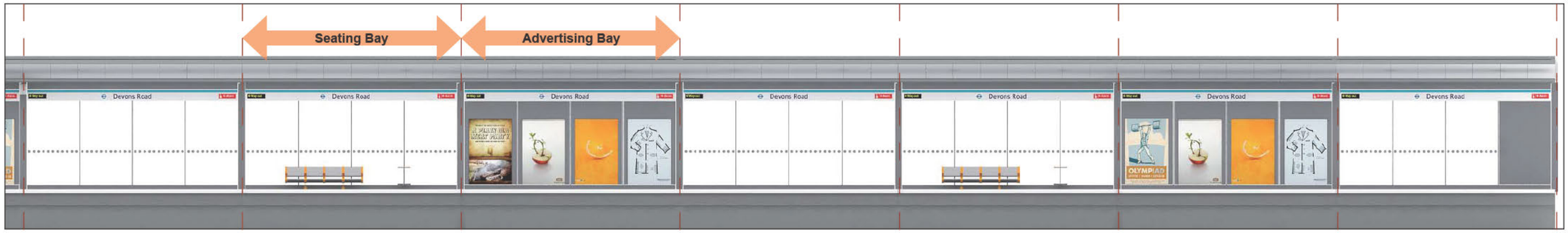
Platform Plan

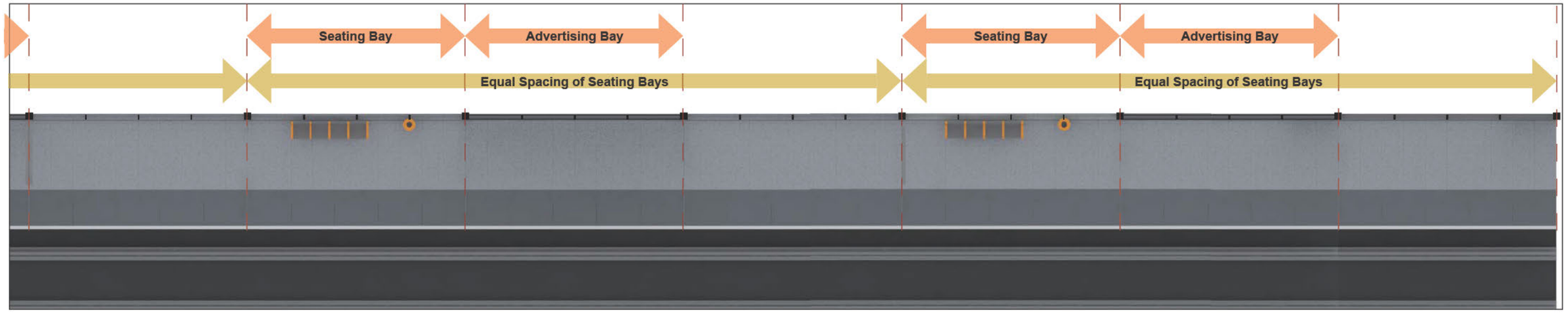
10.2.6 Seating & Bins

- Seating and bins are grouped together and spaced evenly along the length of the platform away from the platform entrances
- Seating and bins are described in section 13 page 37. They are supported off the canopy structure where possible to aid cleaning below and reduce maintenance.

10.2.7 Advertising

- Advertising panels are grouped and located in structural bays adjacent to the seating areas and are therefore away from platform entrances.
- The panels are mounted flush on opaque canopy screens coloured DLR dark grey metallic to aid visibility and create an uncluttered station layout.





10.2.8 Service Boom

- A services boom is continuous and runs the length of the platform suspended below the canopy ceiling and is a strong element.
- The boom contains flush mounted PA speakers and dome CCTV cameras to minimise clutter and reduce maintenance. Platform lighting is contained within the boom to provide functional downlight and feature uplighting to enhance safety and visual quality.
- The top of the service boom is shaped to prevent birds roosting on it.

10.2.9 Structural Grid

- A 6m structural grid is recommended for the canopy columns to produce and open and more accessible feel to the platforms. This provides space for grouping seating information and advertising between the bays to provide a clean and ordered appearance.

10.2.10 Platform Screens

- The inside face of platform screens should be flush with mullions and columns to aid cleaning and visibility.
- The outside face of platform screens (excluding glazing) should be flush with columns to improve the exterior presentation of above ground stations and reduce cleaning.
- The 6m structural bays are divided by 4 equal panels approximately 1450mm wide to accommodate standard information posters, 6-sheet advertisements and help points.
- The screens provide shelter from floor level to the underside of the frieze and are clear glass, translucent glass, or opaque (glass or metal with DLR dark grey metallic finish).
- A metal skirting in DLR dark grey metallic protects the base of the panels and facilitates maintenance.

10.2.11 Canopy

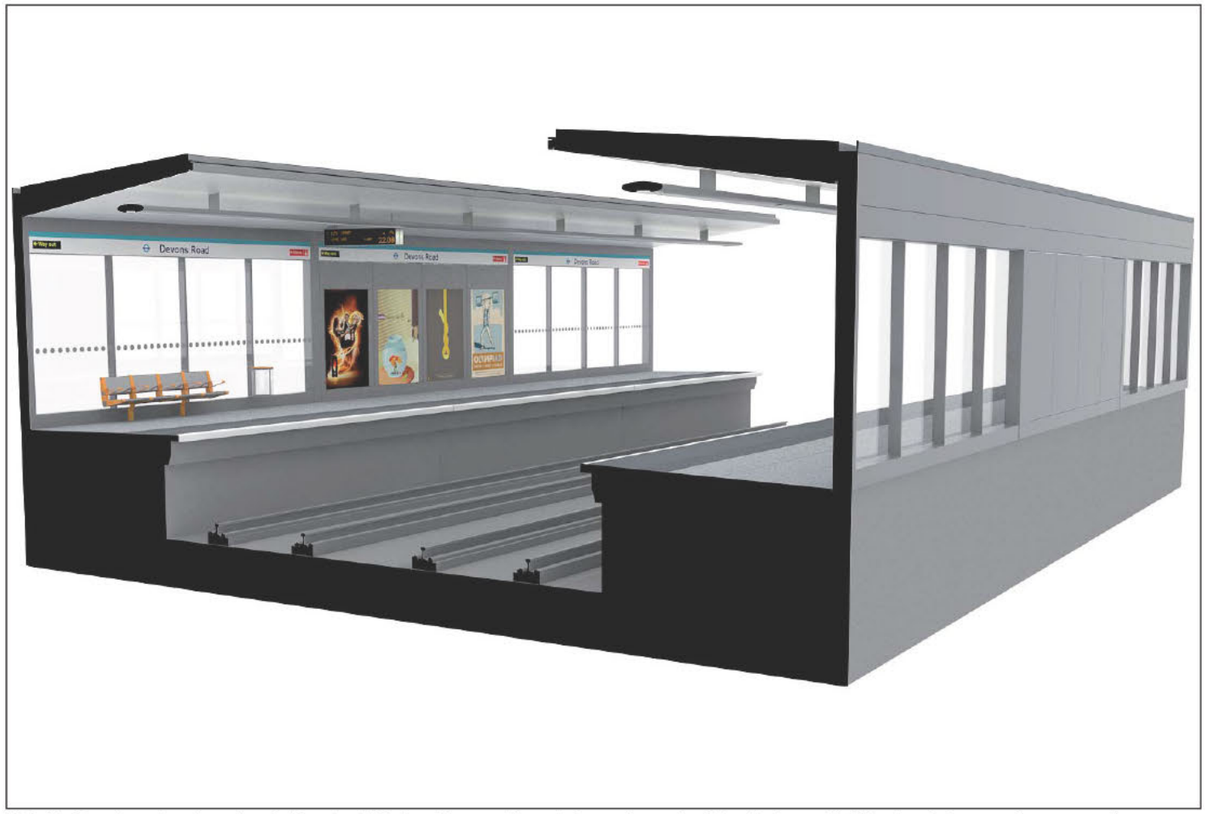
- The platform canopy runs the entire length of the platform where possible and provides weather protection to the waiting areas and platform edge.
- The structural supports to the canopy are concealed with flush metal ceiling panels and coloured DLR light grey metallic to maximise reflected light, simplify cleaning and reduce maintenance.
- The canopy provides a good quality, safe and pleasant public waiting area to enhance the DLR identity.

10.2.12 Platform Mirrors

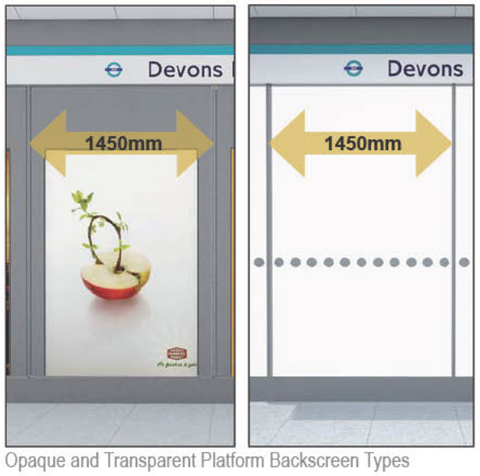
- Mirrors should be located only at the ends of platforms/canopies where they do not obstruct visibility for passengers and CCTV cameras. This may affect the stopping locations of 2 car trains to stop at the end of the platform/canopy.

10.2.13 Platform Paving

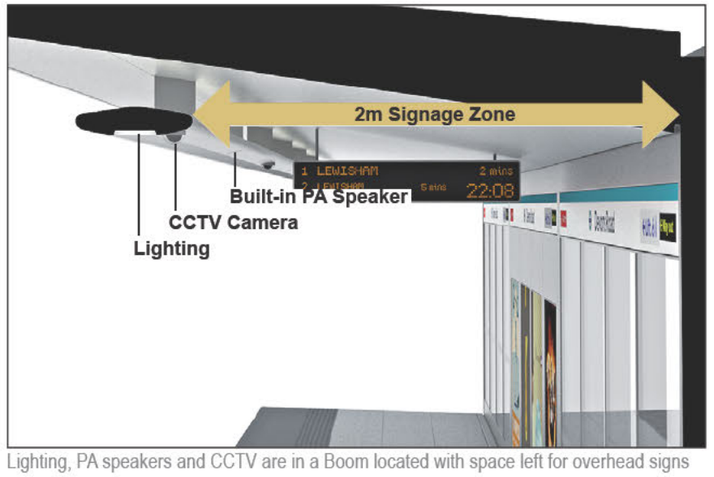
- Paving layout and colours are described in section 16 page 47.



Side Platform Layout – where the platform is visible from the rear, the exterior surfaces should be flush aswell. Other typologies are shown opposite.



Opaque and Transparent Platform Backscreen Types



Lighting, PA speakers and CCTV are in a Boom located with space left for overhead signs

Island Platform Layout – Free-standing seating.

Underground Side Platform Layout – Opaque back panels and structure mounted seating.

Large Island Platform Layout – Free-standing seating.

Underground Island Platform Layout – Layout is similar to the Island Platform layout.

11 LIFTS, STAIRS & RAMPS

This section provides recommendations for the design of lift structures. Lifts represent a good opportunity to reinforce the DLR identity whilst being safe and easy to use.

11.1 Existing Lifts

There are several different lift types on the network including glass and metal lifts as well as solid brick ones. The following examples illustrate some common issues with lifts on DLR.

11.1.1 Limehouse Station

- The solid brick enclosure obstructs passenger views through to the stairs beyond.
- The lift doors are not visible from the station approach.
- The opacity of the lift reduces the sense of continuity and safety of the concourse.

11.1.2 Devons Road Station

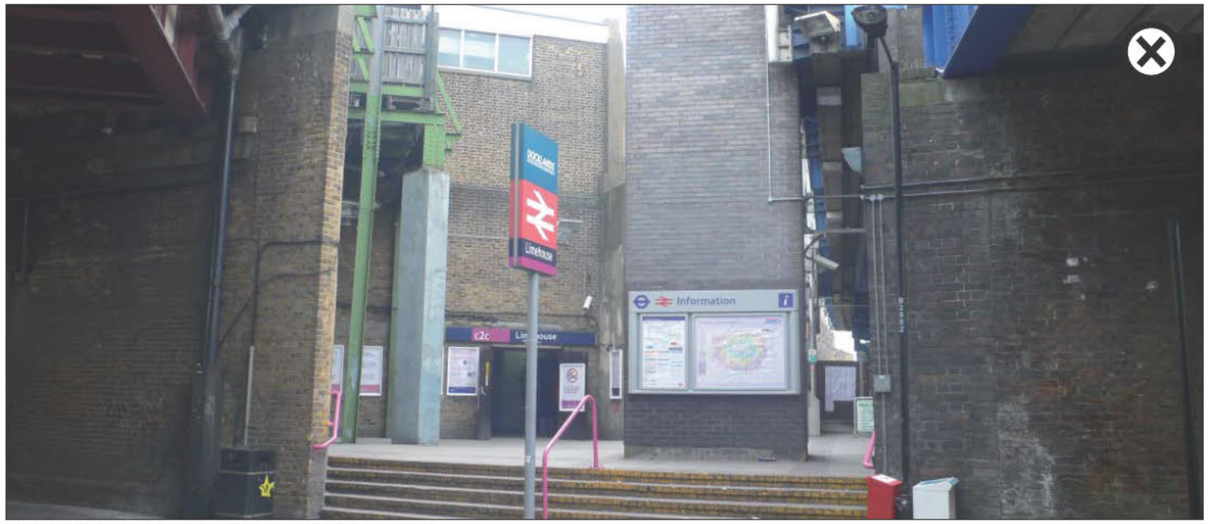
- There is no visibility into the lift car creating a potential passenger safety issue.
- The general appearance of the lift is untidy with a lack of coordination between alarm box, lighting box, exposed conduit, lift sign and other items all adding to visual clutter and increased maintenance.

11.2 Lift Precedents

Copenhagen Metro lift illustrates some good design features:

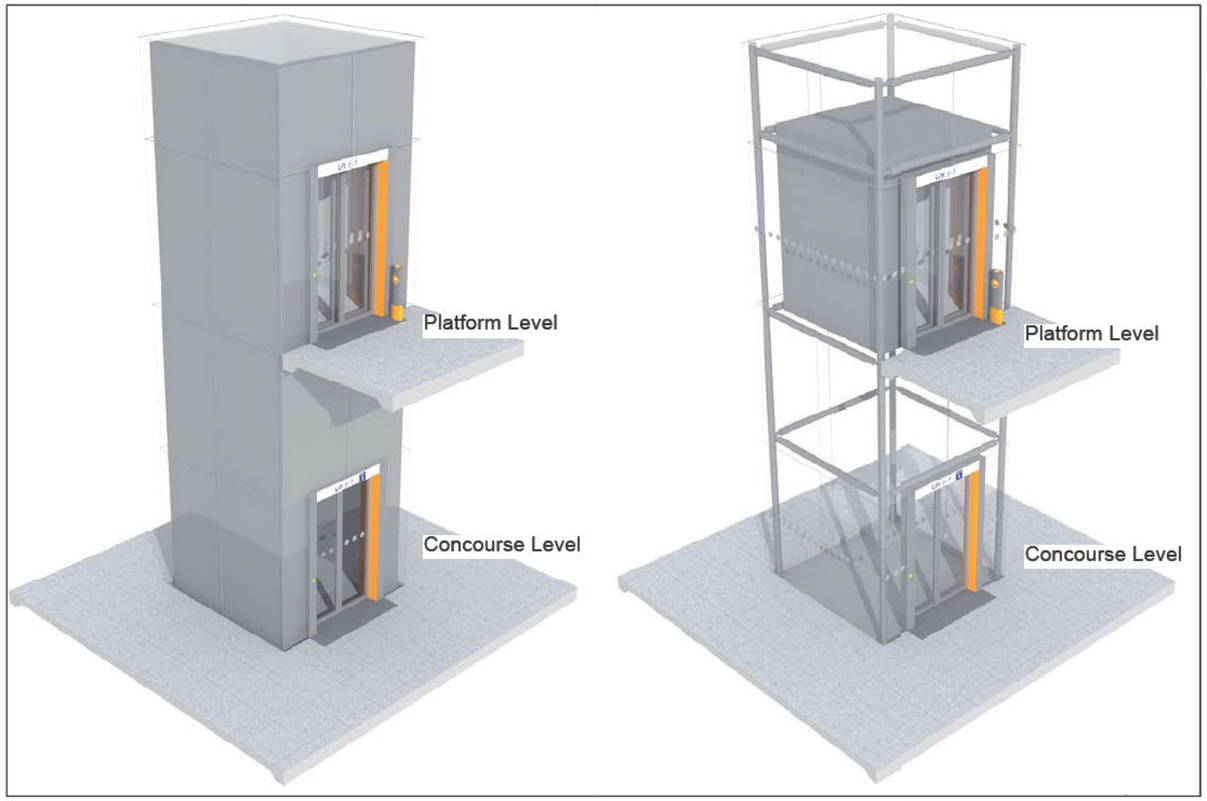
- Bright bands mark out the lift entrance and are highly visible.
- Glass lift doors (both internal and external) allow passengers to see through and into the lift car creating a safe environment.

Copenhagen Metro Lift



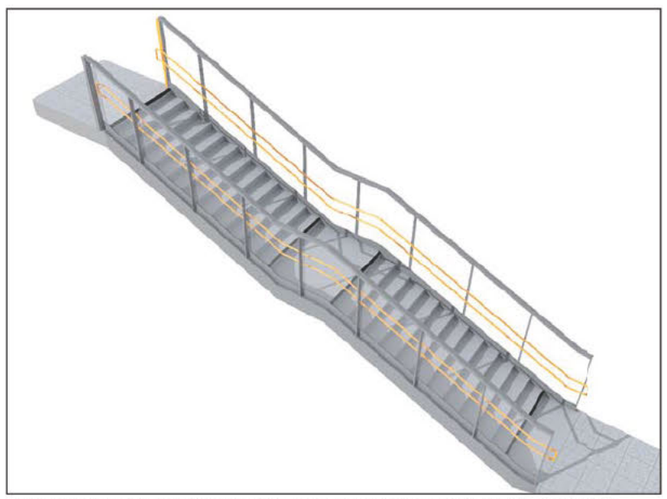
Limehosue station lift obstructs visibility of stairs behind

Devons Road station lift has an untidy appearance with conduit, alarm and other items fixed to the exterior.



Opaque Lift Enclosure

Glass Lift Enclosure



Recommended stair treatments include balustrades shown with yellow highlights

Screen/cladding mounted signs are used beside routes to platforms

11.3 Lift Recommendations

The two lift types shown illustrate how new lifts should be designed and how existing lifts could be modified to comply with the design guide principles.

11.3.1 Lift Enclosure

- Lifts should accommodate mobility impaired passengers.
- Where new or existing lift structures allow, glass cladding is used to provide a transparent enclosure to aid cross visibility and security, and to provide an improved environmental quality.
- Solid lift enclosures are preferably clad in glass but where this is not possible, metal panels can be used and coloured DLR dark grey metallic as in accordance with the colour palette. This will be consistent with the brand identity.
- Cabling, CCTV and lighting is integrated within the cladding and concealed where necessary to reduce clutter and simplify maintenance.
- Lift sign is located above the lift door.
- CCTV is integrated within the lift car and at the lift entrance to reduce vandalism and increase security.

11.3.3 Lift Doors

- Lift doors are recessed in a 300mm portal flush with cladding.
- Transparent, glass lift doors should be used to improve visibility.

11.3.3 Lift Colours

- Lift portal frames are DLR dark grey and DLR yellow highlight (section 16 page 46) on the inner face to define the lift entrance for easy wayfinding.
- Lift doors, skirting, metal cladding and visible structures are DLR dark grey metallic for brand consistency.
- Glass is clear or translucent for brand consistency
- For colour references refer to section 16 page 46 of this guide.

11.4 Stair & Ramp Recommendations

- Entrances to stairs should be marked with yellow verticals on either side as shown in the example to aid wayfinding and visibility for all.
- Stairs that go to platforms should be flanked by a sign on balustrade showing onward destinations as shown on the left.
- Stair treads should be DLR light grey in colour with black nosing following guidance in section 16 page 47 of this document. Tactiles are DLR dark grey paver.
- Stairs and ramps will have handrails as shown on the left – contrasting, double handrail, returned at ends. Where a balustrade is needed the example on the left can be followed with a light fitting on the upper edge of the balustrade.

12 CONCOURSE CLUSTERS

This section concerns the design of Concourse Clusters. These are located on concourse areas in accordance with guidance given in section 9 page 23 of this report. Concourse Clusters draw together currently disparate concourse elements creating a recognisable centre for the concourse.

12.1 Existing Concourse Elements

Concourses currently contain ticket vending machines, information and signage. They may also have lighting posts, staff telephones, cash machines, vending machines, salt bins and other elements. The different elements are currently treated and located separately.

12.1.1 Deptford Bridge station

- At Deptford Bridge ticket machines sit against a brick enclosure which has some information on it, but their is also a further freestanding information board. There is more information on the lift structure, and the tube map is behind the stairs
- Ticket machine signage is attached to the brick enclosure
- Opposite the brick enclosure there are some cash machines.
- Under the stairs there is a salt bin.

12.1.2 West India Quay station

- Passengers are forced by guard railing to enter the Concourse from the Quayside which makes the concourse a large area with many columns in its midst.
- An oyster point is tucked in beside a column near the Quayside but is far away from ticket machines which are at the centre of the Concourse.
- Information is located on boards near one set of stairs at some distance from the ticket machines.

Deptford Bridge Station – Information and ticket vending machines are scattered around the concourse making them difficult to find.

Information and ticket vending machines at West India Quay are hidden among columns and scattered around the concourse

Single Sided Concourse Cluster

Island Concourse Cluster

12.2 Concourse Cluster Element

Concourse Clusters aim to bring the disparate concourse elements (ticket vending machines, information, signage, telephones, etc.) together into a single unit, minimizing clutter and providing for a variety of passenger needs in one location. They are modular, prefabricated units which can be altered/extended and offer value for money. The Concourse Cluster will also introduce a common design identity at each station concourse.

- Concourse Clusters are located on concourse areas in accordance with guidance given in section 9 page 23 of this report.
- In cases where a suitably located blank wall is available, a Concourse Cluster can be placed within or against the wall.
- Where no suitable blank wall is available, an island Concourse Cluster could be used.
- The Concourse Cluster should be made up from modules so that more features can be added without a tacked-on appearance.
- All modules should be based on the station-wide 1450mm module which accommodates standard poster sizes.
- Modules should be of a depth which can accommodate all potential equipment including ticket machines.
- Some modules will have restricted access to staff equipment which will be provided by concealed access doors or panels.
- Panels are opaque DLR dark grey metallic finish (for colour definition see section 16 page 46) in glass or metal.
- Where Concourse Clusters are exposed to the elements they will have an integrated canopy with lighting and CCTV as shown.
- Where necessary Concourse Cluster canopies can have wire type anti-pigeon systems.
- Where space permits the Concourse Cluster will contain the salt dispenser and bins to further reduce clutter.
- Communications and master equipment for ticket validators can be located in the Concourse Cluster.
- Concourse Clusters will need access to power and communications so their potential locations on the concourse will need to be determined early so that conduits can be provided under paving.
- Where digital information screens are used these should be integrated into the concourse cluster with flush glass.

13 FIXTURES & FURNITURE

This section defines the fixtures to be used at DLR stations. Fixtures and furniture must be of good quality, highly functional and comply with the design guide aims to strengthen the DLR brand.

13.1 Existing Examples

Only fixtures approved by the DLR Design Review Group should be used. This section aids the selection of fixtures by showing some examples of what should be avoided.

13.1.1 Seats at Devons Road station

- Arm rest fastenings are readily visible and some have rotated out of place.
- Seats are badly located above a stepped skirting and just under a horizontal rail.
- Seats are painted rather than powder coated.
- Seats are the same colour as the surrounding structure, so do not contrast sufficiently to be readily visible.

13.1.2 Bins at Shadwell station

- Ring bins installed at Shadwell and other DLR stations have exposed liners. These look untidy as the most visible element is the waste inside the liner.

13.1.3 Ticket Validator at West India Quay station

Existing types of validators pose various problems. A more versatile validator such as that shown in section 13.2 (page 36) should be developed. Some things to avoid in the selection of validators or development of a new model are:

- The current boxy, stainless steel ticket validators are not conducive to people walking past so they must be placed at the side.
- When ticket validators are placed at the side they may not be seen if many people are leaving at the same time.
- Some validators (such as at West India Quay) are placed at some distance from the main passenger flows and behind columns where they will not be seen.
- When ticket validators are located on the side at busy stations several machines need to be placed along the route to avoid queues. This arrangement blurs the boundary of paid areas making it easier not to pay.
- On new, heavily stickered validators signage is applied to the ticket validator but repeated in different formats on various parts of the machine. This combination of signs reduces clarity and makes the machine look untidy.

13.1.4 Help Point at West India Quay station

- The help points at West India quay are one of a range of different help point types across the network. These items are different from the rear mounted units used elsewhere on TfL and national rail, so they may not be readily recognised by passengers.
- The help point is made up of a collection of different parts which increase clutter and confusion relating to its use.
- Free standing units in the midst of platforms obstruct views and create clutter. Although this unit is mounted on a column it still obstructs views along the platform.

13.1.5 Balustrade at Elverson Road station

- Balustrades at Elverson Road station are perforated but not sufficiently transparent to deter vandalism.
- Handrails are the same colour as backscreens and structure, so are not accessible to visually impaired.

13.1.6 Light Fixtures at Crossharbour station

- Strip Lighting fixtures are attached to the structure as separate elements which add to the visual clutter. Luminaires are visible so that they cast light into passenger's eyes.

13.1.7 CCTV at Canning Town station

The current approach is to apply different types of cameras depending on the location. This results in a cluttered and incoherent appearance. Cameras with a consistent appearance as shown in section 13.2 (page 36) should be used throughout. Existing cameras at Canning Town station:

- Create visual clutter since they are suspended from a pole rather than integrated with the station structure.
- Cameras are numerous, large and highly visible suggesting to passengers that crime is an issue at this location.

13.1.8 PA Speakers at Crossharbour station

While barrel speakers can be oriented freely and mounted easily, they also introduce visual clutter. A combined boom with flush speakers is proposed in section 13.2 (page 36) which will create a more coherent and uncluttered environment. The use of barrel speakers should be discontinued wherever there is opportunity to use a boom to combine services or integrate flush speakers.

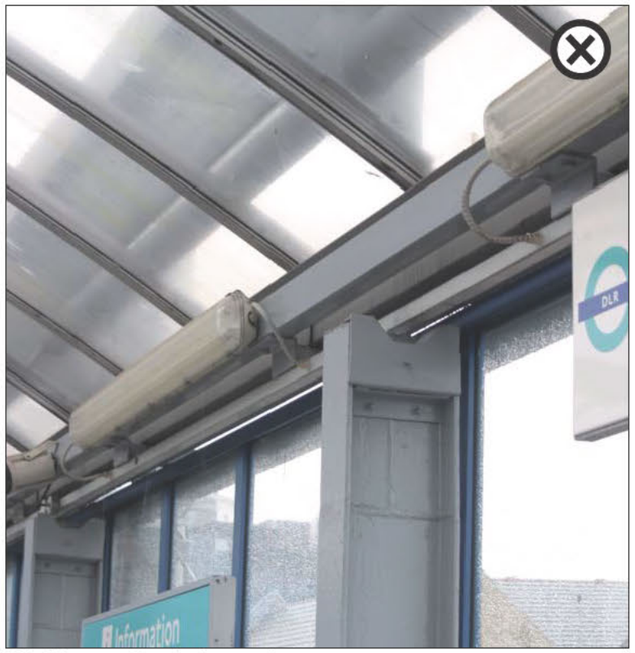
- At Crossharbour, PA Speakers are of the barrel type and add to visual clutter since they are attached rather than integrated with the station structure.

13.1.9 Cycle racks at Gallions Reach station

- Cycles racks were located in an area not overlooked creating a problem with vandalism and theft.
- Cycle racks were high maintenance with peeling paint and rust patches presenting a poor quality image.

Seats at Devons Road station

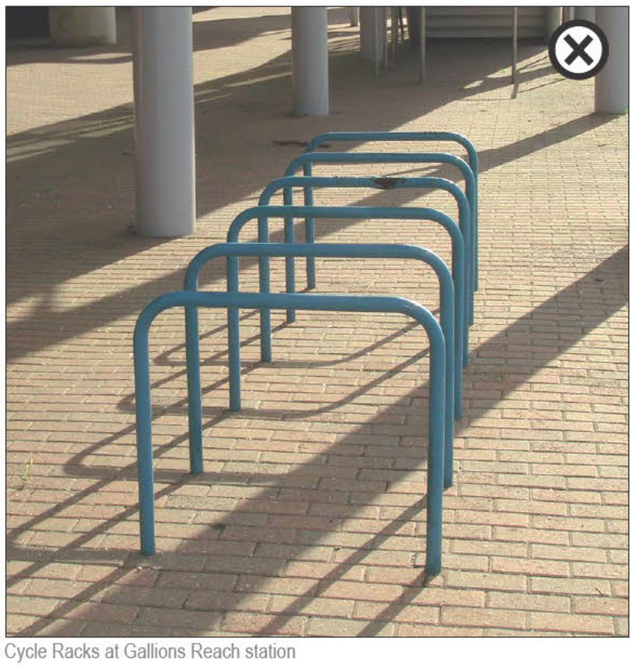
Bins at Shadwell station



Light Fixtures at Crossharbour station

Help point at West India Quay station

Balustrades at Elverson Road station



Cycle Racks at Gallions Reach station

CCTV cameras at Canning Town station

PA Speakers at Crossharbour station platform

13.2 Recommendations

Only DLR approved fixtures should be used. Most of the items shown will need to be developed for large volume production by working with manufacturers to ensure consistency and value for money. Until they become available the DLR Design Review Group will approve an alternative item to be used. Recommended fixtures are described below and shown on the right.

Where bird protection is required for any item the wire type is preferred.

13.2.1 Seats

- Seats can be mounted on the floor or on and coordinated with the structure behind. Seats mounted on the structure behind allow for easier cleaning of the platform floor.
- All seats have stainless steel backs and seats with arm rests and frames in DLR yellow for low maintenance and high visibility. (for colour definition see section 16 page 46)
- They should be grouped in sets of 4 in line or 8 back to back.
- Each group of seats should be evenly spaced along the platform beyond the platform information cluster at the entrance.
- There will be no seating on the concourse.

13.2.2 Bins

- A bin with transparent sides, top in DLR yellow highlight colour and other metallic parts in DLR dark grey metallic should be used. (colour definitions in section 16 page 46)
- Bins are located adjacent to seating and should be fixed to the canopy/ backscreen structure where possible. Otherwise, a free-standing version of the bin can be used.
- Individual bins can be labelled on the top surface for recycling so as to be adaptable to changing needs.

13.2.3 Ticket Validators

Cubic is currently developing a new validator at the time of the writing of this guide. This poses a good opportunity to develop a more versatile validator. The recommended validator is shown on the right and described below:

- Ticket readers will be placed on DLR dark grey metallic posts which are readily visible to people with poor vision.
- Ticket validator posts are shaped for location in the midst of passenger flows.
- Ticket validators should be arranged as part of a gateline as described in section 10 page 25. This will create a clear boundary between paid and unpaid areas which is difficult to cross without touching in or out.
- Post-type ticket validators are smaller than box-type validators allowing them to be used in a variety of locations.
- It is acknowledged that it may be expensive to replace the existing validator design but a new design can be phased in on a station by station basis.

13.2.4 Help Points

- Help points are located at the platform entrances and mounted on an opaque wall panel as part of the platform information cluster.
- The standard pill or DLR approved box-type design will be used to improve recognisability and consistency across DLR and with other London and regional networks.

13.2.5 Balustrades

- Balustrades will be in transparent or translucent glass with steel supports and skirting in DLR dark grey metallic. Handrails will be DLR yellow highlight for visibility.
- Where signage is applied at platform entrances an opaque panel in DLR dark grey metallic will be used.
- A standard design will be used across the network to enhance the DLR brand.

13.2.6 Light Fixtures (see section 17 page 48)

- Platform light fixtures should be recessed into the services boom to reduce clutter.
- Lighting should be integrated in balustrades on stairs,bridges and concourses.
- Additional lighting should be integrated within structures wherever possible.

13.2.7 CCTV Cameras

- Concealed dome cameras will be used for better architectural integration and a more friendly environment.
- Services boom cameras will be at 12m centres. Cameras on concourses should be integrated with concourse structures wherever possible.

13.2.8 PA Speakers

- On platforms PA loud speakers should be recessed into the services boom at 6m centres to reduce visual clutter.
- On concourses PA loud speakers should be integrated with concourse structures wherever possible.

13.2.9 Cycle Racks

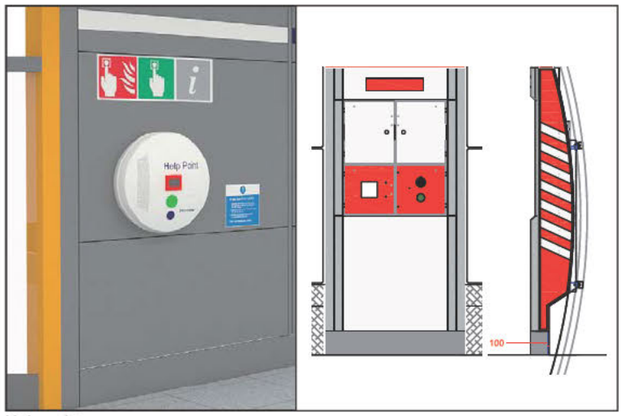
For consistency cycle racks should be selected as described in the DLR Cycle Strategy.

- Cycle racks are to be located on forecourts such that they benefit from good surveillance and should not obstruct approaches and pedestrian movement. They can be placed beside the station totem where there is no cycle shelter in order to build the association with the DLR brand.
- Cycle racks should be manufactured in stainless steel for low maintenance.
- Cycle shelters should be open or sufficiently transparent to enable visibility from all directions. They should use the Concourse Cluster colour scheme for consistency.
- Simple cycle racks that integrate well with this guide should be considered in any future DLR Cycle Strategy revisions.

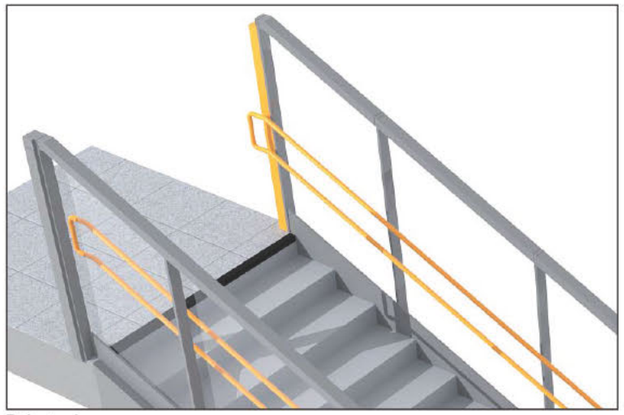
Seats

Bins

Ticket Validator



Help point



Balustrades

Light Fixture Integrated in Boom

Dome CCTV Camera

Integrated PA Speaker

Cycle Racks

14 RETAIL

This section describes the principles for the architecture and location of Retail on DLR. The key recommendations for retail are:

- Siting so as not to obstruct passenger flows and wayfinding views.
- Siting to enable passive surveillance of the station.
- Relocatable and adaptable modular retail unit architecture.
- Retail units that are consistent with Concourse Cluster architecture and more transparent.

14.1 Existing Kiosks

Most DLR units are permanent brick structures with roller shutters or metal gates. These structures look "fortified" when not open and harm station ambience.

14.1.1 Devons Road Station Kiosk

- At Devons Road station, a permanent brick kiosk is located in the centre rear of the concourse where it obstructs potential views to the platforms below.
- The kiosk window is too small to afford good views of the concourse and it is difficult to recognise when it is open.
- Signage lettering is too small and its colours do not relate to any others used at the station.

Devons Road station kiosk has a tiny serving window and cluttered presentation.

14.1.2 Limehouse Station Kiosk

At Limehouse station, a retail unit is located inside a viaduct arch.

- The ends of the vault are filled in brick with a door at one end. This unit offers poor passive surveillance of the concourse.
- The front of the kiosk is cluttered with different kinds of signage. If the end of the kiosk was transparent, some information could be inside the kiosk.

14.2 Retail Layout

- Retail units should be located where they do not obstruct wayfinding or passenger flows.
- In addition, they should be placed so they offer good views of the station and/or forecourt. This will enable passive surveillance and also ensure that units themselves are readily visible to potential customers.
- For some retail units external seating may be desired and these could improve ambience around stations. In placing retail units areas near the kiosks could be designated for seating, but these must not obstruct passenger flows.
- Locations for units will be restricted to those areas where the necessary utilities are available, so possible locations for kiosks will need to be decided early so that the necessary utilities can be provided to these areas.

Limehouse station viaduct retail unit – unit does not have visibility of the station concourse..

Cafe Kiosk

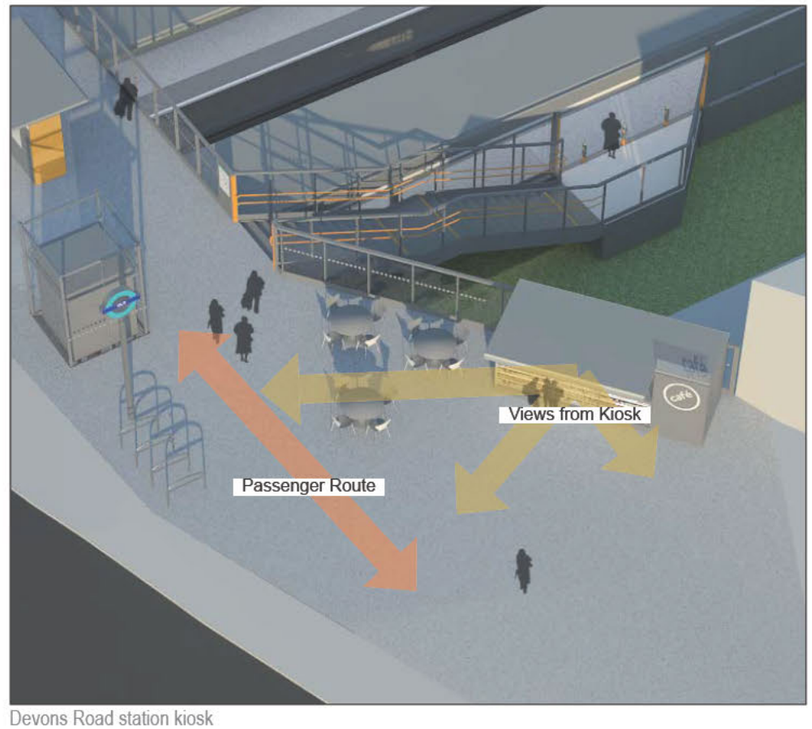
Retail Kiosk

14.3 Retail Unit Architecture

- Retail units should be more coherent with the station architecture. The exterior will be fixed in style and palette for greater coherence.
- Kiosks should be relocatable so they can be removed if the business is unsuccessful. This can be achieved with a sturdy, light unit or one that can be disassembled.
- The retail unit's external appearance should be based on the Concourse Cluster which will be at all DLR stations in order to give a coherent impression. Glazing and panels should match the 1450mm Concourse Cluster module.
- Retail units should have interchangeable clear glass and opaque panels to allow flexible internal arrangement.
- Kiosks should be modular to accommodate various business types and sizes.

14.4 Retail Colours and Materials

- All retail units should adopt a material palette of glass and steel with a potential high level of transparency where views are important.
- Panels will be transparent glass or opaque in DLR dark grey metallic finish for greater consistency with the station architecture on the outside. The colour scheme on the inside may be determined by the concessionaire.



Devons Road station kiosk

15 SIGNAGE, INFORMATION & ADVERTISING

General guidance is provided here regarding the types and locations of signs, but detailed guidance should be obtained from the DLR signage manual. Signage, information and advertising must form a coherent scheme which is an integral part of the station architecture and expresses the DLR brand.

15.1 Existing Signage Schemes

There are several different approaches to signage on the DLR network and a variety of different sign types.

15.1.1 All Saints Station Concourse

Signage and information are cluttered on most of the DLR network.

- On All Saints station concourse information is provided on freestanding information boards in the middle of the concourse which obstruct views and create a cluttered presentation.

15.1.2 Crossharbour Station Platform

- Signage locations are not coordinated so that signs are obstructed and the overall effect is confusing and cluttered.
- The placement of one of the way out signs on the backscreen is near head height so that it may not be visible on a crowded platform.

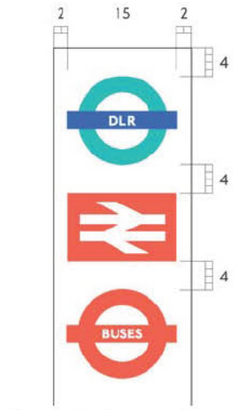
15.1.3 Lewisham Station Concourse

- Freestanding information boards are scattered around the concourse area making it difficult for passengers to find the information they need.

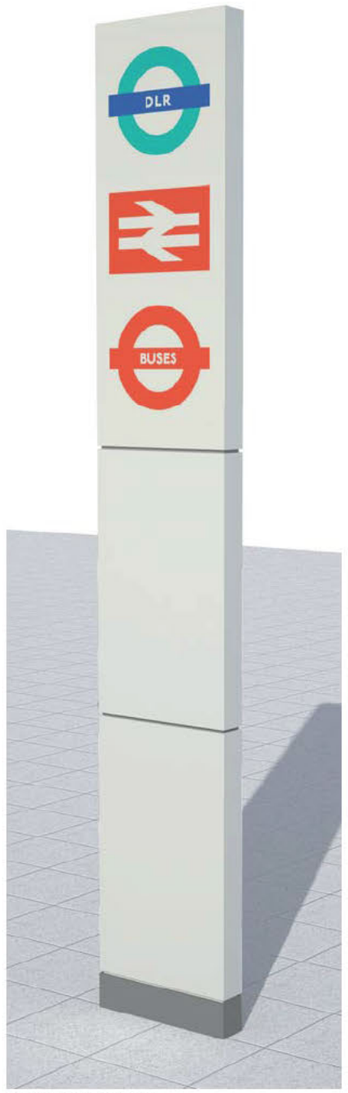
All Saints station concourse – Free-standing information boards obstruct key views for wayfinding.

Lewisham station concourse – Information is scattered around the concourse.

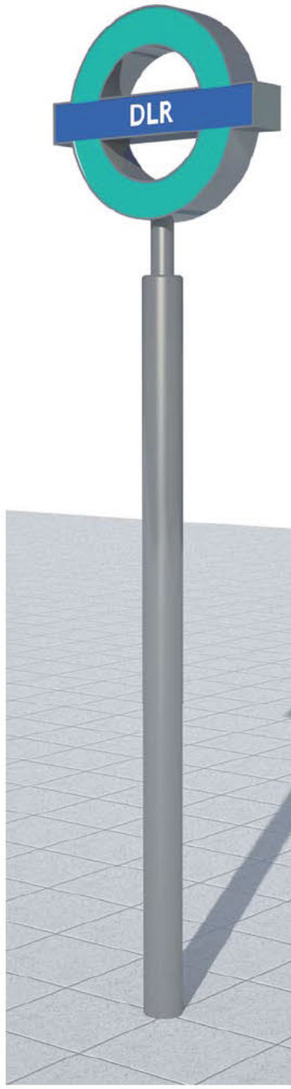
Crossharbour station platform – Clutter and poor wayfinding due to uncoordinated signage locations and a variety of sign formats.



Roundel border proportions



Interchange station



Non-interchange station

DLR Identifiers

15.2 Recommendations

15.2.1 Station Identifiers

Only the two kinds of DLR identifiers shown can be used. In both cases a standard DLR Roundel is used and no other information or station name is shown. Roundels on posts can only be used where there is no interchange. At interchange stations the solid DLR totem should be used. The LUL Signage standards apply to the dimensions and proportions of all totems and roundels. The totem should be placed as described in the Forecourts and Approaches section of this document.

15.2.2 Station Name Signs

The station name sign should always be formatted in the same way – on one line and with solid block letters on a glass or solid background as shown. There should be no DLR roundel here as some stations may also serve other modes. The station name sign will be placed for good visibility depending on the location e.g. top of canopy, on the Concourse Cluster or on the station viaduct.

Station Name Sign on a Viaduct

Station Name Sign on a Canopy Structure

15.2.3 Platform Signage Frieze

A signage frieze is to be used on all platforms to reduce clutter and create a single place of reference for platform signage. The platform frieze is applied at an overhead height of 2.5m in accordance with platform guidance in section 10 page 26 of this document.

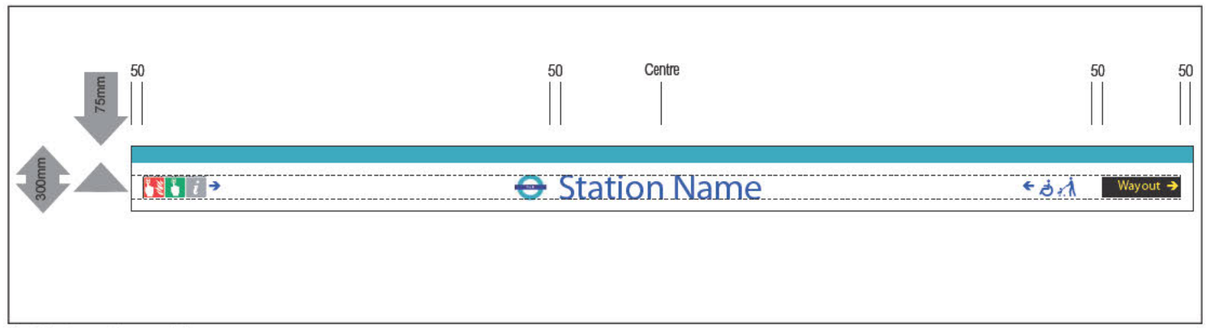
- The frieze itself has a height of 300mm and a 75mm DLR brand colour band along the top edge.
- It is designed at 5800mm length to run between columns at 6m centres, but could be applied to larger or smaller bays by splitting the station name and way out in separate bays.
- If the frieze must be panelised the breaks should occur where there is no text on top and the effect of the joints should be seamless.
- The station name is centred on the frieze in each bay.
- Any other signage, including the way out sign, are also located on the frieze but on the ends as shown. LUL signage rules apply to text and way out signs including the use of lift directions only when it differs from the way out.
- The frieze will be vitreous enamel in DLR white. All text is DLR blue and the DLR colour band is the DLR brand colour and 75mm high for consistency and visibility.

15.2.4 Overhead Signs

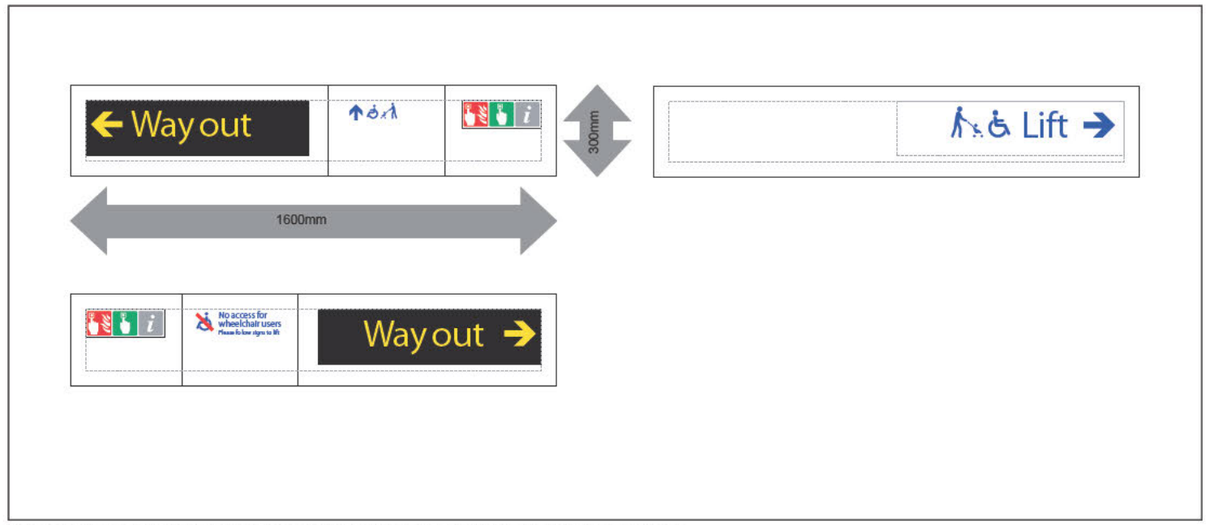
Overhead signs consist of hanging wayfinding signs and passenger information displays (PIDs).

- Overhead signs and PIDs are placed 2.5m above FFL to their lower edge for consistency.
- All overhead signs are located between the platform frieze and boom when on platforms.
- Overhead signs are of fixed dimensions being 300mm high to match the platform frieze. Their width is fixed for clarity to 1600mm with the main sign being located on one side with the remainder being taken up by other signs or left white.
- Overhead signs are located beside columns so as not to obstruct visibility of the frieze.
- No overhead sign should interfere with the visibility of other overhead signs. To that end overhead signs (including PIDs) should be located at least 10m apart. This will enable visibility of signs and PIDs from 30m away.
- Two PIDs are located at equal intervals along the platform length, but should be beside columns so as not to obstruct visibility of the frieze.
- PIDs should have contrast and text size such as to be visible by normally sighted people up to 30m away.

Platform Overhead Signage spacing permits visibility of signs and PIDs from 30m.



6m Platform Signage Frieze



Sample Overhead Lift and 'Way Out' Signs: Signs are of fixed dimensions for consistency.

Concourse Cluster

15.2.5 Screen and Panel Mounted Signs

Where there is no canopy to support overhead signs and no frieze is available (such as at the concourse end of stairs on the Devons Road recommendations) wayfinding signs can be mounted on or integrated in balustrades or wall cladding panels.

- The use of these signs should be kept to a minimum for clarity and visibility. It is expected that these signs will be wayfinding and platform finding signs only.
- The back surface should be opaque to block out visual noise.
- The top of the sign should be aligned with the top of the screen or should be at 1800mm if a map is included with the sign.

15.2.6 Concourse Cluster

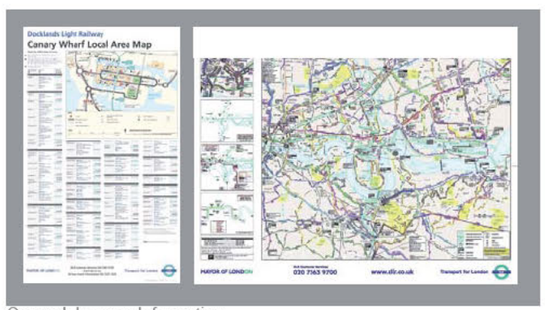
The Concourse Cluster is a modular element which contains ticket machines, concourse area information and other items that may be required such as concealed staff phones or salt bins. Concourse Clusters are described in section 12 page 33 of this document. This section concerns the information content of the Concourse Cluster.

- Cluster modules are based on a 1450mm module that permits a quad royal poster or two double royal posters to be neatly integrated.
- Posters are 1800mm to their upper edge for consistency and readability.
- Above all items and across each panel there is a 150mm high white signage band identifying ticket machines and information.
- All module panels are opaque DLR dark grey metallic and have flush glass panels where information can be inserted.

There are two categories of information posters to be located on the concourse:

- DLR journey information which includes a Tube map and a timetable.
- Onward journey information which includes a local area map and Docklands transport connections map.

DLR Journey Information



Onward Journey Information

Concourse Posters

Screen Mounted Sign

15.2.7 Platform Cluster

The platform cluster brings together platform information and a help point.

- It is integrated in the backscreen and is on a 1450mm module that permits a quad royal poster or two double royal posters to be neatly integrated. Posters are 1800mm to their upper edge for consistency and readability.
- Above all items and across each panel there is a 150mm high white signage band identifying help point and information.
- Required information for platform clusters includes a line diagram in poster format, a tube map and a time table. Where space permits the required information can be followed by other service related information.
- All platform cluster panels are opaque DLR dark grey metallic and have flush glass where information can be inserted.

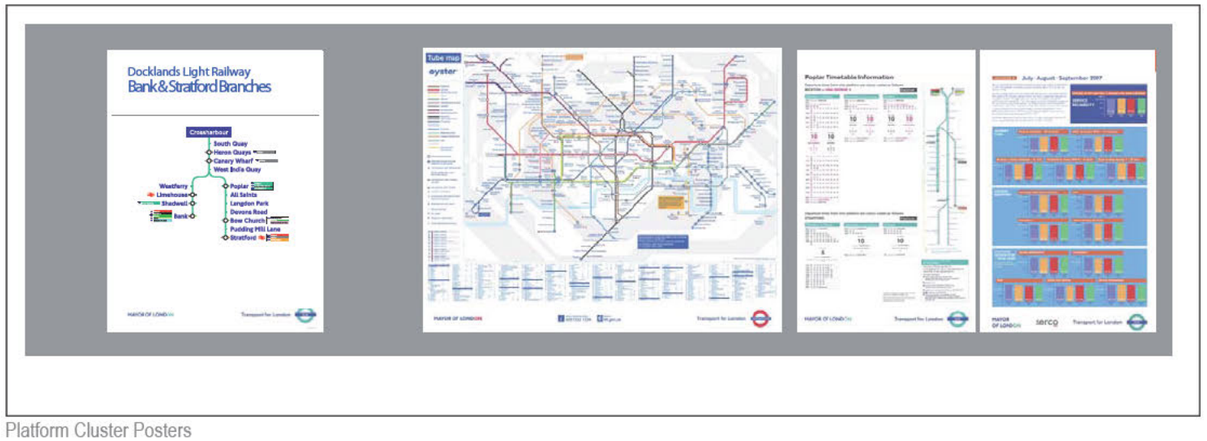
15.2.8 Advertising

Where advertising is applied on platforms it should conform to the platform layout described in this guide and the backscreen panel should be made opaque in DLR dark grey metallic to prevent visibility of the rear of the advertising.

- Advertising will be of 6-sheet format on platforms.
- Platform backscreens on a 1450mm module can have integrated advertising in the backscreen panel in a similar way to the platform information cluster. Where integration is not possible advertising units can be placed in front of and centred on the backscreen panel. The same advertising method should be used throughout the platform.
- On concourses and other areas where a large blank wall space is available, larger format advertising can be used. Otherwise the platform approach with 6-sheet advertisements can be used elsewhere provided that advertisement do not obstruct visibility and are not located too close to signage and information.

Platform Cluster

Integrated 6-Sheet Advertisements



Platform Cluster Posters

16 COLOUR

This section defines the DLR colours referred to throughout the design guide and provides general guidance on their application. Colour guidance on specific items is provided in the relevant section.

Colour is one of the areas where a small investment could have a profound impact on the coherence and functionality of stations. It is a key element of the DLR brand but needs to be controlled, implemented consistently and regularly throughout the sites and approaches to the station. The DLR Brand colour should always be employed with great consistency and care.

16.1 Existing Colour Schemes

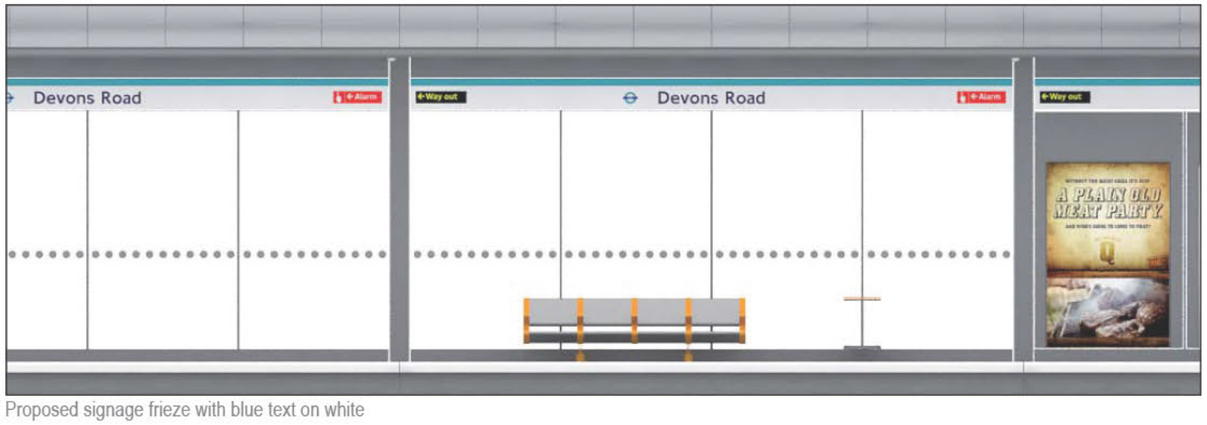
DLR stations employ a variety of different colour palettes and also apply colour with varying degrees of success. Devons Road station employs a palette of strong blues and reds, together with dark greys; these colours can overpower the DLR Brand colour. It is difficult to locate what is important visually; the strong red and blue colours that are applied to large areas on rails and structure detract from the DLR brand. Meanwhile the DLR Brand colour is currently applied to signs with white text reversed out; this combination does not give sufficient contrast for visually impaired passengers and makes the job of identifying the right stop quickly, a difficult task for all travellers. The paving is a dark asphalt with a medium grey concrete coping edge. This paving does not give sufficient contrast to the approach to the platform edge and due to their dark colour do not reflect light; this results in darker platforms at night. A lighter platform surface - before the traveller reaches the tactile and coping edge - is good for visibility for all.

16.2 Recommendations

16.2.1 Colour palette

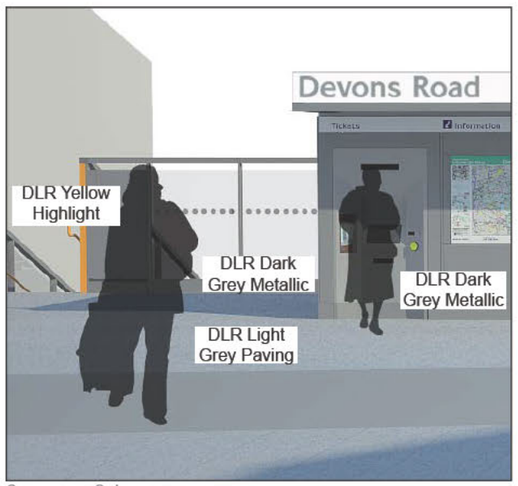
A colour palette has been carefully constructed to ensure that the contrast of materials are sufficiently accessible. The colours are integrated and designed with the existing materials used on the network and will apply to all elements from paving to paint. All colours in the palette have been measured for their percentage of light reflectance value (LRV%) and selected for their ability to be perceptible for people with low vision if used in the right combination. These colours if applied in the ways described and for each of the common elements, will provide an accessible environment for all. To get the correct application of colours they should be used as shown. In addition to these colours there are a few guidelines to aid designers to apply colour in a way that upholds the principles of the design guide. There will on occasion be the need to employ additional colours, but the DLR colour scheme should form the basis of any station colour scheme. Colours should match as closely as possible the criteria described in the palette; the LRV% is to be used as a guide. Natural material colours are preferred over paints for sustainability, so that the colours do not fade over time. The pavings have been selected on that basis so they will automatically be of a sufficient contrast difference for travellers with low vision.

Devons Road station – strong red and blue colours applied to large areas detract from the station name and DLR brand colour which is less visible.



Proposed signage frieze with blue text on white

Platform Colours

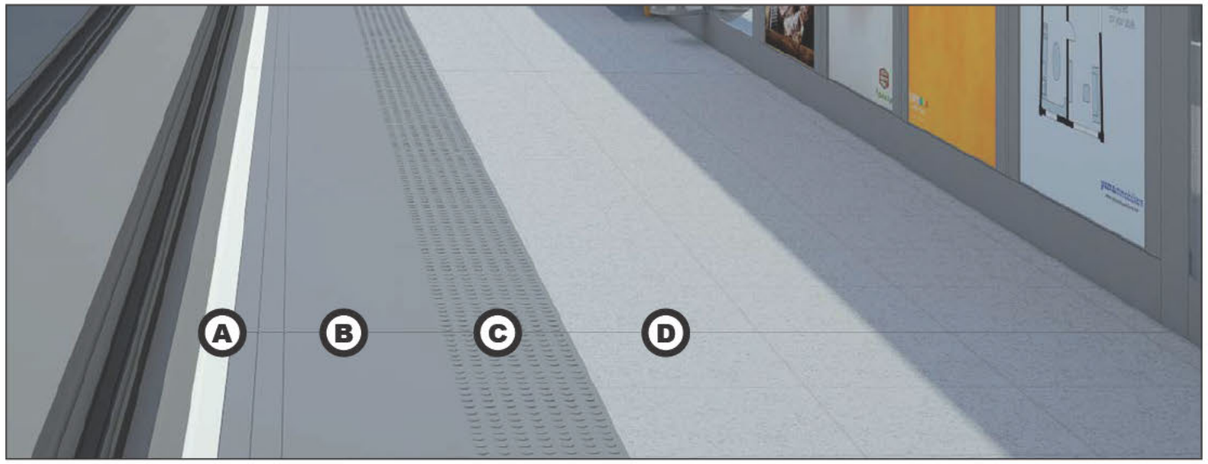


Concourse Colours

Colour application to concourses and platforms

Colour Name	Description *(Reference / RAL / NCS / LRV)*	Examples	Applications
DLR White	*NCS S 0500N* ***(96 – 97% LRV)***	*LUL White*	Signs, Platform edge
DLR Light Grey	**Paint:** *Powder Coat RAL 7035/NCS 2002 G .* ***(57% LRV)***		Ceiling panels (on flat grey colour scheme)
	Metallic: *Powder Coat RAL 9006/ NCS 2005 R50B.* ***(50% LRV)***		Ceiling panels
	Paving: ***(29 – 38% LRV)***	*Marshalls Conservation Textured/Smooth Silver Grey*	Concourse, Platforms
DLR Dark Grey	**Paint:** *Powder Coat RAL 7037/NCS 5500 N.* ***(26% LRV)***		Oyster reader, columns, structures (on flat grey colour scheme)
	Metallic: *Powder Coat RAL 9023/NCS 5005 R50B.* ***(24% LRV)***		Oyster reader, columns, structures
	Paving: ***(8 – 12% LRV)***	*Marshalls Grey Concrete Coper Slab. Blister slab*	Platform edge paving, Tactile paving, Gateline paving
DLR Brand Colour	***NCS S 2050-B50G***		DLR roundel, Line colour band on frieze
DLR Yellow Highlight	*RAL1028/NCS 0580 Y20R.* ***(52% LRV)***		Ticket validation area, Seat frames, Handrails, Lift entrances
DLR Blue	*NCS S 3065 R90B*	*LUL Safety Blue*	Signage Text

DLR Colour Palette



Recommended platform edge paving


Recommended ticket validation line colour scheme

Recommended columns colour scheme

16.2.2 Colour Application

Colours should be employed in a way that is: consistent and more structured: To this end a reduced palette should be used. The palette provides the maximum contrast between adjacent elements of the station site; this might be a column and the concourse paving for example. For contrast to be useful for people with low vision and also those with cognitive impairment, objects and elements of the building which could be obstacles must be visibly of a strong contrasting difference. Use the palette LRV to check on contrast difference and plan the sequence of materials used on a project. For most general uses around 20 - 30 points of contrast difference is adequate. However any element of the site that is critical for safety reasons - e.g. platform edges or pillars and columns - must have a greater level of contrast difference than 30 points. Parts of the station site may need to have around 40 – 50 points of difference between objects or elements to ensure optimum visibility; DLR Dark Grey with DLR White may have around 80 points difference,e.g. the white line on the dark coping platform edge. Where high contrast is needed higher lux levels should be achieved. The areas near Oyster readers, barriers or platform edges should be lit to recommendations in Appendix B page 93 for safety for all users. Visibility of high contrast is not effective unless lighting levels are either raised or luminaire distribution and arrays are increased in those areas. The colour palette forms a basis for the DLR brand identity and if applied correctly improves the visibility of the DLR Brand.

16.2.2.1 Platform Edge Paving Recommendations

A. LRV 95% Painted White Strip. Maintenance is critical for visually impaired passengers

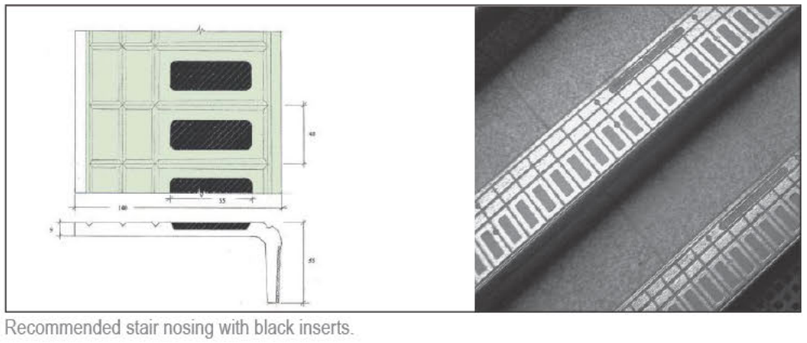
B. LRV 12% Marshalls Grey Concrete Coping Slab

C. LRV 8% Charcon Specialist Blister Concrete Tactile. Contrast between C and D is 30 points

D. LRV 38% Marshalls Conservation Textured Silver Grey

16.2.2.2 Stair Nosings

Despite soiling the brightness of the metal maintains a level of contrast through constant wear on the metal matrix. Black resin inserts on the tread and the riser would improve the contrast.


Recommended stair nosing with black inserts.

17 LIGHTING

This section provides recommendations for lighting of elements and areas described in previous sections. Detailed standards are provided in appendix C page 80.

17.1 Lighting Design Process

The lighting on any station needs to be considered as early as possible during the design process to enable an integrated design approach. Any decisions on materials or architectural form will affect the opportunities and constraints of the lighting design, and restrict the possible lighting applications. Ideally, the lighting design should be considered from RIBA stage B so that the design can be as cohesive as possible.

The design process should form a series of stages so as to maximise the design output and ultimate performance. Typically this will be in three stages:

17.1.1 Analysis

Each station will have a unique set of circumstances which need to be considered before moving into a design approach. This will be specific to each area of the station and will result in a series of conditions being identified that will form the basis of the lighting structure. This strategy will identify a set of specific questions which need to be reviewed against each station.

In design output terms, this stage of the design is likely to result in a documented series of conditions, such as view diagrams, architectural analysis, light level requirements, etc. This would be consistent with the RIBA stage B.

17.1.2 Approach

On the basis of the outcome of the analysis, the lighting approach should identify the lighting structure in both technical and aesthetic terms. Key design principles identified in this report will guide the DLR aspiration across the network and these need to be applied to the exact circumstances on each station.

This stage would be equivalent to RIBA stages C to D and would result in a series of presentation and visuals demonstrating the lighting concept.

17.1.3 Application

This is the technical application stage, where each and every lighting treatment is identified, drawn and detailed according to a specific luminaire specification. There should be a co-ordinated design material between architecture, mechanical and electrical, and lighting design to ensure that the design parameters are met and the concept realised.

The output at this stage should conform to RIBA stage E onwards, and be a purely technical output. This involves the following outputs:

- Layout drawings
- Detail drawings- showing architectural integration
- Switching arrangements, showing the lighting controls to each fitting, electrical load listing and a lighting control philosophy
- Detailed specification, including fitting images and finishes
- Typical lighting calculations to prove technical compliance

17.2 Lighting Design Approach

There are two key considerations when approaching the lighting design for DLR stations. These two considerations are as follows;

- Visual Presentation of the Building: the visual presentation of the building is based on a concept called 'layers of light'. The layers of light concept consists of layers of light for different functions producing an overall design which is both functional and visually pleasing.
- Sustainability: this is a key aim of the DLR network and lighting installations are no different. Lighting installations on the DLR network have to be energy efficient from both running cost and maintenance over life cycle viewpoints.

17.2.1 Visual Presentation of Building (Layers of Light Concept):

The layers of light concept is to be the lighting design approach for any new DLR stations. This encompasses all the individual elements (both functional and aesthetic) of lighting design into the one holistic framework, to produce a balanced and comfortable lighting design solution. The layers of light philosophy comprises of the following elements which when added together give the balanced lighting design required:

- Base Lighting: the base lighting level to be designed for initially is functional lighting for safety and security. This is a paramount concern both inside and around stations. The growth of the retail sector and extended opening hours are key indicators of the importance of the night time economy, thus the use of the DLR network is likely to extend later and later into the day outside the normal commuting rush hours. In this context, lighting is a key ingredient to the safe and successful use of stations and streets at night. Good lighting has the capacity to make spaces feel open and welcoming, whereas poor lighting can make a space feel threatening or difficult to use.
- Enhanced Base Lighting: this consists of the addition of lighting for way finding and orientation, to the base level lighting. The functions of the station should be clear and evident, as should the circulation through the station from platform to streetscape and vice versa. Lighting should reinforce these routes and functions to make the station interactions positive and circulation easy. The application of light, in a cohesive structure from street to platform level will help travellers to maintain an energy to their journey and aid navigation along it.
- Feature Lighting: this is lighting which accentuates the particular architectural features of the station, giving it a particular character and identity. This provides a positive identity and experience to using the DLR network. Thought should be given to the station surface finishes and features. Consideration should also be given to the use of accent and directional lighting to emphasise texture as well as provide contrast and variation to surfaces thus increasing the vibrancy and interest of the space.

Layers of light concept example:

- Base Lighting: functional base level lighting provided by metal halide downlights mounted along the centre of the entrance ceiling. These allow for base illumination levels to ensure safe use of the space.
- Enhanced Base Lighting: added to this is local areas of increased illumination at certain areas to aid wayfinding, in this case at the entrance to ticket hall. It provides for intuitive wayfinding and eases use of station.
- Feature Lighting: a combined use of white and coloured light in this case is used to enhance the concourse structure, increasing the interest and vibrancy of the space and drawing passersby attention to the station, as well as providing a dynamic response to the day to night movement.

17.3 Visual Presentation of Building

17.3.1 Base Lighting Layer (Functional lighting for safety & security):

Functional lighting for safety and security is a key base from which the overall lighting strategy for a station should develop. There are two considerations in functional lighting for stations.

17.3.1.1 Safety

The key considerations when designing for safety are as follows;

- Design criteria recommendations detailed in the appendices should be met as a minimum to provide safe and comfortable visual conditions for use of the station.
- Added to this the layout of the station should be analysed and any potential hazardous areas such as stairwells and disabled areas given special attention with appropriate lighting levels and emphasis.
- The transition from natural daylight to artificial lighting as you enter the station should be carefully considered. Illumination levels should provide a gradual transition from the entrance to the concourse and station platforms. Also the surrounding night-time streetscape will influence the lighting to the station entrances, with the aim being to avoid any hard contrasts in light levels.

17.3.1.2 Security

Good illumination levels and lighting emphasis are central to improving the feeling of safety and thus nighttime use of the stations and reduction of crime. The main considerations when designing for security are:

- Good vertical illumination; research has shown that good facial recognition leads to a better feeling of safety. People want to be able to recognise strangers at a distance of 4m to feel safe. Colour rendering and vertical illuminance are crucial to this.
- Illumination of dark and potentially dangerous areas. The architectural design for the station should be analysed and care taken to illuminate possible dark corners.
- Lighting of the perimeter of the space: framing the space by lighting its perimeter, gives the user an unobstructed view of the area, thus increasing the feeling of safety.

Poor colour rendering and illumination levels makes the space feel unwelcoming. Poor illumination levels also make it difficult for users to spot potential hazards.

Base lighting provides good illumination levels and colour rendering makes the space both safe for functional use and provides a feeling of security.

Note also the enhanced base lighting for the signs and entrance and the feature lighting to the bridge ceiling, providing a balanced visual field and easy to navigate space.

Concourse area lighting is purely functional. There is no highlighting of signs, stairwell or lifts to aid wayfinding.

The use of coloured lighting and increased illumination levels to highlight the escalator entrance to the station.

17.3.2 Enhanced Base Lighting Layer (Wayfinding & Orientation):

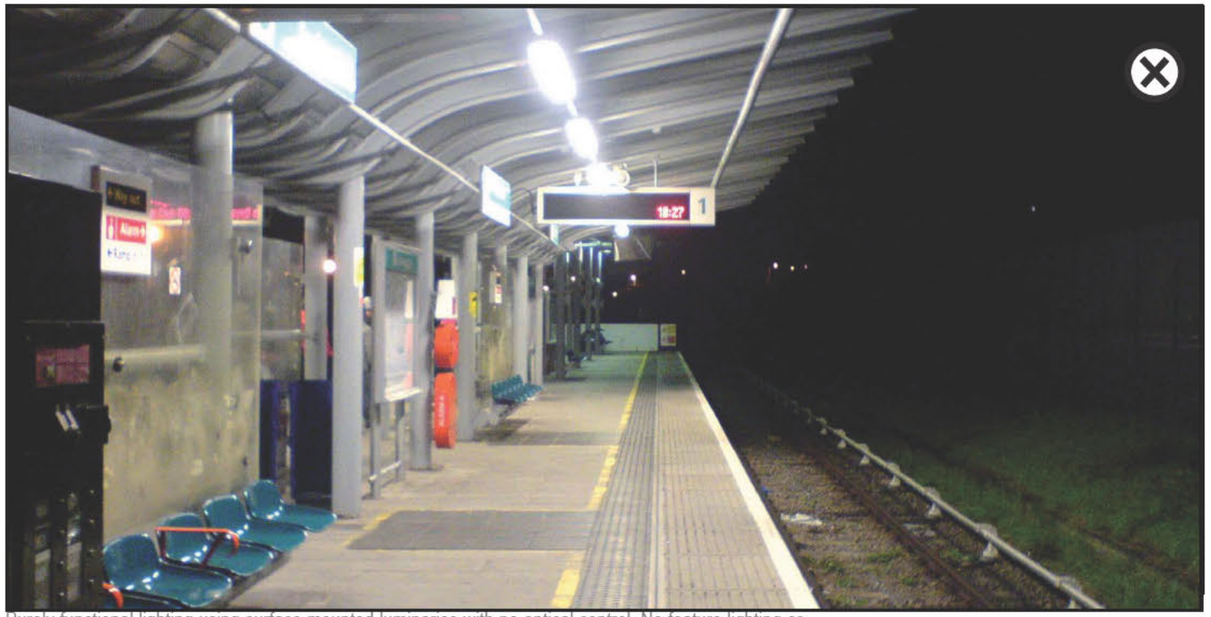
Lighting should be designed to bring attention to the station itself indicating its location as well as to particular important areas within the station, thus aiding ease of use. The key considerations in designing lighting for wayfinding and orientation within the station are:

- Lighting should be designed to draw attention to the station indicating its location and giving a positive visual appearance to the building. The station facade should stand out subtly from its surroundings through one or a combination of increased illuminance, coloured light, lighting of surfaces or change in colour temperature of lighting. The brightness and colour of the lighting in the surrounding area should be assessed and the facade lighting of the station designed accordingly.
- Key areas within the station such as concourse clusters, lifts and stairs should be easy to find through the use of increasing illumination of these areas and through the use of local and feature lighting.
- Integration of lighting: Reducing the clutter of lighting equipment through the use of integrated lighting will allow for unobstructed views through the station.
- Local lighting to friezes and signs should be provided to aid way finding as well as highlighting safety messages.

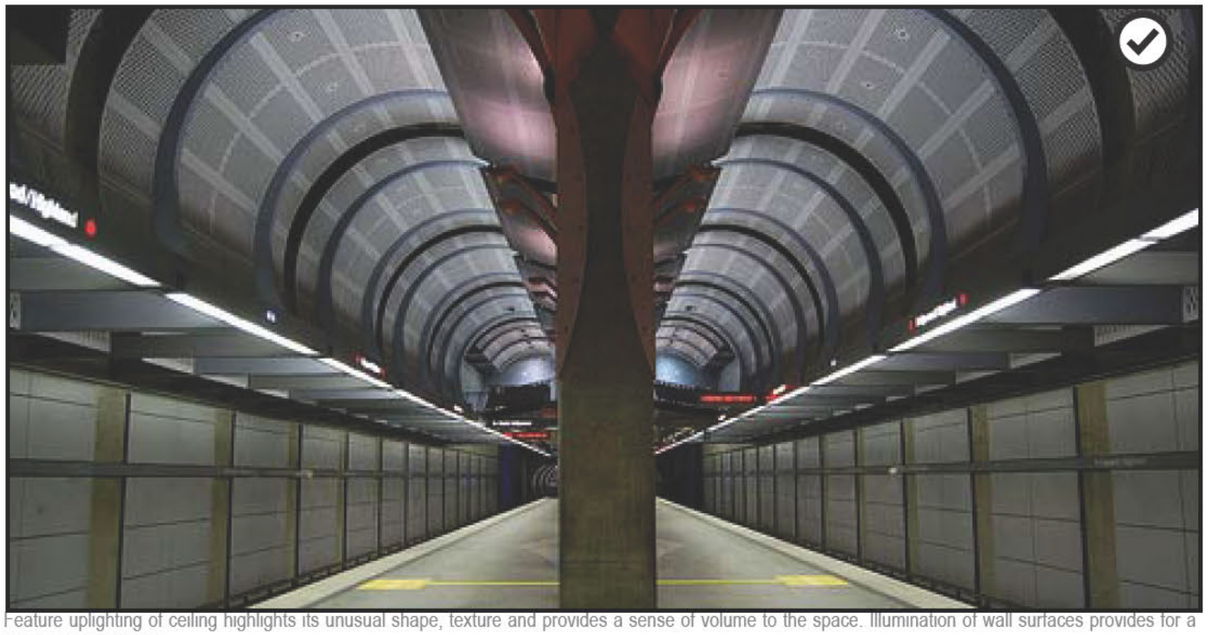
17.3.3 Feature Lighting (Identity):

Feature lighting is the final addition to the station lighting. It's aim is to accentuate particular architectural features, thus increasing the visual interest of the space as well as providing for a certain atmosphere. Each DLR station is different and has to be looked at independently; a lighting design which is sympathetic to a station's particular features and layout will give it a particular identity. Possible design techniques for feature lighting are:

- Lighting of surfaces: lighting of a particular surface can give a space a feeling of volume as well as accentuating features on that surface. Consideration has to taken of both the colour and specularity of the surface. Highly reflective surfaces can be a source of glare when light, matt surfaces are more conducive to being light. The colour of the surface has a great impact on the success or otherwise of lighting it. Ideally the surface should be light in colour in order for it to reflect the light and the effect being seen.
- Directional lighting: this can be effectively used to highlight both surface texture and form. For example inground uplighting of a stone wall will provide a additional interest to the space.
- Contrast: another tool of the lighting designer used to increase the vibrancy of a space. Downlghts or spotlights can be used along a surface to both highlight the surface as well as providing variations of light and dark along it. Thus making a feature of the surface and creating interest where it may otherwise not have existed.
- Colour temperature of lamp: the colour temperature of the lamp refers to the colour white it produces ie. cool, intermediate or warm white. Colour temperature can be used to create mood and variation of it can create contrast. The colour temperature chosen also has to compliment the particular surface colour, for example cool colours such as grey and blue, and warmer colours for yellows and reds.
- Coloured light: like colour temperature, coloured or colour changing light can be used to create atmosphere, as well as creating additional variation and vibrancy within the space. As with other techniques care should be used with coloured light that it is appropriate to the space within which is used.
- Integration of lighting equipment: The desire for the network is for the stations to be illuminated without drawing attention to the light sources, unless consciously for feature purposes. To achieve this lighting should be so far as possible integrated within the structure of the building. This requires close co-operation between the lighting designer and architect from and early stage. The use of integrated lighting creates a cleaner less cluttered visual environment, leading to the sense of additional space. It also diverts attention away from the light source and allows the viewer concentrate on the using and manoeuvring through the space.



Purely functional lighting using surface mounted luminaries with no optical control. No feature lighting or lighting for wayfinding provides for an unattractive space.



Feature uplighting of ceiling highlights its unusual shape, texture and provides a sense of volume to the space. Illumination of wall surfaces provides for a balanced visual field.

The use of natural daylight should be considered on all new DLR stations and utilised where possible.

17.4 SUSTAINABILITY

Sustainability is one of key aims of the DLR network and lighting installations are no different. Lighting installations on the DLR network have to be energy efficient from both running cost and maintenance over life cycle viewpoints. The installation also has to be designed to limit its impact on the local environment. Lighting has to be directed precisely where it is required and light pollution caused by poor optical control to be minimised.

17.4.1 Energy Efficiency

- Natural Daylight: Natural daylight should as much as possible be utilised with in new DLR station designs. Generally people prefer a natural daylight appearance during daylight hours, the use of which can also lead to substantial energy savings. Close co-operation between lighting designer and architect at the early design stages is required to ensure incorporation of natural daylight within schemes. The building orientation and use of windows, rooflights and light pipes should be considered.
- Equipment Specification: specification of energy efficient systems are integral to the design of an energy efficient lighting system. High efficacy luminaires and light sources should only be specified. Lamp life is also an important parameter as it aids in reducing maintenance costs. Lamps should have a lamp life of at least 6000hrs and luminous efficacy of 60 lm/W for use on DLR installations. Luminaires with a high light output ratio and high efficiency ballasts and control gear should be preferred.
- Lighting Control: Simple lighting control systems such as the use of photocell/ timeclock arrangement for outdoor lighting and PIR detectors in areas infrequently used such as stores should be standard in new DLR stations. Luminaires should be dimmible and dimmed when the station is not in use. Consideration should be given to the use of more complex systems such as DALI, for larger installations. These will allow for daylight linking, complex scene setting depending on time of day and use of station and reduce maintenance costs.
- Maintenance: Luminaires should be chosen and located to enable them to be easily maintained without disturbance to the operation of the station. The base lighting (functional lighting) lamp types should also be kept to a minimum to aid maintenance and reduce lamp stocks. A maintenance cycle should be formulated between the lighting designer and maintenance engineers to ensure efficient maintenance of the installation taking into account the life cycles of the equipment and surfaces being used. The lighting designers illumination calculations should take this maintenance into consideration in calculating proposed illumination levels on the platform to ensure they are being met at the time maintenance is being carried out.

17.4.2 Light Pollution

- Light pollution is a problem that effects most urban environments nowadays and London is no exception. It is caused by poorly designed and controlled lighting systems. Care must be taken to ensure spill light is kept to a minimum. This is achieved through the appropriate placement of luminaires with good optical control and beam cutoff. All lighting installations on new DLR stations have to conform to ILE guidelines.

17.5 Lighting Concepts for Individual Station Areas

Each typical area within the station has its own particular lighting requirements and constraints. Guidelines for each area are as follows:

17.5.1 Forecourts and Approaches

17.5.1.1 Existing Conditions

The boundary between the general streetscape and DLR stations is often blurred by multiple entrances and exits to the station and the tight locations of stations within the surroundings (as in the case of the inner city stations). The approaches are often cluttered with lighting provision forming a substantial part of the intrusions into the street. In other instances the Stations exit onto dimly lit surroundings which do not give rise to a sense of comfort and safety. The current lighting installations fail to integrate the station within the surroundings and so a harsh barrier of increased light intensity is created at the junction of the station and street.

17.5.1.2 Recommendations

The approaches and forecourts of the station should integrate the station within its surroundings. The lighting needs to be suitable to the surroundings taking into consideration the type of area the station exits onto; residential, high-street, industrial or public park for example. The surrounding street lighting techniques should be considered alongside any feature lit buildings or landscape. The key views and approaches should be defined with a view to easing wayfinding to and into the station. Equally the transition on exiting the station should allow the user to easily adjust the eye and see their surroundings. The considerations in lighting design for forecourt areas are:

- CRIME & SAFETY AND THE PERCEPTION OF SAFETY - Base Lighting comprising of good vertical and horizontal illumination levels and colour rendering, and avoiding any dark zones.
- CLEAR DEFINITION OF ROUTES TO, INTO AND OUT OF THE STATION - Enhanced base lighting providing for good wayfinding through lighting of changes in direction and areas of station interaction.
- INTEGRATION OF LIGHTING INTO SURROUNDING STREETSCAPE - The building should stand out from its surrounding but the ground plane should integrate into the streetscape without dominating it.
- DLR NETWORK IDENTITY & STATION PRESENTATION - Feature lighting to enhance the particular features of the station.

Poor streetscape but station does not integrate subtly into surroundings. Numerous scattered poles leads to cluttered entrance with poor wayfinding. No feature lighting leads to no station identity or character.

Safe Illumination levels, good signage, integrated lighting to reduce clutter and coloured lighting helps to give the station identity.

17.5.1.3 Recommondations for Particular Types of Stations

a) Underground and Isolated Station: (Building Facade Presentation)

Key Features:

- Lighting of building facade- this is the first and last impression of the station and should be positive to maintain a good identity of the network.
- Lighting of signage- the station is not likely to prominent to the streetscape and signage at street level will be important to identify the station.
- Lighting of approach and forecourt- this can help to signal the station locality and aid in navigiation and identity.

b) Ground Level Station: (Full or Partial Presentation)

Key Features:

- Lighting of building facade- this is the first and last impression of the station and should be positive to maintain a good identity of the network.
- Lighting of vertical elements, lift cores and stairs- these are may be visible from the streetscape and should this be highlighted to aid navigation.
- Lighting of platform canopy, when station is at ground level, and not in a cutting- the lighting to the platform may be visible from a distance and needs to be considered in how it adds to the network and station identity.
- Lighting at the concourse entrance and interaction with streetscape- to aid in wayfinding and ease of use.

c) Elevated Stations: (Full Presentation)

Key Features:

- Lighting of building facade- this is the first and last impression of the station and should be positive to maintain a good identity of the network.
- Lighting of vertical elements, lift cores and stairs- these are likely to be visible from some distance around the station and will affect the presentation of both the network and local area. A positive presentation will reinforce the DLR identity in the community and aid in wayfinding.
- Lighting of platform canopy- this again will be highly visible around the station and needs to be considered in how it adds to the network and station identity.
- Lighting of viaduct and bridges- these provide negative barriers at night and artificial lighting needs to be carefully considered to ensure both a positive presentation both day and night.

17.5.1.4 Station Forecourt and Approaches Example

Elevated Station: Greenwich

- Colour temperature of lighting from the street changes to a subtly cooler tone on the larger forecourt of the station.
- Retaining wall is feature lit to draw the eye along the surface to the entrance of the station.
- Subway vertical surfaces are presented clearly with higher levels of illumination than the forecourt. The colour temperature is cooled to distinguish it from the forecourt.
- Lift cores are illuminated as vertical markers for the site.
- Underside of the canopy is illuminated to provide a destination point that is visible on the approaches to the station.

17.5.2 Concourses

17.5.2.1 Existing Condition

Current DLR concourses fall into two categories, those which are cluttered with luminaires and lighting columns which are a visually intrusive and hinder the natural through routes, or those where the key interaction points such as ticket machines are unlit. Typically column placement is in the centre of concourses restricting easy movement through the space and adding to the visual clutter of the station.

17.5.2.2 Recommendations

Lighting to the concourses needs to serve two functions, to provide a general illumination for safe navigation through the space and punctuation around the interaction areas such as ticket machines and ticket barriers. Routes through and key entrance and exits to the concourse need to be identified as part of the design process, and accented through the use of light. Where concourses are fully or partially enclosed the wider architectural volume of the space should be considered to enhance the sense of space, safety and security. This requires consideration of the vertical and ceiling surfaces.

The main principles for lighting the concourses are:

- SAFE AND WELCOMING ILLUMINATION LEVELS - Base Lighting comprising of good vertical and horizontal illumination levels and colour rendering.
- ARCHITECTURAL INTEGRATION, CREATING AN UNCLUTTERED SPACE - Applies to base and enhanced base lighting leading to unobstructed views.
- PUNCTUATION AROUND INTERACTION POINTS - Enhanced base lighting comprising of local and feature lighting of key interaction points such as ticket offices and kiosks.
- WAYFINDING, IDENTIFICATION OF ENTRANCES, EXITS AND ROUTES - Enhanced base lighting identifying routes through the station.
- FEATURE LIGHTING - Feature lighting of architecture gives a character and atmosphere to the concourse.

Basic lighting columns which visually clutter the space , and with visible lamp sources which disrupt views and are a source of glare.

Architectural form with integrated lighting clearly defines routes; lighting columns are located at the edges of the space to maintain views.

Ticket barriers and oyster points are marked by an increased horizontal illuminance. Lighting of the internal vertical surface also defines the entrance and exit in the long views.

Lighting is integrated into the ticket machine modules providing a good level of illumination on the vertical surfaces displaying information. The light level is also increased noticeably at ground level to provide a horizontal marker for the presence of a task area.

17.5.2.3 Station Concourse Example:

Station Example: Devons Road

- Key feature have lighting integrated into them to provide clutter free accent lighting.
- Lift enclosures glow providing ambient lighting and acting as clear markers.
- Lighting is pooled and emphasised around lift entrances, ticket machines and stair entrances.
- Columns are kept to perimeter of space and located as additional vertical framing entrance and exit points such as stairs.

17.5.3 Platforms

17.5.3.1 Existing Conditions

The existing platform lighting is typically from suspended booms or suspended luminaires on conduit. The luminaires have limited optical control and so appear as the primary feature within the station architecture due to their brightness. Little consideration is given to the vertical surfaces at the back or opposite the platform.

17.5.3.2 Recommendations

Passengers typically spend the majority of their time at the station on the platform and so the presentation of these areas is important in maintaining a strong DLR identity and creating a pleasant, safe environment for passengers.

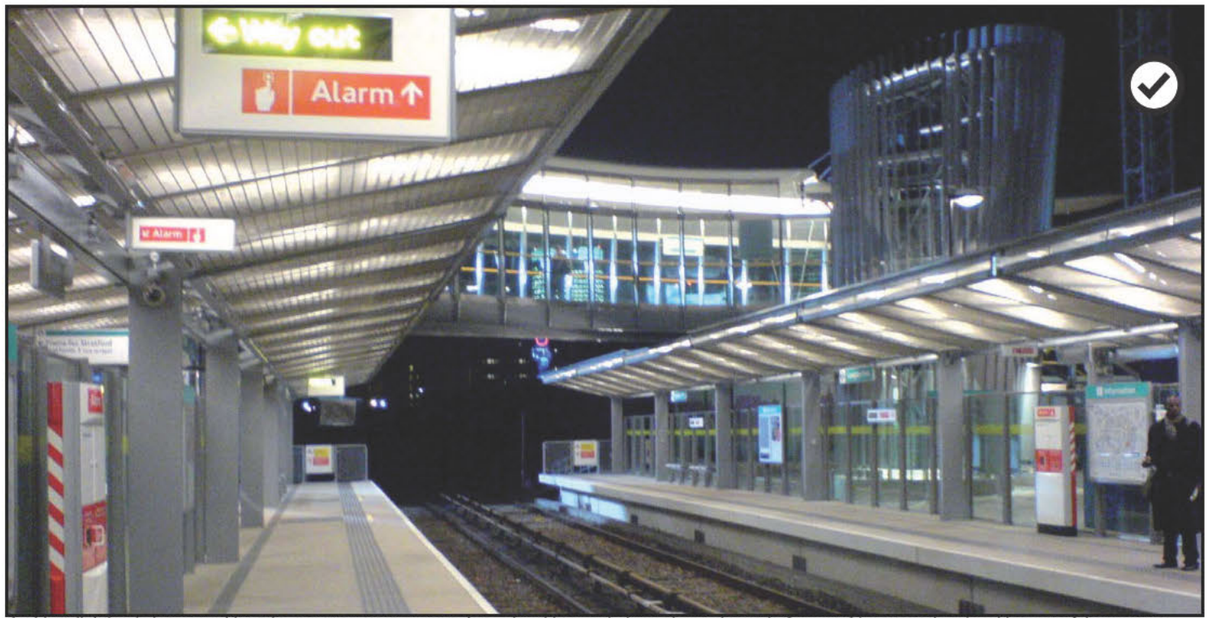
The varying platform typologies require different approaches. Where the station is elevated and there are views out of the station then these should be maintained; by contrast, when stations are enclosed or underground, the station surfaces become the features that define the space and enhance the environment. Where the station surfaces become the features and enhancements to the station, the materials used need to be considered to provide the best quality of light to the surfaces, without reflection or glare.

Integration of lighting into the structure is desirable to provide a cleaner and uncluttered platform appearance.

As with the concourses there are a variety of typologies however the lighting considerations should be as follows.

- UNIFORM ILLUMINATION - Base lighting for safety of movement and facial recognition.
- MAINTAINING OR CLOSING VIEWS INTO AND OUT OF STATION AS APPROPRIATE. - Base lighting for feeling of security
- INTEGRATION OF LIGHTING - Applies to all lighting applications leading to unobstructed views and provide an uncluttered platform presentation.
- WAYFINDING - Enhanced base lighting to provide clear punctuation and accents of entrances and exits to platform.
- LIGHTING OF VERTICAL AND CANOPY SURFACES - Enhanced base and feature lighting to aid wayfinding and increase vibrancy within platform area.
- POSITIVE PLATFORM AESTHETIC - Feature lighting to platform area.

Basic provision only. Surface mounted lighting with no optical control draws attention to the luminaires, are a cause of glare and light pollution

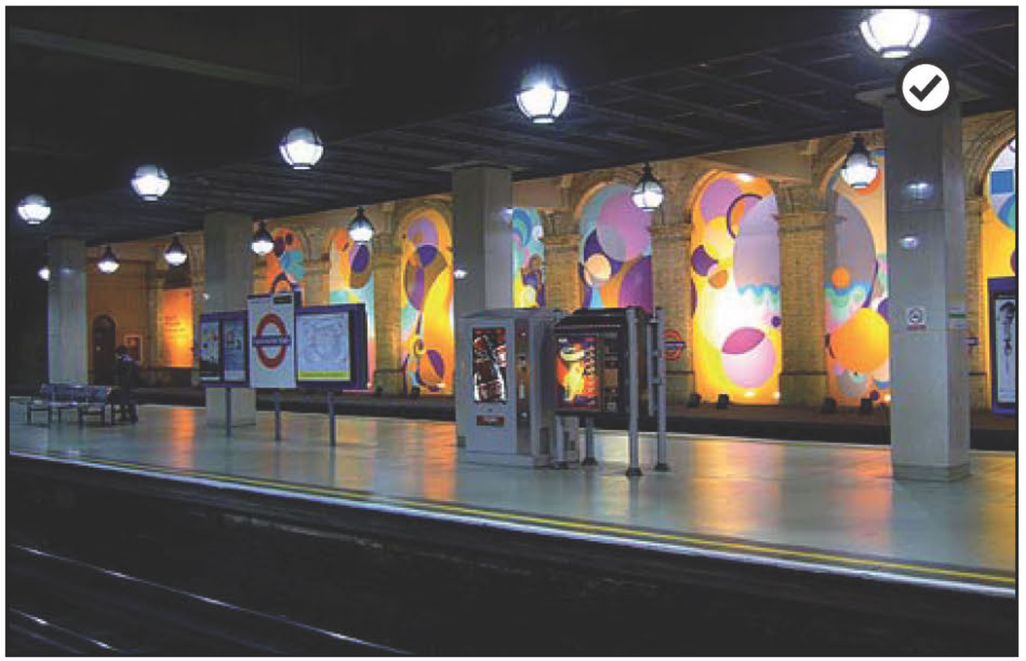


Ambient lighting is integrated into the canopy structure to reduce visual impact in long views along platform and increase the visual impact of the canopy.

Platform lighting is integrated into the canopy and is louvred to limit glare.

Vertical surfaces opposite platform are illuminated from linear in-ground sources to make the full volume of the space apparent. Indirect lighting from uplights in the totems provides the general illumination.

Up lighting and indirect light from the canopy form a distinct station identity.



Vertical surfaces are illuminated as part of art display.

17.5.3.4 Recommendations for Particular Types of Stations

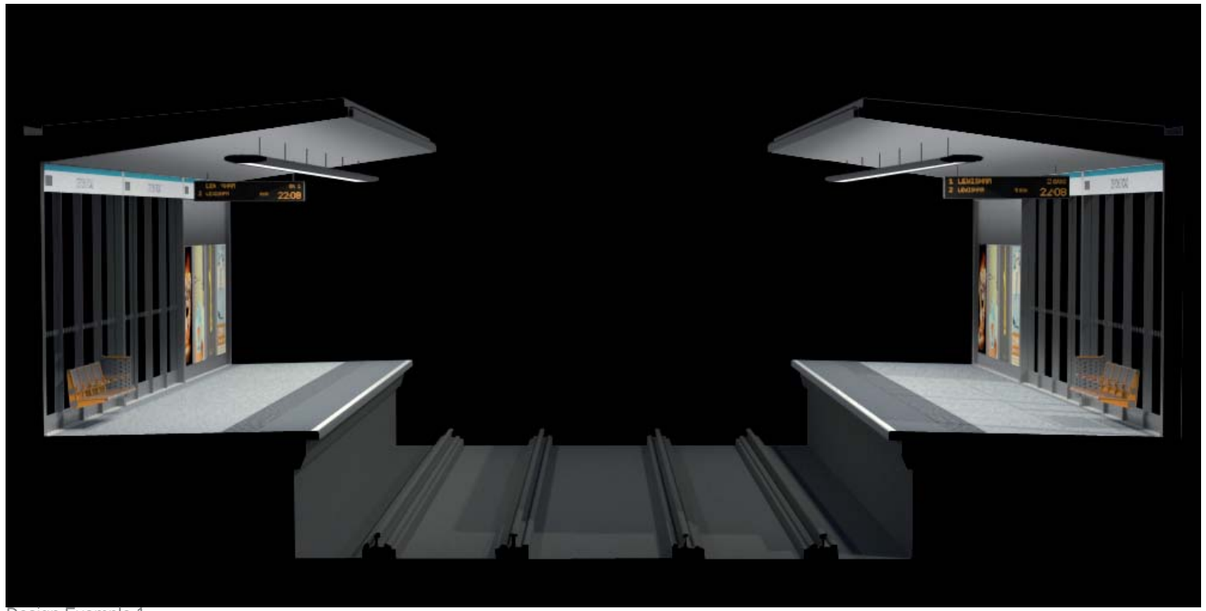
a) Elevated and Ground Level Stations

Design Example 1

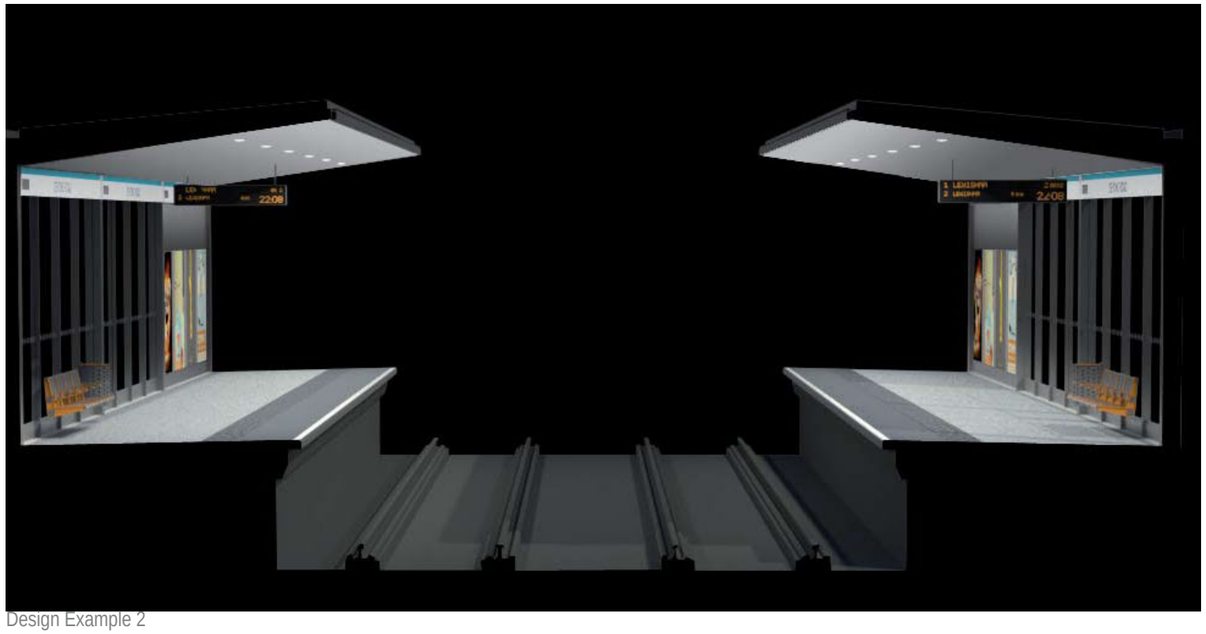
- Continuous linear fluorescent lighting boom system. Optic or louvre to limit glare and reflection into backscreen glazing
- Uplighting component to boom emphasises canopy and gives station identity and presence in surroundings.
- Signage frieze backlit to provide clarity of signage.
- Solid backscreen panels illuminated from luminaires integrated into rear frieze

Design Example 2

- Recessed luminaires in canopy provide general downlighting. Optic should limit glare and reflection in backscreen
- Canopy detail to wash light across underside of canopy surface to give station identity and presence in surroundings.
- Signage frieze backlit to provide clarity of signage.
- Solid backscreen panels illuminated from luminaires integrated into rear frieze

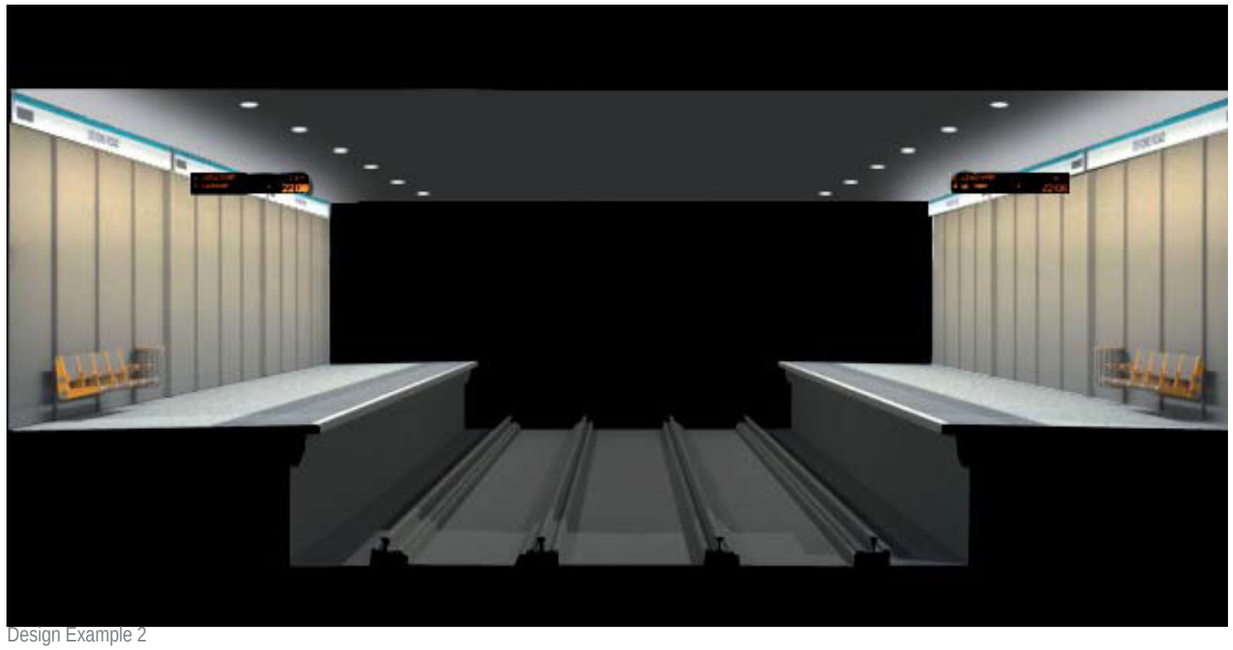


Design Example 1



Design Example 2

Design Example 1



Design Example 2

b) Enclosed or subsurface stations

Design Example 1

- Continuous linear fluorescent lighting boom system. Optic or louvre to limit glare and reflection into backscreen glazing
- Uplighting component to boom emphasises canopy and give station identity and presence in surroundings.
- Signage frieze backlit to provide clarity of signage.
- Solid backscreen panels illuminated from luminaires integrated into rear frieze.

Design Example 2

- Recessed luminaires in canopy provide general downlighting. Optic should limit glare and reflection in backscreen
- Frieze detail to wash light across underside of canopy surface to give station identity and presence in surroundings.
- Signage frieze backlit to provide clarity of signage.
- Solid backscreen panels illuminated from luminaires integrated into rear frieze
- Lighting of vertical surfaces opposite platform to enhance the space.

17.5.4 Lifts

17.5.4.1 Existing Conditions

Some existing lifts use the illuminate triangular light box form as a marker for the station within a macro view. Once on the station the wayfinding to the lifts is poor with no clear definition of entrances and exits to lifts or the routes to them where they are located at a distance from the platform. The entrances and exits of lifts are often underlit meaning immediate identification of people entering or exiting lift cars is restricted.

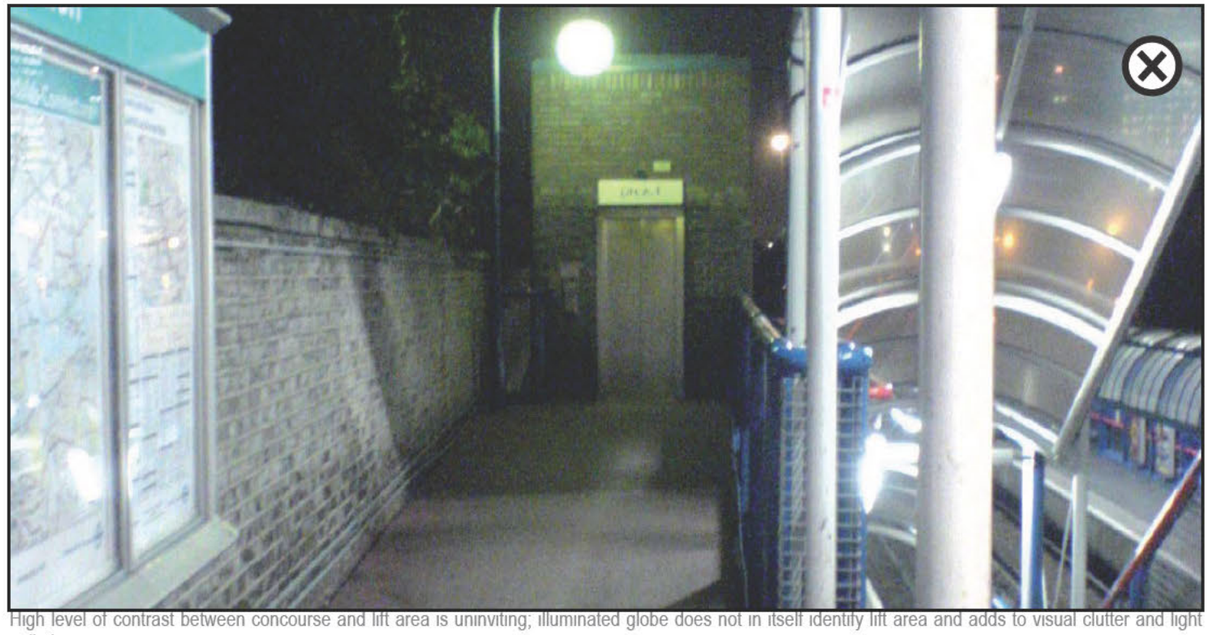
17.5.4.2 Recommendations

The DLR is one of the most accessible forms of public transport in London. The Lifts are an important part of this. The lift towers are often the most prominent piece of structure on the station and could form part of the network identity and wayfinding strategy.

On a local scale the entrance and exits to the lift should be clearly defined and lighting plays a role in this. Facial recognition should be possible on entering or exiting the lift to increase the sense of safety and security. The transition from the lift car to the surrounding illumination should also be considered.

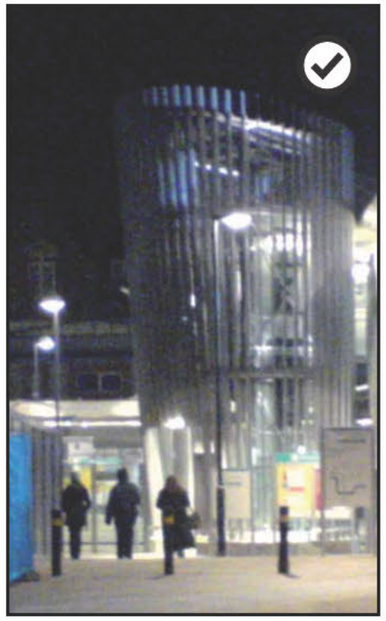
Lighting for the lifts should:

- SAFETY AND SECURITY ON ENTERING OR EXITING LIFT CARS - Base lighting providing safe levels of horizontal illumination in lift car and at lift entrance.
- CLEARLY IDENTIFY ENTRANCES TO LIFTS AND LIFT DOORS - Enhanced base lighting providing local or feature lighting to lift area to draw attention to its location.
- LOOK AT LIFT STRUCTURE AS A MARKER FOR THE STATION WITHIN WIDER CITY CONTEXT - Enhanced base and feature lighting indicating location of station as well as providing an identity to the station.



High level of contrast between concourse and lift area is uninviting; illuminated globe does not in itself identify lift area and adds to visual clutter and light pollution.

Illumination of opaque glass lifts acts both to draw attention to the lift locations for wayfinding and orientation and also as a decorative feature.



Examples of illuminated Glass lifts

17.5.4.3 Recommendations for Particular Types of Lifts

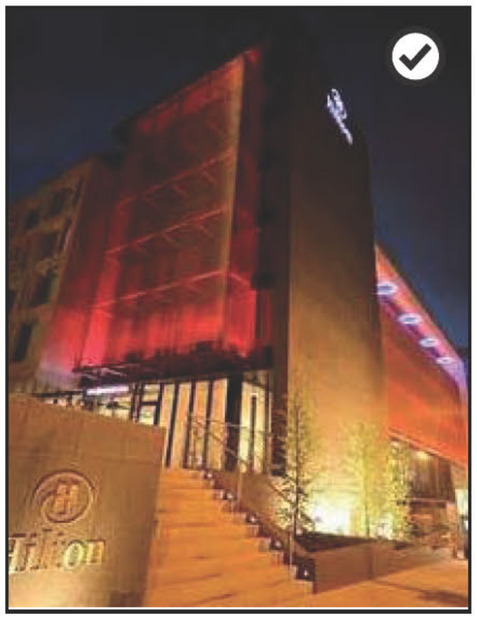
a) Glass Lifts

"Glass Box". These can be turned into large light boxes marking the station location. Care needs to be taken to control light pollution. There is the option of introducing coloured light, such that there is a dynamic movement of white light as the car ascends and descends.

- Lighting is provided to the door recess to accent the vertical recess surfaces, this defines the entrance from long views.
- Light is pooled on the floor around the lift entrance to act as further marker.
- Lift core is internally illuminated as a marker and beacon to the site.

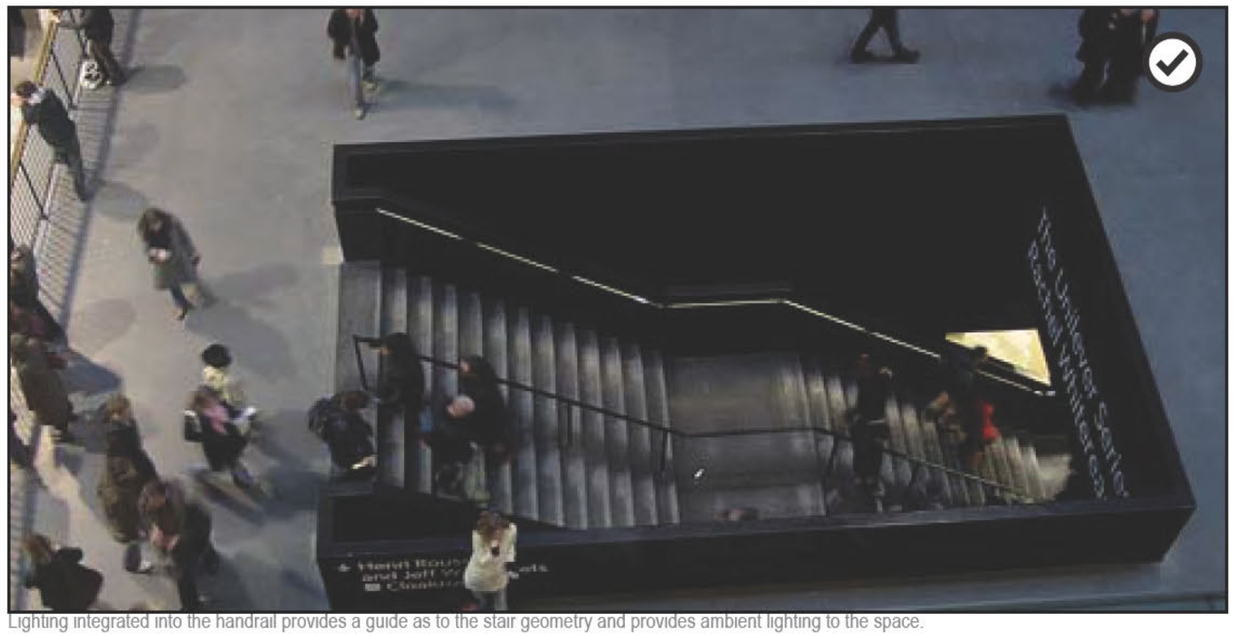
b) Solid Lifts

Solid Core. Lighting the outside surface of the solid core provides a night time presence for the station. The use of coloured light is possible to link to the network identity. Care should be taken when uplighting to keep light pollution controlled.



Examples of uplighting solid structures

Bare lamp battens are disruptive to views, provide a poor identity and are a cause of light pollution.



Lighting integrated into the handrail provides a guide as to the stair geometry and provides ambient lighting to the space.

17.5.5 Stairs

17.5.5.1 Exiting Conditions

The existing lighting treatments are either linear luminaires mounted to the centre or side of a canopied staircase or column mounted luminaires on open staircases. Currently the luminaires inter-reflect between the glass canopy and balustrades limiting the views out of the station. Where columns have been used these are adjacent to the steps and not integrated into the stair construction, adding to the visual clutter of the station.

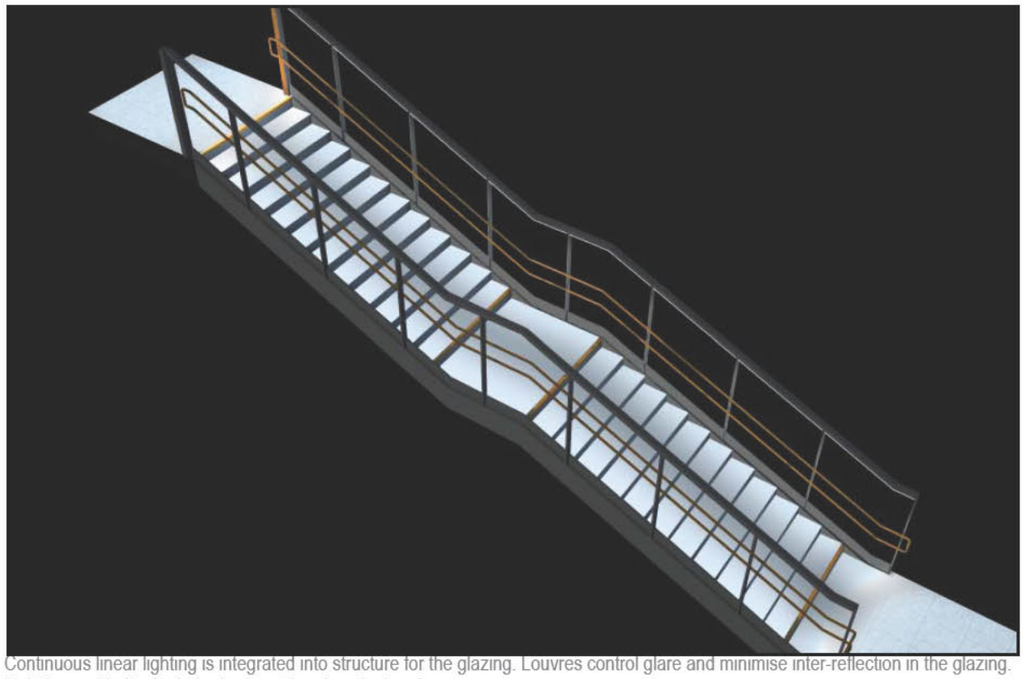
17.5.5.2 Recommendations

The stairs form the key routes on and off the platforms. Lighting needs to link the platforms and concourses with consistency.

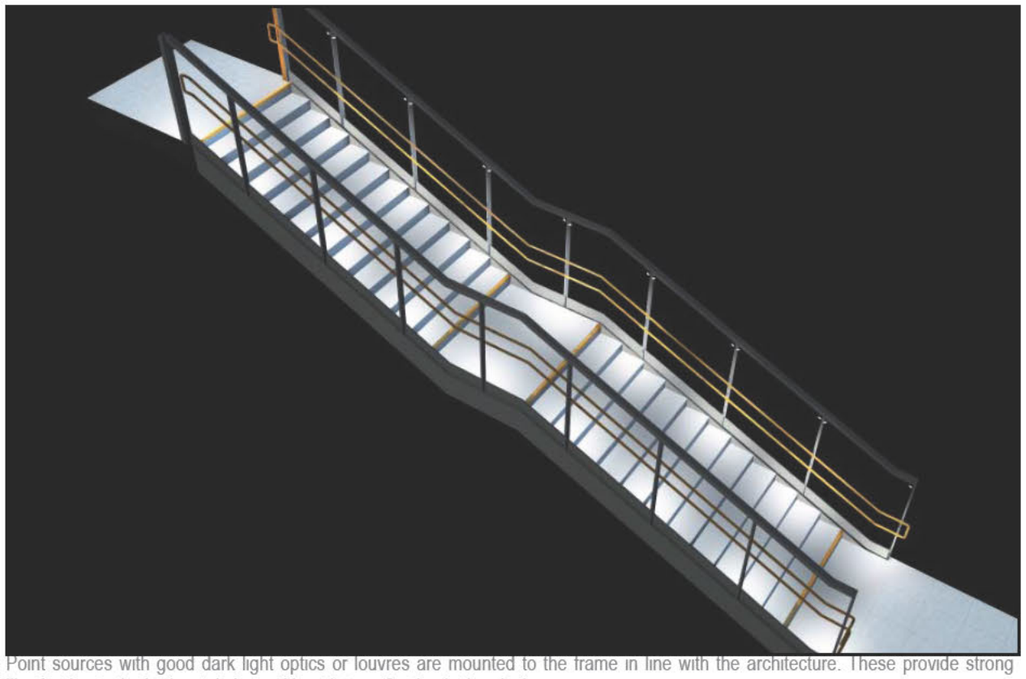
As with the platforms consideration should be given to maximising the views into and out of the stairs to enhance the station transparency.

Staircase lighting should look towards the following:

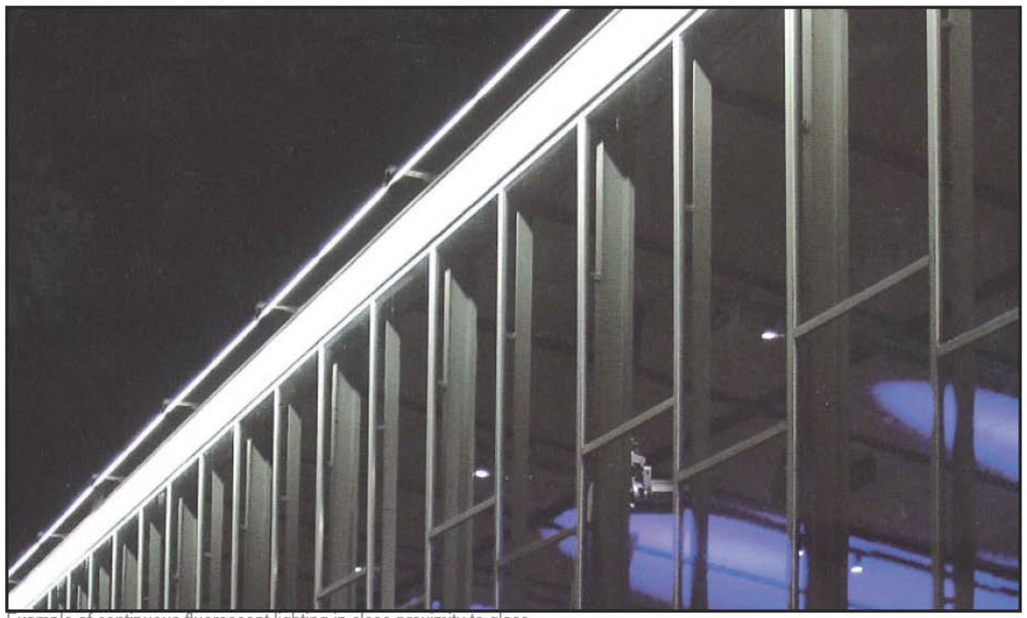
- GLARE FREE ILLUMINATION - Base lighting providing safe illumination levels on the stairs taking care to avoid glare problems, which can be common in stairwells due to users angle of viewing.
- MAINTAINING VIEWS INTO AND FROM THE STAIRCASES - minimising the inter-reflection between glass balustrades.
- INTEGRATION INTO ARCHITECTURE - base and enhanced lighting designed to minimise clutter and hence aiding wayfinding.
- WAYFINDING - enhanced base lighting identifying top and bottom of staircases, or turning points.
- PRESENTATION OF STAIRCASE WHEN VIEWED FROM OUTSIDE STATION - where applicable the staircase can be illuminated with feature lighting adding to the station identity and ambience.



Continuous linear lighting is integrated into structure for the glazing. Louvres control glare and minimise inter-reflection in the glazing. Light is provided to both the horizontal and vertical surfaces.



Point sources with good dark light optics or louvres are mounted to the frame in line with the architecture. These provide strong illumination to the horizontal plane without inter-reflection in the glazing.



Example of continuous fluorescent lighting in close proximity to glass.

Luminaires with a controlled optic allow for good level of illumination without inter-reflection the glass allowing for a view into and out of the bridge.

17.5.6 Bridges

17.5.6.1 Existing Conditions:

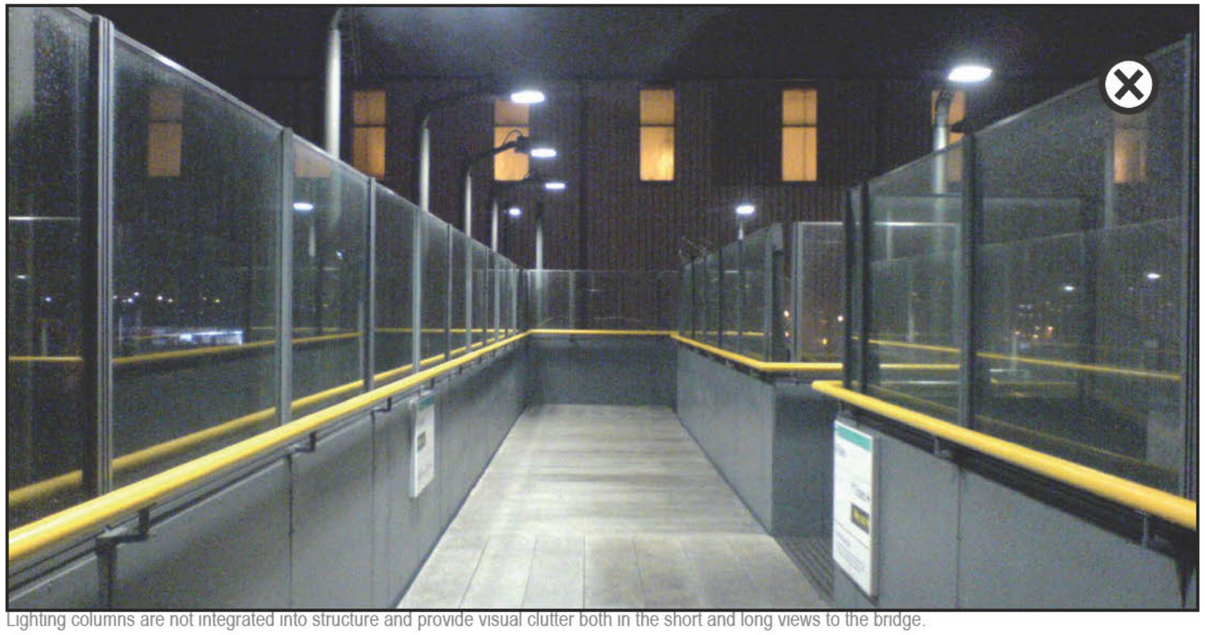
The existing bridge conditions are varied. The consistent element across the majority of bridges is the inter-reflection of lighting treatments between the glass balustrades. Long bridges often lack a focal point at the end creating a more depressing tunnel like environment.

17.5.6.2 Recommendations:

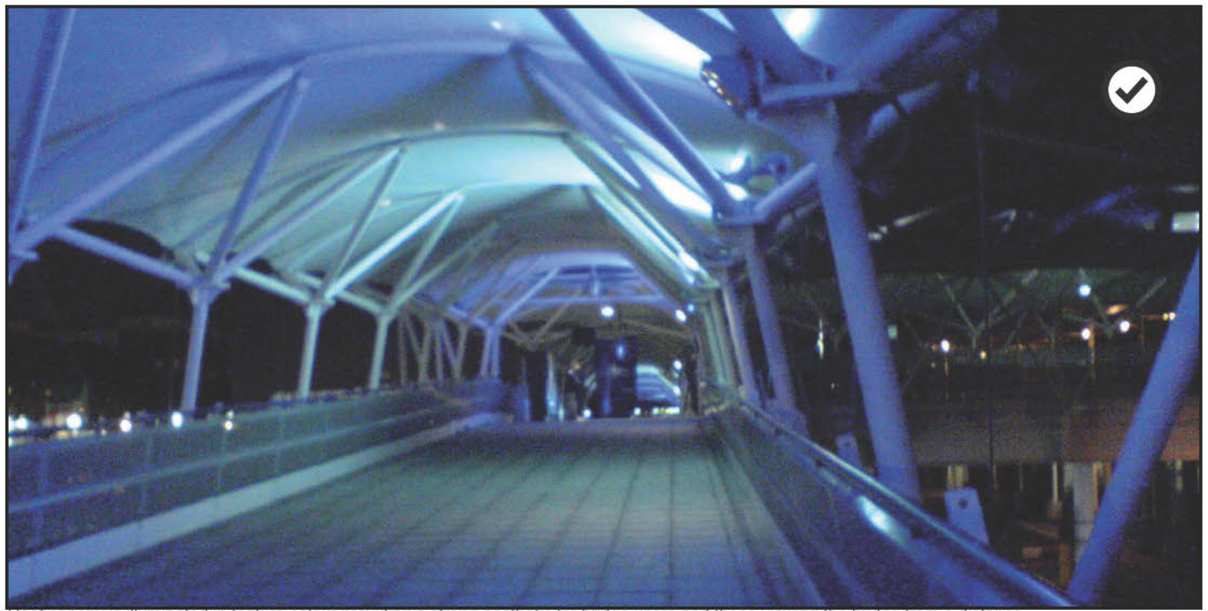
Bridges are typically viewed from two perspectives, the users on the bridge and the view of the bridge exterior. The lighting of the bridge for the user should maximise the views out from the bridge. The bridge materials need to be considered, particularly where is glass present to avoid inter reflections. With enclosed bridges the vertical and ceiling surfaces should be considered to enhance the perception of space within the bridge. The external presentation of the bridge is important as a marker for the site and as part of the Network identity. For wayfinding the entrances and exits of bridges should be well defined and the bridge use should have a destination point marked at the end of the bridge, particularly in enclosed bridges.

Lighting to the bridges should consider the following:

- MAINTAINING VIEWS INTO AND FROM THE BRIDGE - designing base lighting to minimise the inter-reflection between glass balustrades thus giving unobstructed views and aiding wayfinding.
- INTEGRATION INTO ARCHITECTURE - base and enhanced lighting designed to minimise clutter and hence aiding wayfinding.
- WAYFINDING - enhanced base lighting providing focal points at the entrances to bridges.
- LIGHTING OF BRIDGES AS PART OF STREETSCAPE - the bridge may provide opportunities for feature lighting drawing attention to the station. Care should be taken however that the design is in keeping with the surrounding streetscape.



Lighting columns are not integrated into structure and provide visual clutter both in the short and long views to the bridge.



Roof canopy is illuminated in feature colour providing a strong aesthetic for bridge users and those viewing the bridge from a distance.

17.5.7 Viaducts and subways

17.5.7.1 Existing Conditions:

The existing conditions vary from overlit subways which do not sit comfortably within their surroundings to areas of deep shadow around structures of the station and on arches and viaducts adjacent to the main route or public highways.

17.5.7.2 Recommendations:

Where the DLR passes over the streetscape below, the resulting viaduct needs to be considered. In some instances this houses the station entrance and concourse. In other instances it is purely a through route for the street. There is a range of materials creating these viaducts from the Victorian brick arches to modern concrete structures.

Coordination is likely to be required with the local authority as part of improving the wider environs. The recent Light at the end of the tunnel initiative by the Cross River Partnership and Southwark council offers examples of the benefits of improving viaduct illumination.

Lighting around and under these viaducts should address the following.

- SAFETY AND SECURITY - base lighting to good illumination levels to ensure the viaducts do not become areas of shadow. and the area feels safe to use both day and night.
- INTEGRATION - Of functional base lighting where possible to maintain the full volume of the viaduct, avoid clutter and aid wayfinding.
- INTEGRATION INTO SURROUNDING STREETSCAPE - lighting of viaduct integrates with surrounding lighting thus ensuring visual comfort to users passing through the viaduct, avoiding hard contrasts and light colour shifts.
- FEATURE LIGHTING - Feature lighting to public art or in accenting of the Viaduct structure should be considered. This will increase the vibrancy of these spaces which can sometimes seem dark and claustrophobic and visually cut off areas.

Unpleasant dark zones and shadows around the stair entrances with no alleviating features.

Well lit archway with good illumination levels and coloured lighting accentuating viaduct structure and providing a degree of interest

18 PUBLIC ART

This section defines key opportunities for providing art on DLR and gives recommendations for its implementation.

Public Art can make a positive addition to the character of stations and railway corridors and should be employed wherever there is a good opportunity.

18.1 Precedents

18.1.1 'Careless Talk Costs Lives' at a London Underground Station

Beth Derbyshire made use of advertising format and aesthetics in order to convey her message in a series of works which temporarily replaced advertising posters.

18.1.2 LCD Mural at Omotesando Hills, Tokyo

At Omotesando Hills Julian Opie developed an LCD Mural which comments on the space in which it is located thereby engaging the public.

18.1.3 Seat at Buenos Aires Institute of Contemporary Art

This seat at the Institute of Contemporary Art in Buenos Aires is also a contemporary art sculpture and shows how functional elements can play a double role as art and fixture.

18.2 Opportunities

Many opportunities are identified in the DLR Public Art Strategy which should be consulted in addition this guide. Particular points of opportunity are:

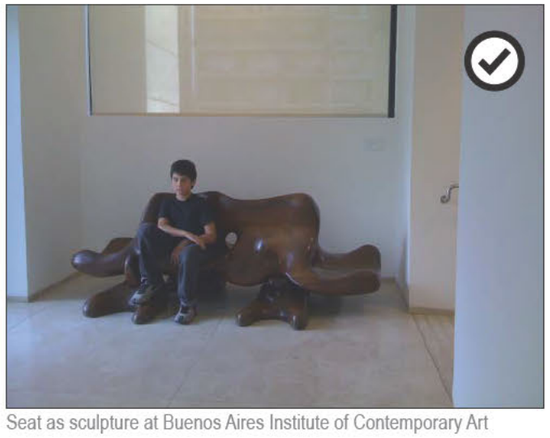
- The design guide recommendations provide a coherent base for all stations. This baseline identity could be complemented with an extended colour palette in consultation with artists, designers or local community provided that the baseline recommendations are maintained.
- Some architectural elements such as paving, seats, handrails, etc. could have integrated artwork if there is early coordination between artists and designers and the alterations maintain design guide recommendations. Such work could have a direct impact on the character of stations without having an "applied" feel.
- Viaducts and bridges provide an opportunity for an artist and DLR to engage local communities in the production of permanent and temporary works which enhance the urban realm and give something valuable back to communities.
- Large blank surfaces opposite underground platforms could be enlivened with murals.
- Railway corridors as seen from the train have not been used as a location for art on DLR. These areas currently constitute a missed opportunity.
- Platform advertising units could be used to display temporary artwork.

18.3 Recommendations

- Artwork should enhance the DLR by being integrated with the station or viaduct architecture rather than applied as a separate item.
- Art on DLR should be developed holistically through early involvement with the design team.

Careless Talk Costs Lives by Beth Derbyshire on London Underground


LCD Mural by Julian Opie at Omotesando Hills, Tokyo


Seat as sculpture at Buenos Aires Institute of Contemporary Art

19 SUSTAINABILITY

This section defines strategies to raise sustainability of DLR through design.

Improving the sustainability of stations involves reducing waste and energy use during construction and operation while also addressing local, social and economic issues. Rail needs high patronage to be sustainable because it requires large infrastructure. The DLR will contribute to the sustainable agenda by encouraging greater use and attracting people out of their cars and onto public transport. A key part of this is the greater integration of the DLR with the wider TfL network.

19.1 Recommendations

The design for large scale refurbishments or new stations should be accompanied by a sustainability statement. This statement will explain how the project has addressed the following sustainability strategies.

- Minimising waste
- Minimising energy use
- Social integration
- Long term cost-effectiveness

A sample outline of a sustainability statement is shown below for reference.

Project Overview

Urban Realm and Accessibility Improvements

Long-Term Cost Effectiveness

Reducing Energy Use

Predicted Energy Demand

Energy Efficiency

Renewable Energy Options: Biomass, Wind Energy, Photovoltaics

Combined Heat and Power

Reducing Waste

Materials, Construction, Water

Summary

Sample outline of a sustainability statement

19.1.1 Social and Economic Sustainability

To be sustainable stations must address their context and be economically viable in addition to being environmentally sustainable. Sustainability statements should where applicable demonstrate:

- Stations address the urban realm in their vicinity so that they make a positive contribution even for those not using the station. Severance should be minimised. Severance is a negative social impact of many stations whereby communities become separated as a result of a network extension. It can be minimised by following the guidance in section 8 page 21 of this document so that the connectivity offered by the station outweighs any severance.
- Long term cost effectiveness e.g. with a maintenance manual. Stations need to be cost-effective in the long term for their services to be sustainable.

19.1.2 Reduce Waste

The sustainability statement should demonstrate that the project minimises waste through design, construction and maintenance. Some suggestions follow:

- Waste can be reduced by designing high quality stations that will be around for a long time.
- High quality materials will last longer without needing to be replaced. Use the natural colours of materials where possible rather than applying paints.
- Minimise on-site cutting of materials. Minimise or reuse formwork.
- Minimise the need for maintenance. Replace fixtures only when needed.
- Use materials which can be recycled or reused and use locally sourced materials where possible.
- Introduce recycling bins at stations.

19.1.3 Reduce Energy Use

The sustainability statement should demonstrate that the project has minimised energy use. For example by:

- Encouraging cycling and walking to stations by improving walking routes/ crossings, and providing cycle parking where possible.
- Encouraging more sustainable transport over driving by coordinating bus stops with station entrances.
- Sub-metering energy use to identify opportunities to improve efficiency.
- Using lighting control systems to minimise energy use when not needed. Daylighting covered or underground stations to minimise the need for electric lighting during the day.
- Using energy efficient equipment (lighting, lifts, escalators).
- Evaluating the use of railway corridors, opaque canopies for sustainable power production. The scale of operations and maintenance regime could be important factors in making renewable energy production sustainable and cost-effective. For example, if large swathes of railway corridors had solar panels the energy benefits might pay off. The visual impact of these measures should also be considered.

20 MAINTENANCE

This section notes key areas to consider in order to improve maintainability of DLR through design.

20.1 Aims

Station designs should consider as far as practicable the whole-life costs of station structures. This includes maintenance and decommissioning as well as construction. What may be a less expensive capital cost option might result in longer-term additional costs which should be avoided.

Developing a coherent maintenance plan is the most cost-effective way to maintain the value of DLR assets. Producing a coherent maintenance strategy will ensure:

- A safe environment is maintained for passengers and public.
- The whole-life costs of the station are minimised and better controlled
- The standard and presentation of the property can be maintained
- The property is maintained in a systematic way

20.2 Recommendations

Station projects should adopt a maintenance manual at design stage to demonstrate value for money over the whole life of the station. Key areas to consider in the maintenance manual and in station designs are as follows:

- Good detailing of exposed elements such as canopies and back screens will mitigate the need for frequent maintenance due to environmental degradation.
- Selection of appropriate materials will reduce maintenance and replacement costs. Resilience will need to be greater where surveillance is poor and vandalism is an issue. However, the other functions of materials such as the need for transparency in some areas should also be considered.
- Designs should facilitate the expected inspection and maintenance regime in accordance with the frequency of inspection required while considering the day to day appearance and operation.
- Safe access to infrequently used areas such as roofs should be considered at design stage and included in the maintenance manual.
- Design for ease of replacement in line with anticipated requirements for frequency of replacement. Designs should consider access constraints for both elements being replaced and equipment used.
- Designs should facilitate cleaning. For example, seats should allow cleaning underneath without difficulty.
- Identify inappropriate cleaning methods and cleaning materials which can reduce design life and increase maintenance while damaging appearance.
- Project-specific maintenance hazards are now to be included in the Health and Safety File under CDM regulations. This information should also be included in the maintenance manual.

21 CONCLUSION

21.1 Summary

It is clear that there has been, in the 20 year history of the DLR, much innovation and good design at a number of stations. These guidelines are to promote a greater consistency and coherence throughout the network. This guide will be used by designers on future DLR projects and it will also be used by the Design Review Group to brief designers and review designs.

21.2 Key Recommendations

The high level aims (section 2.5 page 5) should inform designs for each of the elements below. The key recommendations for the elements of the guide are as follows:

1. STATION IDENTITY – (detailed in section 5 page 14)
   - Establish a strong DLR brand identity relating to the wider Transport for London family.
   - Consistent use of the DLR roundel and colour band.
   - Acknowledge differences but promote greater consistency between station typologies by using the common elements and design principles described.

2. STATION LAYOUT – (detailed in section 6 page 16)
   - Designs must provide for good visibility and intuitive wayfinding across the station as a whole.

3. FORECOURT & APPROACHES – (detailed in section 7 page 18)
   - Introduce a DLR Roundel in a highly visible location.
   - Develop a coherent forecourt design with common materials and elements.
   - Improve the accessibility,environment and convenience of station approaches.

4. RAILWAY CORRIDORS – (detailed in section 8 page 20)
   - Provides guidance for treatments to improve ambience, safety and interest along railway corridors.

5. CONCOURSES – (detailed in section 9 page 22)
   - Raise consistency by organising layout and employing a palette of elements.
   - Maximise visibility for efficient wayfinding and a reassuring environment.

6. PLATFORMS – (detailed in section 10 page 24)
   - A consistent, hierarchical DLR platform layout with information and help points clustered at the entrance and a more uniform layout elsewhere.
   - A consistent module for setting out platforms is to be adopted.
   - Common DLR fixtures to be used throughout.
   - A standard and consistent canopy design which offers value for money on new-builds and replacements

7. LIFTS, STAIRS AND RAMPS – (detailed in section 11 page 30)
   - A consistent family of lift types which are accessible,transparent, recognisable.

8. CONCOURSE CLUSTERS – (detailed in section 12 page 32)
   - Draw information, ticket vending machines and other concourse items together into a standard unit
   - Create a consistent and clear focus for concourses.

9. FIXTURES & FURNITURE – (detailed in section 13 page 34)
   - A prescriptive, common palette of items should be used.

10. RETAIL – (detailed in section 14 page 38)
   - Use consistent and well-designed retail units which are adaptable/movable to suit demand.

11. SIGNAGE, INFORMATION & ADVERTISING – (detailed in section 15 page 40)
   - Reduce the variety of formats of signage and coordinate signage heights.
   - Consolidate signage, information and advertising into coherent groups such as a frieze.

12. COLOUR – (detailed in section 16 page 45)
   - A common palette and application of colour to improve inclusivity, consistency, ambience and wayfinding.

13. LIGHTING - (detailed in section 17 page 48)
   - Higher consistency, quality and integration of lighting.
   - Reduce glare and light pollution

14. PUBLIC ART – (detailed in section 18 page 87)
   - Integrate art with station designs by involving artists and designers to coordinate at an early stage so that artwork does not have an “applied” quality.

15.SUSTAINABILITY – (detailed in section 19 page 88)
   - Improve sustainability of station construction and operation by reducing waste and energy use.

16.MAINTENANCE – (detailed in section 20 page 89)
   - Projects should adopt a maintenance manual to ensure value for money over the life of the project.

21.3 Recommendations for Further Development

- The Design Review Group will examine how these design guidelines will be implemented and will review them regularly in order to identify and implement updates while ensuring continuity.
- Some of the more prescriptive items in the guide, such as the seats, ticket validators, Concourse Clusters and other items need to be developed for volume production by working with manufacturers to ensure consistency and value for money.
- Related DLR guides (Signage Manual, Cycle Strategy, etc.) should be reviewed in order to ensure that they support the new strategies which have been established during the development of this guide.

APPENDIX A – RELATED DOCUMENTS

A.1 Required Documents

A.1.1 DLR Engineering Standards

Some DLR Engineering Standards apply to stations e.g. ES-502 Station Areas and ES-503 Sub-Surface Stations.

A.1.2 DLR Public Art Strategy

This document indentifies opportunities for Art on the DLR network.

A.1.3 DLR Signage Manual

The DLR Signage Manual provides further detail on signage for the DLR.

A.1.4 DLR Cycle Strategy

The DLR Cycle Strategy identifies cycle hubs and provides further detail on cycle routes, parking and shelters.

A.1.5 Railway Safety Principles and Guidance

This document was produced by HM Rail Inspectorate and is now maintained by the Office of Rail Regulation. It contains key standards for stations.

A.1.6 Train and Station Standards for Disabled People: A Code of Practice

This Department for Transport rail document was previously produced by the Strategic Rail Authority and provides guidance on accessibility.

A.1.7 The Fire Precautions Act 1971: Section 12

This act provides statutory guidance on the design of subsurface stations.

A.1.8 The Disability Discrimination Act 2005

This act requires transport service providers to take reasonable steps to remove barriers from use. Some measures have been taken in this document, such as maintaining visible colour contrasts.

A.1.9 Building Regulations of England and Wales

The Building Regulations should be consulted, since most DLR station structures are not on the exempt buildings list.

A.1.10 LDA's Inclusive Design Toolkit

LDA's Inclusive Design Toolkit should be consulted. see http://www.lda.gov.uk/server.php?show=ConWebDoc.2983)

A.2 Useful Documents

A.2.1 Relevant British Standards

Guidance and Building Regulations sometimes reference British Standards which provide detailed background information. Other British Standards can be consulted when no guidance is available elsewhere e.g. BS4211 offers guidance on access ladders.

A.2.2 LULStation Planning Standards and Guidelines

Provides useful Best Practice guidelines on station layout.

A.2.3 LULSignage Manual

The LUL Signage Manual covers signage in detail and can be referenced for best practice.

A.2.4 Building Research Establishment

The Building Research Establishment is a leading UK centre for sustainability and environmentally responsible building practices. Best practice guidance can be found at: http://www.bre.co.uk/sustainable

A.2.5 Cromocon

Cromocon offers guidance on contrast, size and lighting levels for visually impaired and normally sighted people. http://www.cromocon.com

APPENDIX B – LIGHTING EXPLANATIONS AND GUIDANCE

B.1 Lighting Explanations

B.1.1 Light as a Medium

Lighting is a blend of visual art and science. Some characteristics of lighting are represented by standardised numerical values. When these standards are respected they ensure a minimum visual quality and comfort. This forms the first objective of the Design Guide.

The second objective of the Design Guide is to develop an identity and night time presentation for the network. This element cannot be expressed through standards and numerical values. The results are subjective and open to interpretation. The Design Guide aims to set a framework within which the aesthetic of the lighting scheme can be evaluated against the desired identity and night time presentation.

B.1.2 Qualities of Light

Intensity

- Illuminance is a quantity of light that arrives at a surface, this is measure in lux. The human eye does not see the illuminance, it understands the surface from the light reflected off the surface, for example if two surfaces receive exactly the same illuminance, if one is white specular and the other black mat, the black surface will appear darker than the white, as the black is less reflective. The value of light coming off of a surface is referred to as the luminance and is measured in candela. Illuminance is provided as a standard guidance and requirement within regulations as it is easier to measure and provides a reasonable approximation of the visual rendering in a standard architectural environment. The reflectivity of the surfaces should still need to be considered within the design.

Maintained Illuminance

- This is the minimum average illumination that an area is allowed to reach. This is based on the proposed cleaning and maintenance as a factor of the required lighting levels. Therefore the initial scheme when measured will present higher values.

Uniformity & Diversity

- The uniformity covers the even distribution of illuminance across and area. The uniformity is the ratio of the minimum illuminance to the average illuminance. The diversity also covers the need for even distribution of light across an area. The diversity is the ratio of the minimum illuminance to the maximum illuminance within a given area or on a given surface The uniformity and diversity are important they a guide to ensure all parts of a defined area are lit to an acceptable level, as the numerical average illuminance could be skewed by areas of intense brightness, while other areas receive little or no illuminance.

Direction

- The direction from which illumination is achieved should be considered, particularly in relation to glare. The direction of illumination influences the perception of an object and the ability to recognise it. The direction of illumination should be appropriate as to the area, or objects being illuminated.

Glare

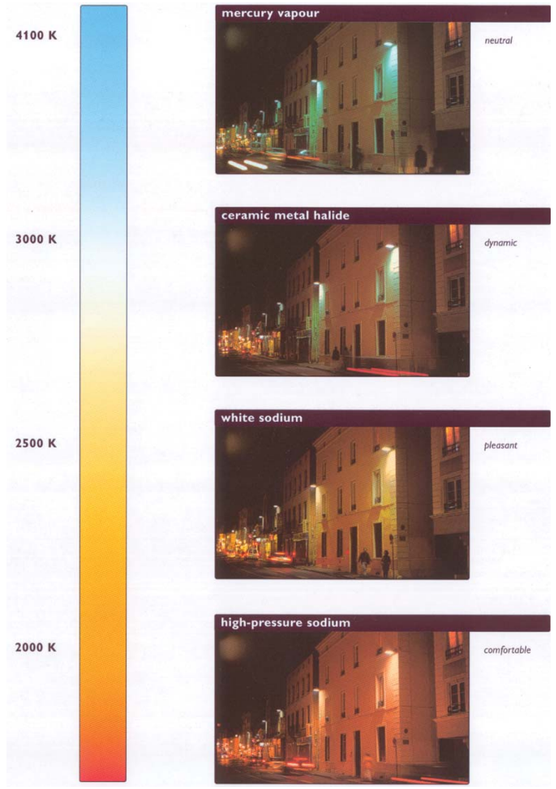
- Glare is caused when one part of an environment appears significantly brighter than its surroundings. This could be the luminaire itself or reflections from a lit surface. Glare can have two effects. It can impair vision, in which case it is referred to as disability glare and it can cause discomfort, in which case it is called discomfort glare. The intensity of a source in a given direction is measured in Candela(Cd). Maximum candela values are often specified as a method for limiting glare. Control of glare is important for maintaining a safe and comfortable environment

Colour Temperature & Colour

- The colour temperature, the warmth/coolness of white light produced by the lamp, measured in Kelvin [k] Contrasts in colour temperature can be used to define spaces or accent particular elements. The colour temperature should be appropriate to the surrounding area and the desired perception of the space, and be appropriate to the materials used.

Colour Rendering

- Good colour rendering is important for facial recognition and a full perception of the surrounding environment. Higher levels of colour rendering improve the perception of the environment and the sense of safety.



B.1.3 The Lamp

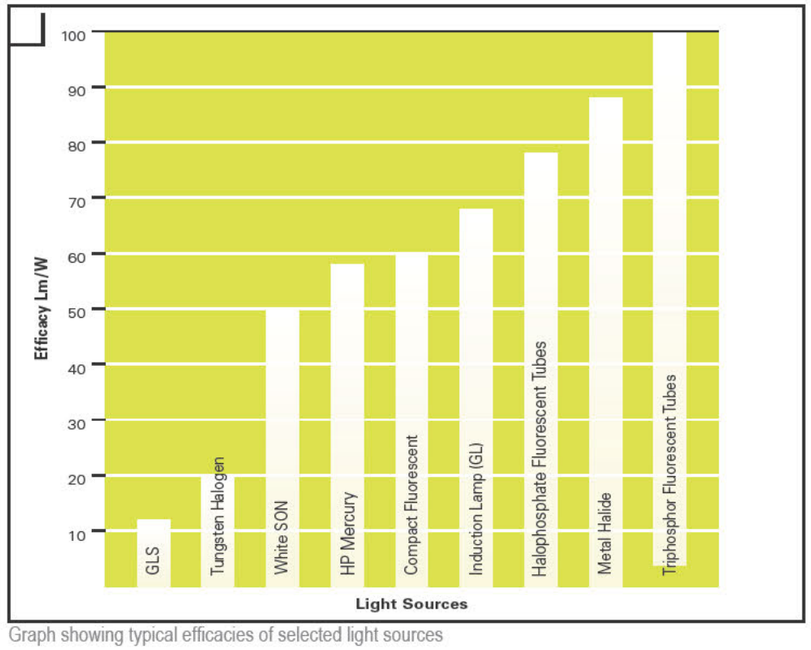
The lamp is central to any luminaire and lighting scheme. A wide range of light sources (lamps) are available on the market. The characteristics of the lamp need to be considered appropriate for the desired task. Each lamp technology has a different characteristics and none offer a universal solution. Consideration should be given to the following variables in selection of lamps, and subsequently luminaires.

Efficacy

- This is the amount of light the lamp gives relative to the power consumed. Power consumed is measured in Watts [W] and should also include any additional power consumed by ballasts, gear, drivers or transformers. The lamp wattage and associated control gear consumption are combined to give Circuit Watts. The light output of the lamp is measured in Lumens [Lm] this reflects the total output in all directions after an initial running in period for the lamp. The Efficacy of a lamp is defined by the Lumens per Circuit Watt [Lm/CiruitW] The higher the value the more efficient the lamp and control gear is at producing visible light. Using efficient lamps and light sources is important as it consumes less energy, reducing the environmental impact and running costs of the luminaire.

Lamp Life

- Rated Lamp Life: The rated lamp life is provided by the lamp manufacturer and defines the average life expectancy of the lamp. This is based on the point in time where 50% of lamps have failed. For light sources such as LEDs, no formal definition of lamp life is yet given. LEDs do not typically fail, they will continue to operate and grow increasing dim. Manufacturers lamp life should be checked. The expectation is that the life will define the point at which the lumen output drops below 80% of the initial lumen output. The lamp life should be considered to ensure an efficient maintenance cycle can be undertaken.



Graph showing typical efficacies of selected light sources

There are three typical categories of lamps on the market.

1. Incandescent: Light is produced as a result of current passing through a metal filament, which heats up and subsequently glows emitting light. (Tungsten, halogen, dichroic...).

Advantages - Low initial cost, good colour rendering, instant start.

Disadvantages -Inefficient technology, short lamp life lead to high running and maintenance costs.

2. Discharge: Light is produced by passing an arc of electricity across a gas chamber. This lamp type is subdivided dependant on the gas used within the lamp. (Low pressure sodium, High pressure sodium, mercury vapour, Fluorescent [subdivided into linear and compact], Metal Halide, Cold cathode...)

Advantages - High Efficiency Sources, Long Lamp life, range of colour temperatures.

3. Electroluminescent: Light is produced by the passing of an electrical current across a particular type of semi-conductor. (LED)

Advantages - Long lamp life when heat correctly managed. Low power consumption.

Disadvantages - Increased initial cost, efficiency variable dependent on type.

It is recommended that Fluorescent, Metal Halide, White SON and LED lamp types are considered for use within the DLR network as ambient lighting as they offer, good efficacy, lamp life and are available over a wide range of intensity (lumen outputs) and colour temperatures

Disadvantages - Some Varieties (sodium) offer poor colour rendering. Lamp takes a time to reach full intensity.

Comparison of Key Lamp types.

Lamp Type	Lamp Life	Efficiency	Colour Rendering
Incandescent & Tungsten Halogen	1000-2000	10 - 20 lm/W	100
Fluorescent	8000 +	60+ lm/W	80 - 90
High Pressure Sodium	1200-2800	90 lm/W	<40
White SON	6000-1000	50 lm/W	80 - 90
Metal Halide	6000+	85+ lm/W	>70
LED	50,000	Varies	Varies


Metal Halide Lamp


Fluorescent Lamp


LED Lamp

B.1.4 The Luminaire

The luminaire, or light fitting, is the complete product consisting or housing, reflector, optics, lamp and typically any control gear or transformers required to power the lamp, although this can sometimes be mounted in a separate enclosure.

Physical Construction

Ingress protection (IP)

- The ingress protection rating of a luminaire denotes the protection against dust, solid objects and moisture from entering the luminaire, where it could interfere with the mechanical and optical performance of the lamp and luminaire. This should be considered relative to the mounting location and cleaning strategies being implemented.

Impact Resistance

- Impact resistance is important where luminaires are installed in hazardous environments and where there is the potential for accidental damage or vandalism.

Weight Bearing

- Particularly for in-ground luminaires the top of the luminaire and installation method should able to sustain loadings on top suitable to the predicted traffic flow through the area. This considers the weight and speed of any vehicles / pedestrians moving over the luminaire.

Temperature

- For luminaires that are accessible, particularly in-ground and wall mounted luminaires it is important that the temperature of the luminaire does not pose a hazard to users of the station, additionally in areas where there is likely to be debris, leaves etc accumulating around the fittings the temperature is important for minimising fire risk.

First number:

degree of protection against accidental contact / contact with external elements

First numeral and symbol	Description	Explanation
0	non-protected	
1	hand protected	protected against solid foreign objects exceeding 50 mm in diameter
2	finger protected	protected against finger contact with live parts; against solid objects exceeding 12 mm in diameter
3	tool protected	protected against contact with live parts via tools, wire or similar objects over 2.5 mm thick; protection against penetration of solid objects exceeding 2.5 mm in diameter
4	wire protected	protected against contact with live parts by tools, wire or similar objects over 1 mm thick; protection against penetration of solid objects exceeding 1 mm in diameter
5	dust accumulation protected	complete protection against contact with live parts and against harmful accumulation of dust; some dust may penetrate but not to the extent that operation is impaired
6	dust penetration protected	complete protection against contact with live parts and against penetration of dust
X	not defined	

Second number:

degree of protection against ingress of moisture

Second numeral and symbol	Description	Explanation
0	non-protected	not protected against moisture
1	drip-proof against vertical water drops	water drips falling vertically shall have no harmful effect
2	drip-proof when tilted at angles up to 15°	water drips shall have no harmful effect
3	rain/spray-proof	water falling at an angle of up to 60° shall have no harmful effect
4	splash-proof	splashing water from any direction shall have no harmful effect
5	jet-proof	water projected by a nozzle from any direction shall have no harmful effect. (Nozzle diameter 6.3 mm, pressure 30 kPa)
6	jet-proof	water projected by a nozzle from any direction shall have no harmful effect. (Nozzle diameter 12.5 mm, pressure 100 kPa)
7	watertight	watertight; temporary immersion in water under specified conditions of pressure and time possible without ingress of water in harmful quantities
8	pressure watertight	pressure watertight; continuous submersion in water under specified conditions of pressure and time without ingress of water in harmful quantities
X	not defined	

Impact resistance

IK code	Shock energy	Description	Example
IK00	-		
IK01	0.15 J		
IK02	0.2 J	Standard	Standard open luminaire Closed luminaire with polymethylmethacrylate cover
IK03	0.35 J		
IK04	0.5 J	Standard plus	Open luminaire with reinforced optical system
IK05	0.7 J		
IK06	1 J		
IK07	2 J	Reinforced	
IK08	5 J	Vandal-protected	Closed luminaire with polycarbonate or glass cover
IK09	10 J		
IK10	20 J	Vandal-resistant	Closed
IKxx		not defined	

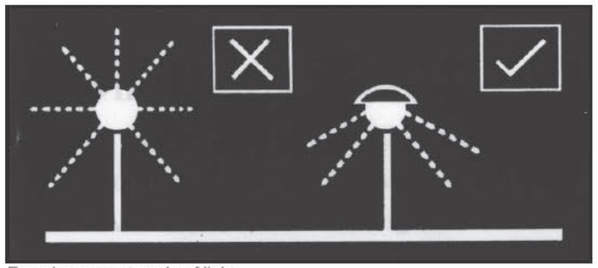
Protection against flammability

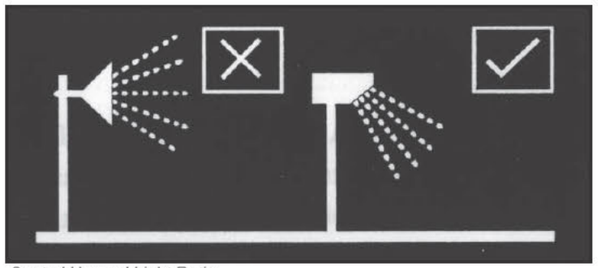
Symbol	Application	Characteristics of ceiling material
None	Suitable for mounting on non-flammable surfaces	Stone, concrete
F	Suitable for mounting on normally flammable surfaces	Ignition temperature materials > 200°C Some combustion time lag
F F	Suitable for mounting on easily flammable surfaces	Ignition temperature materials < 200°C No combustion time lag

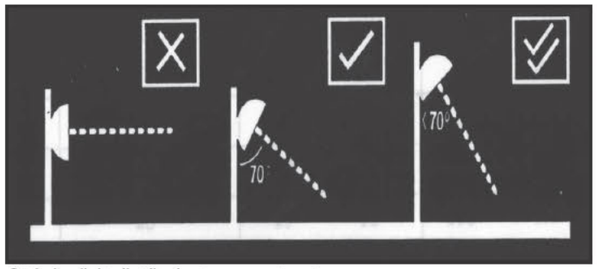
Protection against electrical shock

Safety Class	Symbol	Protection
0		Basic insulation only
I		Basic insulation plus protective earth connector
II		Double or reinforced insulation, no provision for protective earthing
III		Supply of safety extra-low voltage

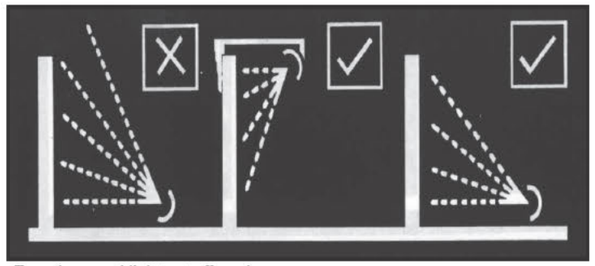
Ingress Protection

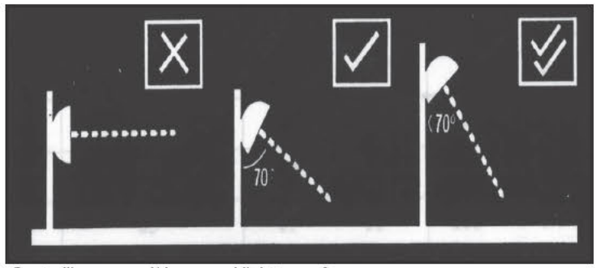

Ensuring correct angle of light


Control Upward Light Ratio



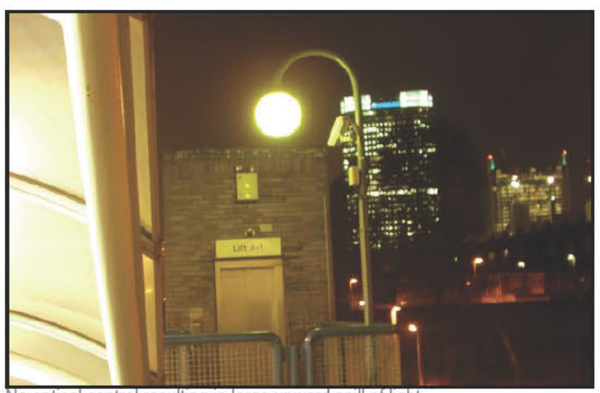
Optimise light distribution to prevent wastage


Ensuring good light out off angles



Controlling upward/downward light to surfaces


Unshielded luminaires resulting in large porportion of upward loss of light


No optical control resulting in large upward spill of light

B.1.4 The Luminaire (continued)

Optical Properties

- The light produced by a lamp needs to be controlled and directed towards where it is required. The optic of the luminaire is responsible for this control of the output. The optic typically takes the form of a reflector or a lens. Louvres, cowls and accessories can be added to further control the output.

Beam Angle

- The beam angle of a luminaire is defined by the output angle at which the intensity of light output drops below half of the peak output. Light is still distributed outside of this beam however to a lower intensity .The beam angle should be considered suitable for the area to be lit

Field Angle

- The field angle is defined by the output angle at which the intensity of light output drops below 10% of the peak output. An awareness of the field angle of a luminaire should be shown particularly in relation to the control of light pollution.

Light Output Ratio (LOR).

- The light output ratio is the percentage of light (in lumens) that exits the luminaire. Reflectors, Lenses and the casing of a luminaire absorb or block some light from exiting the luminaire, this is part of the optical performance in directing the light to a beam angle and direction. Fittings should have as high a possible LOR without becoming a source of glare. As a luminaire with a high LOR will output more light for the same wattage when compared with a low LOR luminaire either fewer luminaires are required or the lamp can be dimmed saving energy and money.
- DLR are committed to maximising energy savings throughout the network. Choosing luminaires with a High LOR helps in reducing the wattage and quantity of luminaires required.

Upward Light Ratio (Cut-Off)

- The upward light ratio of a luminaire is the percentage of output above the horizontal plane. For column mounted luminaires this should be kept to a minimum to reduce light pollution and sky glow. This is applicable to the entire scheme and considers the aiming direction of the luminaire.

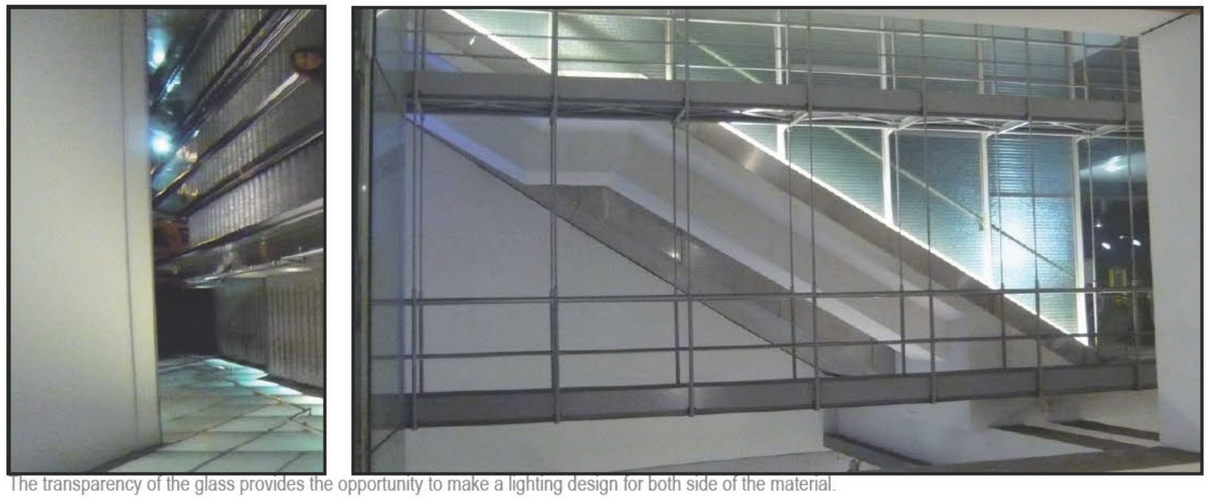
B.2 Lighting Application

B.2.1 Lighting Techniques - Lighting of Surfaces

Consideration of the surface finishes in crucial to any lighting design and DLR stations are no different. Lighting is perceived by its interaction with surfaces. These surfaces should be considered when designing for wayfinding and identity. Lighting of surfaces provide a degree of visual interest, can be used as markers for wayfinding, to provide emphasis to important areas of the station as well as providing an important wayfinding and safety function when lighting signs. In all instances the surface finishes must be considered when choosing the type of lighting to be used. The main considerations are as follows;

- TRANSPARENCY / OPACITY. How solid is the surface. The transparency or opacity could relate to the differing qualities of glass or to the density of perforations on a opaque surface. The transparency and opacity is important to understanding potential light pollution in and out of the site. It also offer opportunities for feature lighting or integration of lighting into the architecture.
- REFLECTANCE (SPECULARITY.): The reflectance of the surface also needs to be considered if indirect lighting is being used to contribute to the lighting levels on the station. Inadvertent reflections and glare on the station should be kept to a minimum across the station and the nature of the surface is key to this. With highly reflective sufaces (often encountered in DLR stations) the luminaire optic is key in controlling potential glare and reflection problems. Reflection of luminaires in surfaces should be avoided, particularly in glazing where they will obstruct views in and out of the station.
- COLOUR TONE & SATURATION. We perceive colour by the wavelengths of light absorbed and reflected from a surface. Different light sources have differing colour renderings or colour temperatures. Sources with low colour rendering properties will limit the ability to distinguish between differing surface colours. The colour temperature of the light can also dull or enhance a surface. Warmer colour temperatures are more suited to use on colours and tones towards the red end of the spectrum, while cooler colour temperatures emphasize the blue end of the spectrum.
- FINISH, SMOOTH / TEXTURED. The texture of a surface is perceived through the highlights and shadows created from the illumination. Lighting can be used to enhance a texture through lighting from angles that generate a strong contrast in the highlights and shadows, inversely lighting can flatten the perception of textured surfaces by lighting them evenly. Lighting can also highlight the textured flaws of surfaces which should appear smooth, such as in poured concrete for example. The angle and diffuse nature of the light source should be considered relative to all the surfaces it will interact with.

Example of colour temperature interaction on the same surface. Note the difference in the vibrancy of the red colour between the Warm (left) and Cool (right).



The transparency of the glass provides the opportunity to make a lighting design for both side of the material.

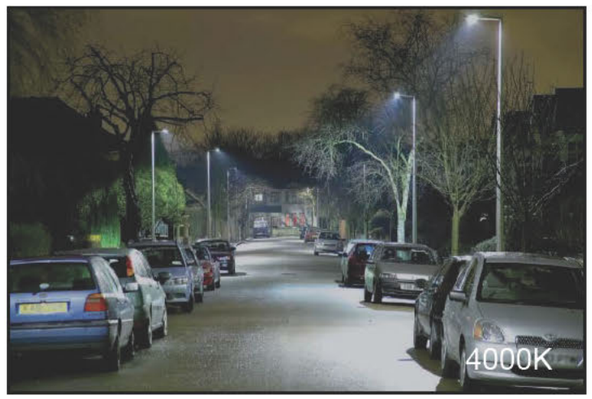
Techniques for enhancing texture

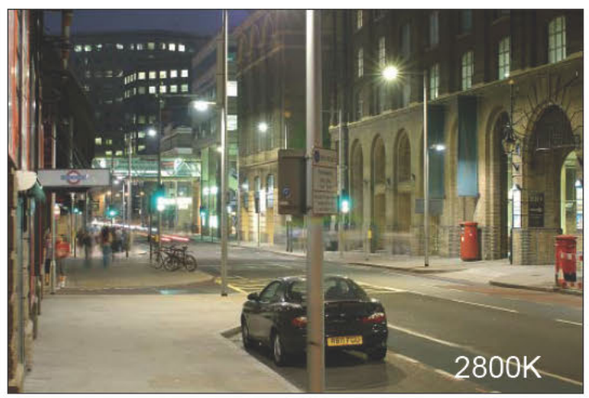
Concrete ceiling used as a reflector for a diffuse lighting.

Ceiling of station with ceramic tiles, the fitting is reflected in the material.

Ceiling of station without ceramic tiles to limit the reflexion of the lighting fitting. Light is reflected and diffused by the surface.

Examples of Road lighting colour temperatures





Road Colour	Around Station
2000K	2250-3000K
2800K	2800-3000K
3000K	3000K
4200K	4200K

B.2.2 Lighting Techniques - Design Guidance for Station Facade Lighting Design

i) Integrating the station into wider streetscape

The station should sit comfortably within it's immediate environs and compliment the streetscape. This involves comfortable transitions from the DLR to the street and visa versa. Lighting should not be obtrusive to neighbouring properties and passers by. There should be good permeability between the DLR network and surrounding streetscape creating an easy flow in and out of the station. It is important that a person feels safe on the DLR network so the lighting should promote a perception of safety which should extend as far around the station as is reasonable to integrate into the streets surrounding.

To identify the station within the street use of changes in colour temperature and intensity are proposed. These should be proportionate to the surrounding street. Guidance is shown below.

Road Lighting levels dependant road classification as per EN 13201 and Local Authority.

ii) Wayfinding & Station identity

- The integration to surrounding streetscacpe elements [previous] allow for the station to be subtly marked out through variation in intensity and colour temperature.
- Reducing the clutter of lighting equipment around the station approach and when looking into the station allows for views into and out of the station.
- The long views and station markers come through the presentation of the station architecture.

Road Illuminance	Around Station
Residential	
7 Lux	14 Lux
10 Lux	20 Lux
15 Lux	30 Lux
Urban Street	
> 15 Lux	= street

APPENDIX C – LIGHTING STANDARDS

C.1 Ambient Lighting

Internal Stations

- The requirements for internal and sub-surface stations have been developed from the DLR existing requirements. Reference has also been made to Lighting of London Underground Assets (April 2005).

External Stations

The requirements established within this design guide are drawn from the following sources

- BS EN 12464-2:2007 Lighting of work places - Part 2: Outdoor work places.

Existing DLR requirements

- BS EN 12464-2:2007 includes requirements for Railways, these have been taken as a basis for the requirements. Higher illumination levels have been requested across the areas to fit with the DLR preferences and based on creating the stations as destinations within the surroundings.
- The Colour Rendering requirements have been increased as it is important that people feel safe and have a positive interaction with the stations. Good colour rendering is a key factor for this to occur.

C.1.1 Internal & Sub-surface Stations - Enclosed Stations

Ambient Lighting Requirements: Areas requiring horizontal illuminance at floor level.

	Average maintained illuminance [$\bar{E}_m$]	Uniformity [U_o]	Glare [$GR_{L]}$	Colour Rendering [R_a]
Approach	***Refer to Approach Table***			
Concourse	**100**	**0.6**	**≤45**	**≥80**
Stairs	**150**	**0.5**	**≤45**	**≥60**
Bridges	**100**	**0.5**	**≤45**	**≥60**
Corridor	**100**	**0.4**	**≤45**	**≥60**
Platform	**100**	**0.4**	**≤45**	**≥80**
Lift	**100**	**-**	**≤45**	**≥80**

Areas requiring vertical illuminance on task area.

	Average illuminance [$\bar{E}_m$]	Uniformity [U_o]	Glare [$GR_{L]}$	Colour Rendering [R_a]
Information	**150**	**0.4**	**≤45**	**≥80**
Ticket machine	**150**	**0.4**	**≤45**	**≥80**

- Particular attention should be given to the platform edge, yellow line and textured strip to ensure lighting at these points allows clear definition of the platform edge and safety markings.
- Consideration is required to the both the horizontal and vertical surfaces to re-enforce daylight, particularly at transition zones.
- Lighting levels to be considered in conjunction with natural lighting levels externally especially at transition zones from internal to external and visa versa.

C.1.2 Surface Stations - Open Areas

Ambient Lighting Requirements

Areas requiring horizontal illuminance at floor level.

	Average maintained illuminance [$\bar{E}_m$]	Uniformity [U_o]	Diversity [U_d]	Glare [GR_L]	Colour Rendering [R_a]
Approach	**Refer to Approach table**				
Concourse	**50**	**0.6**	**-**	**≤40**	**≥80**
Stairs	**100**	**0.5**	**-**	**≤45**	**≥60**
Bridges	**30**	**0.5**	**-**	**≤50**	**≥60**
Corridor \ Walkway	**30**	**0.5**	**-**	**≤50**	**≥60**
Platform, Under Canopy	**100**	**0.4**	**≥0.2**	**≤45**	**≥80**
Platform, Open	**60**	**0.4**	**≥0.2**	**≤45**	**≥80**
Lift	**100**	**-**	**-**	**≤40**	**≥80**

Areas requiring vertical illuminance on task area.

	Average maintained illuminance [$\bar{E}_m$]	Uniformity [U_o]	Diversity [U_d]	Glare [GR_L]	Colour Rendering [R_a]
Information	**150**	**0.4**	**-**	**≤40**	**≥80**
Ticket machine	**150**	**0.4**	**-**	**≤40**	**≥80**

- Particular attention should be given to the platform edge, yellow line and textured strip to ensure lighting at these points allows clear definition of the platform edge and safety markings.
- Care should be taken at transition zones to ensure smooth light level movement.

C.2 Emergency Lighting

Emergency Lighting requirements have been based on the following documents:

- BS EN 1838:1999 and BS 5266 variations.
- The Fire Precautions (Sub-surface Railway Stations) Regulations 1989,
- CIBSE, Lighting Guide 12:Emergency lighting design guide
- DLR existing Requirements.
- BS EN 1838:199 and BS5266 referes to the lighting of escape routes. At present DLR does not differentiate between escape routes and general lighting.

Lighting of London Underground Assets (April 2005)

C.2.1 Escape Routes

- Escape routes should be permanently unobstructed. Escape routes are considered in 2m wide bands. Wider escape routes can be considered in multiples of 2m bands.
- It is expected that an escape route will run along the length of the platform linking into the exits and following the escape routes.

C.2.2 Anti Panic Areas

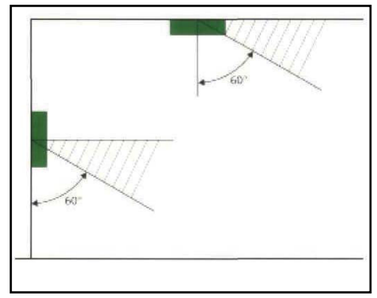
For those areas outside of the escape route lighting is still required however by providing a safe lower intensity of light in these areas attention is clearly drawn to the defined escape route.

Areas requiring horizontal illuminance at floor level.

	Average Illuminance (Lux)	Minimum Illuminance (Lux)	Diversity [U_d]
Escape Route	**-**	**15**	**< 40**
Other Areas (Anti Panic)	**5**	**1**	**< 40**

Glare

Maximum Candela values of luminaires when in emergency operation. Maximum values apply to the viewing angles shown.



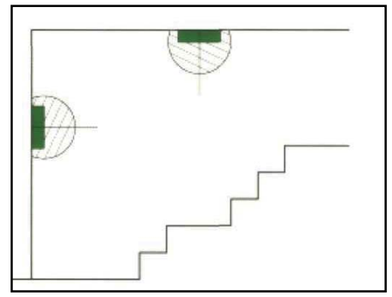


Table 3.1 Disability glare limits

Mounting height above floor level *h* (m)	Escape route and open area maximum luminous intensity I_{max} (cd)	High-risk task area lighting maximum Luminous intensity I_{max} (cd)
$h < 2.5$	500	1000
$2.5 \leq h < 3.0$	900	1800
$3.0 \leq h < 3.5$	1600	3200
$3.5 \leq h < 4.0$	2500	5000
$4.0 \leq h < 4.5$	3500	7000
$h = 4.5$	5000	10 000

C.3 Light Pollutions and Obtrusive Light

The lighting scheme should conform to the ILE guidance on reducing Obtrusive light. See Extract below:

Institution of Lighting Engineers *Guidance Notes for the Reduction of Obtrusive Light GN01*

ENVIRONMENTAL ZONES:
It is recommended that Local Planning Authorities specify the following environmental zones for exterior lighting control within their Development Plans.

Category	Examples	
E1:	**Intrinsically dark landscapes**	National Parks, Areas of Outstanding Natural Beauty, etc
E2:	**Low district brightness areas**	Rural, small village, or relatively dark urban locations
E3:	**Medium district brightness areas**	Small town centres or urban locations
E4:	**High district brightness areas**	Town/city centres with high levels of night-time activity

Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

DESIGN GUIDANCE
The following limitations may be supplemented or replaced by a LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a professional lighting designer before installing any exterior lighting.

Table 1 – Obtrusive Light Limitations for Exterior Lighting Installations

Environmental Zone	Sky Glow ULR [Max %] (1)	Light Trespass (into Windows) Ev [Lux] (2)		Source Intensity I [kcd] (3)		Building Luminance Pre-curfew (4)
		Pre- curfew	Post- curfew	Pre- curfew	Post- curfew	Average, L [cd/m2]
E1	0	2	1*	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5.0	10	2	10	1.0	10
E4	15.0	25	5	25	2.5	25

ULR = **Upward Light Ratio of the Installation** is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.
Ev = **Vertical Illuminance in Lux** and is measured flat on the glazing at the centre of the window
I = **Light Intensity in Cd**
L = **Luminance in Cd/m2**
Curfew = **The time after which stricter requirements (for the control of obtrusive light) will apply**; often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23.00hrs is suggested.
***** = From Public road lighting installations only

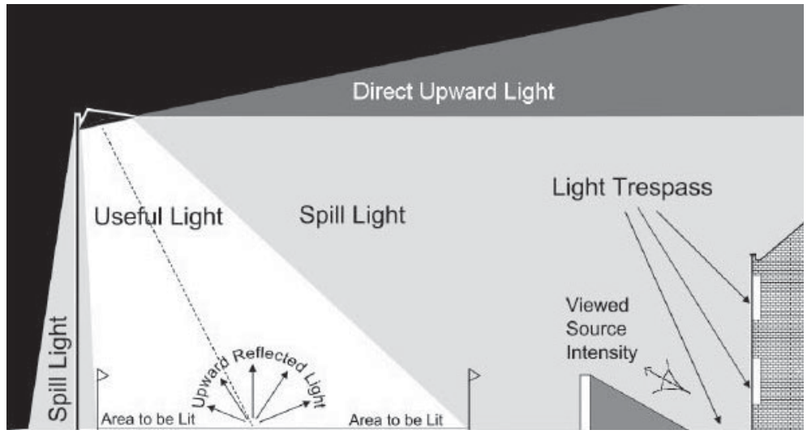
(1) **Upward Light Ratio** – Some lighting schemes will require the deliberate and careful use of upward light – e.g. ground recessed luminaires, ground mounted floodlights, festive lighting – to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

(2) **Light Trespass (into Windows)** – These values are suggested maxima and need to take account of existing light trespass at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light trespass into the window down to the after curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.

(3) **Source Intensity** – This applies to each source in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.

(4) **Building Luminance** – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

Type of Light Pollution



C.4 Glare

Maximum Glare values are listed for areas of the station. Consideration also needs to be given to the viewing of luminaires and surfaces away form the targeted illumination area.

For example whilst luminaires may be acceptable in glare terms when viewed from the platform, in the case of elevated stations there are additional viewing angles from the streetscape below.

In these situations it should be checked that any glare being caused by the luminaire does not exceed the maximum glare rating for the roadway class over which the network extends.

Roadway classification and requirements can be located in:

- BS-EN 13201-1:2004 “Road Lighting Part 1: Selection of lighting classes”, BSI 2004
- BS-EN 13201-2:2003 “Road Lighting Part 2: Performance Requirements”, BSI 2003
- BS 5489-1:2003 ”Code of practice for the design of road lighting”, BSI 2003

C.5 Luminaire Requirements

Ingress Protection

	IP
Interior	***>20***
Exterior covered	**>65**
Exterior no covered	**>65**

IP65 rating externally allows for water jet cleaning strategy.

F Mark

F Mark should be appropriate to mounting surface. Fire rating should also comply with LUL safety requirements for Section 12 station.

Impact Protection

	IK
Foot access	IK10
Hand access	IK10
Not accessible	IK08

Surface Temperatures

Surface temperature requirements are based on BRE Report 290, Section 9: 1995.

	Maximum Temperature (Degrees Celsius) for up to 4 second contact time.
Glass	60
Metal	75

Weight bearings

All in-ground luminaires should be verified as suitable for the typical traffic flow that passes over them.

C.6 Lighting Calculations

There are many different factors that influence the resulting light levels on a project. Computer simulation allows for prediction of these levels. It is important that the following variables are clearly listed on any calculation documentation to reflect the known environment or any assumptions being made.

- LUMINAIRES, Luminaires should be listed and clearly identifiable on the calculation. Luminaire information should list manufacturer, luminaire type, part number and any accessories included in the calculation. The lamp type, quantity and lumen value for the luminaire should also be clearly stated.

- SURFACES, Surfaces and associated reflectance value should be listed.

- MAINTENANCE FACTOR, The maintenance factor for the installation.

- HORIZONTAL LUX LEVELS, For each area. Height of calculation plane should be listed. The Average, Maximum, Minimum and Uniformity should be clearly displayed.

- GLARE RATINGS, A range of typical locations should be checked to ensure that proposed scheme does not generate glare to the user.