Standard Category 1

S1371 A7 Station capacity planning

Contents

1 Purpose

The purpose of this standard is to define the spatial requirements to allow for the safe and reliable movement of customers within the station environment.

2 Scope

This standard applies to proposers of design of or change to the public areas of:

a) new stations

b) existing stations – new or altered assets

c) Temporary works.

This standard sets out the minimum spatial requirements for both normal operations and for degraded operations during temporary works or special events.

It applies to the following:

a) Customer flow

b) Ticket hall and concourses

c) Routeways and vertical circulation

d) Platforms

e) Run-offs

f) Headroom

g) Public facilities.

Note:	For staff accommodation requirements, refer to S1372 'Station staff accommodation'. For customer requirements refer to S1351 'Station Design' and S1375 'Planning for Ticket issuing Facilities'. For evacuation requirements refer to S1080 'The application of fire safety engineering principles to TfL premises'.

3 Requirements

3.1 General requirements

3.1.1 Stations shall comply with London Underground (LU) standards, the Building Regulations and relevant British Standards, including BS 8300. Where any conflicts arise between Building Regulations and this standard, compliance with this standard shall take precedence except where a breach in the Law would arise.

Note:	Relevant references can be found in the Premises standards listed in section 10

3.1.2 Public space for normal operations in stations shall be planned to:

a) minimise congestion;

b) be resilient to surges in demand and train service disruption;

c) Provide a suitable level of security to reassure customers and staff.

d) Provide a safe environment to reduce the likelihood of customer or staff injury.

3.1.3 Public areas in stations shall be determined by the space requirements of all activities, e.g. customer flow to and from trains, ticket purchase & validation, passage through the gate-line, wayfinding, fixtures and facilities, commercial activities (tenancy, Automated Telling Machines (ATMs), advertising), fire doors, security gates, access to and from platforms, waiting for trains and boarding & alighting from trains.

3.1.4 Station capacity planning shall ensure that obvious routes with minimum travel distances are free from obstructions, have good lines of sight and avoid dead ends and hiding places.

3.1.5 New and substantially altered existing stations shall be designed to ensure that persons of reduced mobility can move between street and train via step-free routes between levels, which comprise lifts, ramps and platform humps, and between platforms on different lines.

3.2 Planning criteria and Levels of Service

3.2.1 The next sections of this standard specify how to calculate the size or capacity of station elements for what is considered to be normal Levels of Service (LoS).

3.2.2 When events, construction work and temporary work is carried out in parts of existing stations, the levels of service required will differ (see Table 10).

3.2.3 The levels of service shall apply to peak forecast traffic demand.

Note:	At some stations, the busiest periods may not necessarily be the traditional morning or evening peaks, such as stations with heavy night-life usage or major rail termini. At these locations, it may also be necessary to assess crowding for these extraordinary peaks.

3.2.4 Using Table 1 and the relevant formulae for sizing station elements, capacities of new and existing stations can be determined for these special events or during work. These capacities need to be known for existing stations to determine if and when special station control measures need to be implemented.

3.2.5 If special events are a regular occurrence, such as football matches every other week, then station capacity and design shall reflect this situation.

3.2.6 The table below shows the levels of service and associated quantitative measures to applies to normal service in the locations listed. A fuller description of Levels of Service and their definitions can be found in the accompanying guidance document G371A 'Station Planning Standards and Guidelines'.

Station area	Normal Service	
	LoS	Quantitative measure
Open concourses	B	1.0m^2 per person
Queuing for ticket hall facilities	C	0.8 m^2 per person
Passageways		
- one-way	D	50 pax/m/mw
- two-way	C	40 pax/m/mw
Stairways		
- one-way	D	35 pax/m/mw
- two-way	C	28 pax/m/mw
Escalators		100 pax per minute
Platforms	C	0.93 m^2 per person
Note: pax/m/mw = customers per minute per metre width		

Table 1: Passenger Flow minimum requirement

3.3 Customer survey data

3.3.1 The calculations for station areas shall use the average flow per minute which shall be derived from the peak 15 minutes flow.

$$\text{The average per minute} = \left(\frac{\text{Peak 15 minutes}}{15}\right)$$

3.3.2 If forecast flows are not available, then the result based on current demand levels shall be multiplied by 120%.

3.3.3 The following elements are the exception to the peak 15 minute flow:

a) Run-offs
b) Ticket issuing facilities
c) gates
d) Smartcard readers
e) Lift Waiting Areas.

3.3.4 Should peak 15 minute customer flow data be unavailable (e.g. for a new station), the factors from the following Table 2 shall be applied to the flow for the shortest peak period available (either peak 3-hours or peak 1-hour) to give the peak flows in the shorter periods. Hence:

Peak	Station fare zone	Factor applied to peak 3-hour flow to give peak hour flow	Factor applied to peak hour flow to give peak 15 min flow	Factor applied to peak 15 min. flow to give peak 5 min flow (see gateline below)
AM peak	1, 2 & 3	0.45	0.27	0.4
	4, 5 & 6	0.48	0.27	0.4
	Others	0.53	0.27	0.4
PM peak	1, 2 & 3	0.41	0.26	0.4
	4, 5 & 6	0.39	0.26	0.4
	Others	0.39	0.31	0.4

Table 2: Peak Passenger Flow Factors

3.3.5 Run-offs and ticket issuing facilities shall be designed for peak 1 hour, gates and smartcard readers shall be designed to cater for the average flow per minute derived from the peak 5 minute flow (see section 3.5) while lift waiting areas shall be designed to cater for the peak one minute customer demand.

3.3.6 Customer areas derived from methodologies contained in this document (other than the concourse unpaid side, see sections 3.4 and 3.6 to 3.11) shall be the net areas available after allowing for the requirements of all customer related activities, as specified in other relevant standards (see section 8).

3.3.7 Stations are allocated a category for the purposes of spatial capacity planning and dynamic modelling, as follows:

a) Gateway
b) Destination
c) Metro
d) Local

Note: Data on the number of customers using the London Underground is largely based on the Automatic Ticket Gate (ATG) System data. This information feeds through into business cases either directly or via the Rolling Origin and Destination Survey (RODS) and internal models such as the annual passenger counts. This data can be obtained by email to Rail & LU Passenger Demand enquiries.

Note: At some stations, the busiest periods may not necessarily be the traditional morning or evening peaks, such as stations with heavy night-life usage or major rail termini. At these locations, it may also be necessary to assess crowding for these extraordinary peaks.

3.4 Ticket hall

3.4.1 General

When planning the layout of a ticket hall, all customer related activities that are expected to take place within the ticket hall shall be identified and incorporated. Conflicts of differing customer flows shall be avoided. These activities include ticket selling, gatelines, queuing, customer circulation & assistance and secondary revenue activities.

3.4.2 Station entrances/exits

3.4.2.1 Station entrance/exit minimum width shall be calculated as follows:-

$$\text{Entrance/Exit width per ticket hall} = \left(\frac{\text{No. of Gates} \times 50}{80} + \left(\text{No. Of Entrances/Exits} \times 2 \times 0.3 \right) \right) \text{m}$$

3.4.2.2 The entrance/exit width may be split across multiple entrances and exits; however each of these shall have a minimum width of 2.5m. The entrance/exits shall not be so large that they cannot contain the numbers that may enter concurrently or significantly exceed the capacity of the gatelines, stairways and escalators.

3.4.2.3 There shall be a level landing outside and immediately in front of any station entrance/exit of at least 1.5m deep and at least 300mm wider than the entrance/exit.

3.4.2.4 Where station entrance/exits are protected by hostile vehicle mitigations they shall not impede with customer flows.

3.4.3 Concourse (unpaid side)

3.4.3.1 The area of the unpaid side of the ticket hall concourse shall be designed to offer a minimum of 1.0m2 per customer, for the forecast average flow per minute over the peak 15 minutes.

$$\text{Concourse Area} = \left(\frac{\text{Peak 15 minute flow}}{15} \right) \text{ X } 1.0\text{m}^2$$

3.4.3.2 This area is inclusive of and not additional to gateline run-offs, ticket queuing space and amenities and facilities as specified in relevant standards (see S1375).

3.4.4 Space for ticket issuing

3.4.4.1 To ensure that adequate customer space is provided, the number of POMs shall be sufficient to ensure that at least 95% of passengers requiring tickets during the peak 1 hour of ticket sales shall not wait for more than 3 minutes.

Note:	Refer to S1375 'Planning for Ticket Issuing Facilities' for further detail and for modelling parameters contact London Underground Transport Planning. [redacted]@tfl.gov.uk

3.4.5 Spacing of Ticket Vending Machines

3.4.5.1 Advanced Fare Machine (AFMs) and Queue Buster Machine (QBMs) shall not be in groups of more than two without being separated by either an MFM or a 600mm boarded gap. This is to prevent overcrowding at machines, thus maximising usage.

3.4.5.2 Ticket Vending Machines (TVMs) shall be installed in groups of three or fewer to allow sufficient space for staff to assist customers.

3.4.6 Queuing distance in front of Ticket Vending Machines (TVM)

3.4.6.1 The queuing distance in front of each ticket vending machine shall be 4m. This space shall not overlap with gateline or other run-offs.

3.4.7 Queuing systems

3.4.7.1 Where there are more than four TVMs, a queuing system, commonly known as a 'Uni-Queue', shall be considered. Where a queuing system is in place, the queuing distance shall be calculated as being within the confines of the queuing system.

3.4.7.2 The Uni-Queue shall be of sufficient capacity to contain the queue length expected at the station at peak times.

3.4.7.3 The Uni-Queue shall be designed in such a manner that it will not impede the flow of customers around the ticket hall.

3.4.7.4 Where installed, a Uni-Queue shall be no less than 1.2 metres wide along the walkways, and no less than 1.8 metres wide along the face of the Ticket Vending Machines. At the turning circle, there should be a minimum width of 1.5 metres across the angle of the corner.

Note: For the Uni-Queue barrier design refer to S1132 'Premises – Barriers and Fencing'.

3.5 Gateline and other ticketing validation equipment

3.5.1 All stations shall have a gateline. The purpose of gateline is to enable revenue collection/protection as well as assisting in the management of customer flows.

3.5.2 The formula shall initially be used twice, once to calculate the number of gates needed in the AM peak and then again to calculate the number of gates required in the PM peak.

3.5.3 If a station has a high level of usage (i.e. tourist, shopping, etc.) then the busiest period of gateline activity may be found to be outside the AM and PM weekday peak times, in which case a third calculation for the number of gates will be required.

3.5.4 The highest figure from all these calculations shall then be used as the required number of gates.

3.5.5 The formula for the total number of gates is as follow:

$$\text{Roundup}\left(\frac{\text{5min Entry Flow}}{25 \times 5}\right) + \text{roundup}\left(\frac{\text{Total Number of Exiting Customers}}{25 \times 2}\right) + X$$

3.5.6 The calculations for the entry and exit flows shall be from the same period of gateline demand (all station users except interchangers) using forecasted flows. Contact Transport Modelling Team for guidance.

3.5.7 The inputs for the gateline formula are:

a) The peak 5 min entry flow into the station (converting from 15 minute entry flow if appropriate, see section 3.3).

b) Total Number of Exiting Customers; this is the sum of all customers exiting the station from each train service. The formula assumes all trains arrive concurrently and all exiting customers must now pass through the gateline in 2 minutes.

Note:	It is important that before combining the Number of Exiting Customers from each of the train services, the train service that contributes the highest number of exiting customers has its contribution increased by 25% (this is to allow for a gap in service).

c) X = 1 if total (without X) is less than or equal to 10 gates, or X = 2 if total (without X) is more than 10 gates.

3.5.8 The Number of Exiting Customers shall, where possible, be extracted from individual train alighting load survey data for each train service or, if this is not available, calculated using the following formula applied to each train service.

$$\text{Number of exiting customers} = \left(\frac{\text{Peak 15 min alighters} - \text{Peak 15 min interchangers}}{15} \right) \times \text{Train service headway}$$

Where:

a) Train Service Headway is the time in minutes between trains in the peak hour in the period being considered;

b) For different train services that share one or more platforms, (e.g. Circle and District at St. James's Park) a combined Train Service Headway shall be used;

c) the maximum Number of Exiting Customers exiting the station from a single train shall be the 'practical crush capacity' for the train stock type on the line;

d) The Total Number of Exiting Customers shall be the sum of all the Number of Exiting Customers for each train service (including the rule that the highest Number of Exiting Customers from all of the individual train services shall be increased by 25%).

3.5.9 The minimum number of gates in each ticket hall shall be three.

3.5.10 A number of wide aisle gates shall be provided according to the size of the gateline:

Size of gateline	Minimum wide aisle gates required		
Up to 6 gates[1]	1	Up to 12 gates	2
Up to 18 gates	3	More than 18 gates	4
[1] Uni-directional gatelines only			

Table 3: Gate Numbers

3.5.11 A bi-directional gateline shall always have at least two wide aisle gates.

3.5.12 The gateline formula assumes that both the entry and exit capacity of a gate is 25 customers per minute. A wide aisle gate in uni-directional mode also has a capacity of 25 customers per minute, so can be included in any gateline calculations.

3.5.13 Where a single wide aisle gate is installed and used in bi-directional or First Come First Served mode the throughput of the gate is 7 customers per minute and hence cannot be used to make up the number of gates in any gateline calculations.

3.5.14 Gatelines shall be sited so that all gates are readily accessible to customers moving in an expected manner through the ticket hall. The width of a gateline shall be determined as follows:

Gateline width = **(**Number of automatic gates x walkway width + (no. of gates + 1) X stanchion width + gateline equipment (as required from table below)**)**

3.5.15 Entry or exit gate shall be grouped to one side of the gateline (i.e. they shall not alternate between entry and exit)

3.5.16 Gate Dimensions are as follows:

Automatic gate type	Walkway width, mm	Stanchion width, mm
Pneumatic	620	267
Electric (Mk. 1 and Mk. 2)	620	155
Wide aisle	1080	155

Table 4: Gate widths

3.5.17 Where wide aisle gates are installed, there shall be no requirement for manual gates to be installed.

3.5.18 Where no wide aisle gate is fitted and where large pieces of equipment (such as parts for escalators or lifts etc.) will be required to pass through the gateline, the combined manual/equipment gate shall be required at stations. At other stations where no wide aisle gate is installed, the single leaf manual gate shall be used.

3.5.19 Smart card readers/Oyster Validators located in ticket halls should not be placed in areas that will impeded customer flows.

3.5.20 Customer Information zone

3.5.20.1 Adequate space shall be provided for a consolidated area of wall-mounted customer with a surrounding exclusion zone of at least 1m.

3.5.20.2 Content within the customer information zone shall be in accordance with LU standard S1311 'Customer information – stations'.

3.6 Routeways and vertical circulation

3.6.1 General

3.6.1.1 Routeways shall be arranged to minimise walking distances and to make the wayfinding through the station as obvious as possible.

3.6.1.2 Where stairways are located in passageways, the passageway shall be the same width as the stairways.

3.6.1.3 Where routeways exceed 50m in length, recessed rest areas with seating shall be provided at appropriate locations.

3.6.1.4 Rest areas shall not protrude into routeways, but shall avoid providing a recess or hiding place by a gradual widening to provide sufficient space for seating to be installed without disturbing customer flows.

3.6.1.5 The means for providing changes in level shall be as follows:

Height of change in level	Means
Less than 2m	Ramp
0.5m to 3m	Stairway (Minimum of three risers)
3m to 5m	Stairway or escalator if benefits are justifiable
Over 5m	Escalator

Table 5: Appropriate change in level solutions

3.6.1.6 Lifts may be considered as a means of vertical transportation where severe local constraints justify their use.

3.6.1.7 The 5m rise limit is cumulative and stairways shall not be separated for the sole purpose of avoiding installing escalators.

3.6.1.8 New stations shall include at least one step-free access route between the street and the concourse (unpaid side) and at least one step-free route between the paid side of the concourse and the platforms.

3.6.1.9 No single escalator, moving walkway or lift shall provide the sole means of access or egress from any part of the station.

3.6.1.10 When calculating capacity in routeways with square walls, 0.3m 'edge effects' shall be added to each wall, except where noted in 3.6.3.1 and 3.7.5.1.

3.6.1.11 Equipment installed on squareworks walls in routeways and platforms shall not protrude into busy public areas by more than 100mm between a height of 300mm and 2.1m above floor level.

3.6.1.12 Equipment installed on circular cross-section walls in routeways and platforms shall not protrude into the area above the flat floor level of the routeway or platform

3.6.1.13 Convex mirrors shall be installed where a safety risk is identified such as blind corners, recesses and other obstructions which may represent the possibility of injury due to collision.

3.6.2 Passageways

3.6.2.1 Two-way passageway width shall be determined as follows:

$$\text{Two-way passageway width} \left(\frac{\text{Average flow per minute}}{40} + (2 \times 0.3) \right) \text{m}$$

where the average flow per minute is specified in section 3.3.1

3.6.2.2 One-way passageway width shall be determined as follows:

$$\text{One-way passageway width} \left(\frac{\text{Average flow per minute}}{50} + (2 \times 0.3) \right) \text{m}$$

where the average flow per minute is specified in section 3.3.1

3.6.2.3 Central barriers shall be installed to separate opposing customer flows where significant bi-directional movement occurs in passageways.

3.6.2.4 Central barriers, where installed, shall have regular breaks.

3.6.2.5 Where central barriers are provided in passageways to divide customer flows, 0.3m shall be added to the passageway width.

3.6.2.6 The minimum width either side of the passageways central barrier shall be 1.7m between barrier and wall finishes. Therefore the minimum passageway width shall be 3.7m, i.e. (2 x 1.7m) + 0.3m.

3.6.2.7 The minimum width for any passageway including evacuation and emergency exit routes shall be 2m between finishes.

3.6.2.8 The width of a passageway between junctions shall be constant for its entire length and to minimum headroom height (with the exception of circular cross-section passageways, as detailed below).

3.6.3 Circular cross-section passageways

3.6.3.1 Circular cross-section passageways shall satisfy the following requirements;

a) The width of the floor shall be no less than the calculated passageway width, but without adding the sidewall 'edge effects'.

b) The internal diameter of the passageway (i.e. with finishes applied) shall be no less than the calculated passageway width with the sidewall 'edge effects' included. This requirement and that above do not allow any local reductions to width, for example by advertising panels that 'square-off' a circular cross-section passageway.

3.6.4 Intermediate concourses

3.6.4.1 Intermediate concourses within a station shall be constructed at the intersection of more than two means of access.

3.6.4.2 The required area for an intermediate concourse shall comprise the following:

a) Run-off areas (See section 3.8).

note: run-offs from adjacent means of access shall not overlap.

b) An area of 2m2 in front of any line diagram.

3.6.4.3 Intermediate concourses shall be of a consistent width along their entire length.

3.6.5 Moving walkways

3.6.5.1 Passageways exceeding 75m in length shall have a moving walkway installed.

3.6.5.2 The minimum length of a moving walkway shall be 50m and the maximum shall be 100m. Longer passageways shall have a series of two or more moving walkways.

3.6.5.3 The following shall be taken into account when designing moving walkways:

a) Moving walkway capacity = 100 customers per minute per metre width of treadway (based on a linear speed of 0.75m per second)

b) The width of treadway shall not be less than 1.2m, or 1.4m where luggage trolleys are permitted

c) Run-offs shall be provided at both ends of all moving walkways (see section 3.8).

3.6.5.4 A conventional passageway beside the moving walkway shall be provided. For passageways with one moving walkway only, the width of the conventional passageway shall be as defined for two-way flows in 3.6.5.1-3 above.

3.6.5.5 For passageways with two or more parallel moving walkways, the conventional passageway shall be as defined for a one-way flow in 3.6.5.1-3 above.

3.6.6 Stairways

3.6.6.1 All stairways shall comply with LU standard S1133 'Premises – Stairways and ramps'.

3.6.6.2 One-way stairway width shall be determined as follows:

$$\text{One-way stairway width} = \left(\frac{\text{Average flow per minute}}{35} \right) \text{ m}$$

where the average flow per minute is specified in section (reference section)

3.6.6.3 Two-way stairway width shall be determined as follows:

$$\text{Two-way stairway width} = \left(\frac{\text{Average flow per minute}}{28} \right) \text{ m}$$

where the average flow per minute is specified in section (reference section)

Note: All dimensions are measured between handrails.

3.6.6.4 If the stairway has one or more intermediate handrails, 0.3m shall be added to the overall width for each central handrail. Where stairway width is constrained in existing stations, 0.05m may be used.

3.6.6.5 For planning purposes, the minimum widths for stairways shall be as follows:

a) A one-way stairway shall be 2.0m, not including handrails.

b) A two-way stairway shall be 2.4m, not including handrails.

c) Between all handrails shall be minimum 1.5m, and a maximum 2.0m.

d) Where stairways of between 2.0m and 3.0m width are required, the 2.0m maximum between handrails shall always take precedence over the 1.5m minimum.

Note:	For example a 2.8m staircase would be split 1.4m / 1.4m (less whatever is allowed for the central handrail width).

3.6.6.6 As an exception to the requirements in 3.6.6.5, where a single stairway is required to be installed in between a bank of only two escalators, they shall be of 1.0m minimum width (between the handrails) for the full rise of those escalators.

3.6.7 Ramps

3.6.7.1 All ramps shall comply with LU standard S1133 'Premises – Stairways and Ramps'.

3.6.7.2 The width shall be calculated in the same way as that for a passageway unless the gradient is steeper than 1 in 20. In this case a 10% reduction in the flow rate shall be assumed.

3.6.8 Escalators

3.6.8.1 The number of escalators required for any one direction is as follows:

$$\text{Number of escalators} = \left(\frac{\text{Average one-way flow per minute}}{100} \right) \text{m}$$

where average flow per minute is specified in clause 3.3.1 and based on escalator capacity of 100 customers per minute.

3.6.8.2 The calculated number of escalators shall be rounded up to the next whole number if the first number after the decimal point is equal to or more than 0.2, and rounded down otherwise; e.g. 2.2 escalators would be rounded up to 3 and 2.1 escalators would be rounded down to 2.

3.6.8.3 Escalator shafts shall be constructed to be capable of accommodating a minimum of three escalators even if fewer than that number are initially installed.

3.6.8.4 Where one bank of escalators is provided as the sole primary means of vertical transportation and only two escalators are planned to be installed, a stairway shall be installed centrally between the two escalators, as defined in S1092 (also see section 3.6.6.6).

3.6.8.5 Where four or more escalators are planned for the same route, they may be installed in two separate adjacent banks without the need for a central staircase.

3.6.8.6 Escalator machine chambers shall be accessed by maintenance stairs from within the station and in the vicinity of the escalators themselves. Access to the chambers shall not cause a hazard to customers and doors shall open inwards.

3.6.9 Lifts

3.6.9.1 Whether planned as the main method of vertical circulation, or as a step-free access route, they shall be installed for the benefit of all customers.

3.6.9.2 In new and substantially altered existing stations the use of transverse or inclined lifts as a means of vertical transit shall be considered.

Note:	For works affecting lift availability refer to Rule Book 11

3.6.9.3 For lifts that provide the Primary Means of Vertical Transportation, the effective capacity of the lift shall be assumed to be 4 customers / m2, based on the internal dimensions to the handrail.

3.6.9.4 For lifts that provide the Secondary Means of Vertical Transportation, the effective capacity of the lift shall be assumed to be 1 customer / m2, based on the internal dimensions to the handrail.

3.6.9.5 Lift capacity shall be calculated as follows:

$$\left(\frac{\text{Peak minute passengers using lifts} \times \text{lift cycle times (minutes)}}{\text{Capacity of lift(s)}} \right) = \text{Number of lifts}$$

where 'Peak minute customers using lifts' is derived from the peak minute flow in the peak direction along the link served by the lift, multiplied by the proportion of people expected to use the lift – the number of lifts shall always be rounded up.

Note:	The proportion of PRMs likely to use the lifts varies significantly by type of station and throughput. Full guidance can be found in the Legion Modelling Best Practice Guide

3.6.9.6 Lift waiting areas shall be provided in front of lift doors, calculated for each customer according to the type of lift, as defined below:

PMVT through lifts	$0.45m^2$
PMVT non-through lifts	$0.69m^2$
SMVT through lifts	$0.69m^2$
SMVT non-through lifts	$0.93m^2$

Table 6: Lift waiting area dimensions

3.6.9.7 Where, due to the existing infrastructure of a station, the lift capacity does not match the demand for the lifts, then the lift waiting areas shall be correspondingly enlarged to ensure that sufficient waiting capacity is available.

Note:	Where lifts serve more than two levels, it will not be possible for it to be a fully through lift at every level. Capacity should be calculated according to the predominant flows and demand at each level, and an appropriate decision made as to which measure of waiting area is used.

3.6.9.8 In addition to the calculated lift waiting area, non-through SMVT lifts shall have a 1,500mm turning circle immediately in front of the lift doors.

3.6.9.9 Lift waiting areas located in concourses or circulating areas shall be bordered by barriers to protect vulnerable customers, and to ensure adjacent customer flows are not hindered.

3.6.9.10 Lift waiting areas shall be provided with seating either within or in the vicinity of the lift waiting area.

3.6.9.11 Where lifts are located on surface station platforms, they shall have a sheltered waiting area no smaller than the calculated lift waiting area immediately in front of the lift door.

3.6.9.12 Where lifts discharge directly towards a platform edge and the doors are closer than 5m from the platform edge, a barrier shall be provided between the lift and the platform edge which is not less than 3m from the platform edge.

3.7 Platforms

3.7.1 Platform length

3.7.1.1 Platforms lengths at stations that are exclusively used by LU trains shall be at least 3m longer than the longest current or proposed train stock type booked to stop at that platform.

3.7.1.2 Platform lengths at stations where TOC trains share the same platforms as LU trains shall be at least 5m longer than the longest train booked to stop at that platform.

3.7.1.3 Stations with terminus (dead-end) platforms shall be at least 7m longer than the longest train booked to stop at that platform.

3.7.2 Platform width – General principles

3.7.2.1 The width of a platform shall be the same along its entire length except in the following circumstances:

a) to accommodate equipment rooms or staff accommodation which is impossible to locate elsewhere in the station;

b) for essential structural reasons;

c) to accommodate track geometry;

d) during temporary works. Refer to table 10.

3.7.2.2 Any variation in platform width shall be subject to the following conditions:

a) width reductions shall be at the less busy parts of the platform as defined below for variable platform width;

b) all parts of the platform shall be visible from all of the platform entrance and exit points.

3.7.2.3 Equipment lockers, seats and commercial revenue equipment shall not be installed within 5m of platform entrance or exits and only within :

a) Side platforms: 0.5m of the platform wall

b) Island platforms: 0.5m of the platform centre line.

3.7.2.4 Posts and columns shall only be installed within:

a) Side platforms: 0.5m of the platform wall

b) Island platforms: 0.5m of the platform centre line.

3.7.2.5 Increased platform width shall be provided if installed equipment is over 0.5m deep.

3.7.3 New platforms

3.7.3.1 The following minimum widths shall apply:

a) Side platforms: 3m (from platform nosing to wall finish at floor level).

b) Island platforms: 6m (between platform nosings).

3.7.4 Existing platforms

3.7.4.1 When new or altered assets are proposed to existing stations and compliance with platform requirements for new stations (insert no. for new stations clause above) cannot be met without major rebuilding/alterations to the existing building structure, then the platform width shall be optimised and shall comply with the following:

a) Deep tube – not less than 3m

b) Surface and sub-surface – not less than 2.5m

c) Temporary installations for less than 6 months duration – not less than 2m. They shall not be located within 5m of platform entrances or exits.

Note: Temporary installations on designated step free platforms shall comply with a) or b).

Note: For existing island platforms, a), b) and c) applies to each side of the platform.

3.7.5 Uniform platform width

3.7.5.1 It is assumed that customers are distributed along a platform such that 35% of a platform load occupies 25% of the platform at the busiest section. The platform is sized to give these customers 0.93m2 per customer with 2 x 0.5m (1m) added for edge effects.

3.7.5.2 The formula for the width of a platform along its entire length is as follows:

$$\text{Platform Width} = \left(\frac{\text{Platform per headway} \times P \times 0.93\text{m}^2}{\text{Platform length} \times 0.25} \right) + 1\text{m}$$

where P = the proportion of the platform load; in this case 0.35, and

Where the platform load per headway shall be determined from the following steps:

a) Peak 3 hour platform load = Peak 3 hour entry flow to platform + Peak 3 hour exit flow to platform;

b) Peak 15 min platform load can be derived from (a) using Table 2;

c) Average platform load per minute can be derived from (b) using formula in 3.3.1;

d) Train service headway = 60 / No. of trains per hour;

e) Platform load per headway = (c) x (d).

3.7.6 Variable platform width

3.7.6.1 It is assumed that customers are distributed along a platform such that 35% of a platform load occupies 25% of the platform at the busiest section. It is also assumed that 30% of a platform load occupies the second busiest 25% of the platform, 22.5% of a platform load occupies the third busiest 25% of the platform and 12.5% of a platform load occupies the final 25% of the platform.

3.7.6.2 The busiest quarters of the platform will be located either side of the busiest entrances or exits whilst the least busy quarters will be distributed progressively away from the entrances or exits. Each quarter shall be split into eighths, by dividing by two, as appropriate.

3.7.6.3 The calculation for platform width for each quarter of the platform shall be determined from the formula given for uniform platform width above, where P = 0.35, 0.30, 0.225 and 0.125 for each of the quarters respectively.

3.7.6.4 The location of rooms at platform level shall start at the ends of platforms except that, if an entrance or exit is at one end of the platform, the width shall not be reduced at that end.

3.7.7 Island platforms

3.7.7.1 Island platform widths shall be calculated by treating them as two separate platforms and adding the two widths together.

3.7.8 Alignment of escalators and stairways with platform edges

3.7.8.1 Stairways and escalators feeding directly onto a platform shall be aligned along the length of the platform, i.e. parallel with the tracks.

3.7.9 Entry or exits from platforms

3.7.9.1 Two-way platform entry or exit widths shall be determined as follows:

$$\text{Two-way platform entry or exit width} = \left(\frac{\text{Average platform load per minute}}{40} + (2 \times 0.3) \right) \text{m}$$

3.7.9.2 One-Way platform entry widths shall be determined as follows:

$$\text{One-way platform entry width} = \left(\frac{\text{Average boarding load per minute}}{50} + (2 \times 0.3) \right) \text{m}$$

3.7.9.3 One-Way platform exit widths shall be determined as follows:

$$\text{One-way platform exit width} = \left(\frac{\text{Average alighting load per minute}}{50} + (2 \times 0.3) \right) \text{m}$$

3.7.9.4 The average platform load per minute shall be as calculated in 3.7.5.2.

3.7.9.5 The average boarding load per minute shall be derived in the same way as the average platform load, except that only the flow to the platform shall be used (as above).

3.7.9.6 Similarly, for the average alighting load per minute, only the flow from the platform shall be used.

3.7.9.7 If the total capacity required is to be provided by more than one platform entry/exit then the 'edge effect' of 0.3m per sidewall shall be included for each platform entry/exit (e.g. one exit of 4.6m is equivalent to two exits of 2.6m each).

3.7.9.8 The greater of the capacities required for normal operations or for emergency evacuation shall be provided (see also S1080 'The application of fire safety engineering principles to TfL premises').

3.7.9.9 The minimum width of a platform entry, exit or cross-passageway shall be 2.0m.

3.7.9.10 To encourage balanced loading within trains, the location of each entrance and exit relative to the train shall be varied from one station to the next and not favour one particular end of a train.

3.7.9.11 Separate entrances and exits shall be provided and arranged to facilitate even loading and rapid exit of the platforms, with minimum congestion and to minimise conflicts between customer flows.

3.7.9.12 For platforms with more than one entrance and exit, these shall be distributed along the platforms as evenly as possible.

3.7.9.13 Customers moving from one part of the station to another shall not be routed along any platforms as part of the interchange route.

3.8 Run-offs

3.8.1 The following minimum lengths shall apply across the maximum width of the run-off types for one-way flows:

Run-off type	Minimum run-off length (for variable lengths (see 3.8.6)
One way *(Note: for one-way flow the direction is from the first to the second item)*	
Escalator-Gateline (2)	8m – 12m
Gateline-Escalator (when the ratio of the number of gates to each escalator is less than or equal to 4) (1)	6m
Gateline-Escalator (when the ratio of the number of gates to each escalator is more than 4) (1)	8m – 12m
Gateline-Moving walkway (when the ratio of the number of gates to each Moving walkway is less than or equal to 4) (1)	6m
Gateline-Moving walkway (when the ratio of the number of gates to each Moving walkway is more than 4) (1)	8m – 12m
Moving walkway-Gateline	8m – 12m

Table 7: Minimum run-off lengths

Note: Note that the capacity in normal circulation of both an escalator and a moving walk is 100 customers per minute and the capacity of a gate is 25 customers per minute.

Note: Pan-TfL escalators shall have an additional 2m added to their minimum run-off.

3.8.2 The following minimum lengths shall apply across the maximum width of the run-off types for two-way flows:

Run-off type for Two-Way flows	Minimum run-off length (For variable lengths see 3.8.6)
Escalator-Escalator (2)	8m – 12m
Escalator-Passageway (2)	6m
Escalator-Concourse or Circulating area (2)	6m
Escalator-Stairway (2)	6m – 10m
Escalator-Platform (2) (3)	6m
Escalator-Street (2)	6m
Gateline-Passageway	4m
Gateline-Platform (3)	4m

Gateline-Entrance Matwell	4m
Gateline-Street	6m
Moving walkway-Escalator (2)	8m – 12m
Moving walkway-Passageway	6m
Moving walkway-Concourse or Circulating area	6m
Moving walkway-Moving walkway	8m – 12m
Moving walkway-Stairway	6m – 10m
Moving walkway-Entrance Matwell	4m
Moving walkway-Street	6m
Stairway-Gateline	6m – 10m
Stairway-Passageway	4m
Stairway-Concourse or Circulating area	4m
Stairway-Platform (3)	4m
Stairway-Entrance Matwell	2m
Stairway-Street	4m

Table 8: Run-off lengths

Note: Pan-TfL escalators shall have an additional 2m added to their minimum run-off.

Note: The run-offs from escalators, stairways and gatelines onto a platform shall be in addition to the platform width.

3.8.3 Run-offs shall be before any change in direction, decision point or reduction in width.

3.8.4 Gatelines shall never be on platforms.

3.8.5 Run-off dimensions for escalators and moving walkways are measured from the equipment 'combs'.

3.8.6 The variable lengths of run-off shall depend upon the level of customers flows as follows:

a) for 'light flow' the minimum run-off length shown above shall apply;

b) for 'medium flow' the run-off length shall be:

$$\text{Run-Off Length} = \left(\text{Minimum Run-Off} + \left(\frac{\text{Peak hour flow} - 1000}{500} \right) \right) \text{m}$$

where the minimum run-off is the lower of the lengths given in the table above;

c) for 'heavy flow' the maximum run-off length shown above shall apply, where:

Light flow	= the maximum peak hour entry or exit flow, for the relevant station area, across the whole traffic day is less than 1000 passengers
Medium flow	= the maximum peak hour entry or exit flow, for the relevant station area, across the whole traffic day is between 1000 and 3000 passengers
Heavy flow	= the maximum peak hour entry or exit flow, for the relevant station area, across the whole traffic day is greater than 3000 passengers

Table 9: Maximum peak flows

3.8.7 The width of a run-off shall be consistent along its entire length.

3.9 Headroom

3.9.1 Headroom in public areas (other than platforms)

Note:	This includes ticket halls, concourses, passageways, stairways, moving walkways, escalators.

3.9.2 New public areas (other than platforms)

3.9.2.1 The headroom in public areas (other than platforms) shall not be less than 3m.

3.9.2.2 Localised lower headroom for beam soffits, CMS installations, signage, CCTV cameras etc. shall be no less than 2.4m.

3.9.2.3 For escalators and moving walkways installed in atriums, headroom shall be as per other public areas. For escalators in shafts, the headroom shall not be less than 2.3m.

3.9.3 Existing public areas (other than platforms)

3.9.3.1 When new or altered assets are proposed to existing public areas (other than platforms)and compliance with headroom requirements for new public areas (other than platforms) (see 3.9.2) cannot be met without major rebuilding/alterations to the existing building structure, then the headroom shall be optimised and shall comply with the following:

a) not less than 2.3m for areas of ceiling, beam soffits, CMS installations;

b) not less than 2.1m for fixtures such as signage, CCTV cameras, or information displays.

3.9.4 Headroom on platforms

3.9.4.1 **New platforms**

The headroom above a platform shall not be less than 2.5m when measured to the lowest point of suspended signage or equipment.

3.9.4.2 **Existing platforms**

When new or altered assets are proposed to existing platforms and compliance with headroom requirements for new platforms (see 3.9.4.1) cannot be met without major

rebuilding/alterations to the existing building structure, then the headroom shall be optimised and shall comply with the following:

a) not less than 2.3m for the full width of the platform

And

b) not less than 2.1m for fixtures such as signage, CCTV cameras, or information displays at distances greater than 2m from the platform edge.

3.10 Special events, construction and temporary works

3.10.1 When existing stations are being upgraded, modernised or refurbished, the associated construction works will generally require hoardings that will compromise the dimensions of routeways. The table below defines acceptable levels of service under these circumstances .

Station area	Guidance for Special events up to 3 days			Guidance for Special events over 3 days		Guidance for Temporary work		Minimum widths – Temporary work
	LoS	LoS	Quantitative measure	LoS	Quantitative measure	LoS	Quantitative measure	
Open concourses	B	D	0.45 m^2 per person	C	0.8 m^2 per person	C	0.8 m^2 per person	
Queuing for ticket hall facilities	C	E	0.28 m^2 per person	D	0.45 m^2 per person	D	0.45 m^2 per person	
Passageways								
- one-way	D	E	80 pax/m/mw	D	65 pax/m/mw	D	65 pax/m/mw	**1.4m** without Step-free Access **and** **1.9m** with Step-free Access.
- two-way	C	E	65 pax/m/mw	D	50 pax/m/mw	D	pax/m/mw	1.9m
Stairways								
- one-way	D	E	43 pax/m/mw	E	43 pax/m/mw	E	43 pax/m/mw	1.2m
- two-way	C	E	43 pax/m/mw	D	35 pax/m/mw	D	35 pax/m/mw	2.0m
Escalators			120 pax per minute	D	110 pax per minute		110 pax per minute	
Platforms	C	E	0.28 m^2 per person	D	0.45 m^2 per person	D	0.45 m^2 per person	
Note: pax/m/mw = customers per minute per metre width								

Table 10: Levels of Service for temporary works and special events

3.10.2 For temporary works not in place for more than six months and where it is impossible to comply with the spatial requirements of this standard as a consequence of installing the temporary works, then the dimensions shall be optimised and shall comply with the minimum widths in the table above.

3.11 Other public facilities

3.11.1 Public toilets

3.11.1.1 Public toilet facilities shall be provided at all new stations, and when major building or modernisation works are carried out at existing stations.

3.11.1.2 Toilets being installed at stations which are step-free between the street and the platform should include at least one toilet suitable for wheelchair users. This should be unisex, with an entrance separate to the male and female toilets.

3.11.2.3 Toilets should be located on the paid side of the gateline, in the ticket hall area if possible. Where this is not possible, toilets should be in busy areas which have good natural surveillance. This will allow toilets to be monitored.

3.11.2 Litter receptacles

3.11.2.1 Litter receptacles, to the design approved by LU, shall be sited in stations subject to the gaining of appropriate safety and security approvals and provided that they do not interfere with customer flows, run-offs etc., as specified throughout this standard.

3.11.3 Exclusion zone for sensitive items

3.11.3.1 A total exclusion zone of 1200mm (from the outer edge) shall be applied to all memorials, plaques and heritage features (including Labyrinth artworks).

3.11.4 Advertising and sponsorship

3.11.4.1 Commercial Development should be contacted for all advertising & sponsorship.

3.11.5 Automated Telling Machines (ATMs)

3.11.5.1 If ATM are provided, to space to be provided for the queue shall be 4m, which shall not conflict with customer flows, ticket purchasing or staff going about their duties.

Note:	Car parks are managed and maintained by an external contractor.

4 Responsibilities

This standard is owned by the Customer Experience Lead.

The technical content management for all clauses in the standard is shared between the Customer Experience Lead and the Principal Engineering Lead for Built Environment, who are both responsible for the standard content.

5 General considerations

There are requirements laid down by the Office of Rail and Road, and this standard is LU's response to these requirements.

Good station planning is necessary to provide safe, comfortable and efficient conditions for passengers making their journeys and for staff operating stations.

Careful attention to the spatial design of stations will minimise the risks of accidents and congestion and will speed evacuation in the event of an emergency.

All works shall follow the principles of the LU Station Design Idiom which contains additional information about the requirements of design insofar as they relate to this standard.

Space planning, as defined in this standard, is based upon passenger density and the concept of 'levels of service' (see research by John J. Fruin Ph.D.).

The methods within this standard will produce sufficient space to allow free flow of customers through public areas and to give reasonable comfort in waiting areas.

5.1 Safety considerations

The design of a station (as well as the facilities contained therein) and all the materials and construction methods used in building it must comply with all statutory and LU standards, regulations and processes relating to safety. This will particularly include those relating to Fire safety.

LU will need assurance, via specified processes, that this is the case.

Where the refurbishment or modernisation is part of a larger project to construct and deliver a new or rebuilt station, the processes of ensuring and assuring that the station is fully safety compliant shall be integrated with and equal to those in place to ensure the entire project is safety compliant.

5.2 Environmental considerations

The construction of a station (and all facilities contained therein) and all the materials and methods used in building it must comply with all statutory and LU standards, regulations and processes relating to the environment and environmental protection.

This will include compliance with all requirements relating to any listed building, conservation or heritage status that apply to the station or the area around it.

LU shall require assurance, via specified processes, that this is the case.

5.3 Customer considerations

Stations shall be designed and built to maximise the benefits to LU's customers by providing adequate and compliant facilities to enhance the customer experience.

Stations shall be designed in accordance with the requirements of equality legislation, whilst not compromising the needs of staff for which these facilities are part of their workplace.

5.4 Security considerations

Stations shall be designed and built with consideration to the requirements of the Department for Transport document Security in Design of Stations (SIDOS) Guide.

5.5 Other information

Failure to apply the criteria set down in this standard is likely to result in poorly planned and congested stations. This is likely to cause passenger distress and the need for temporary station closures and other control measures.

6 Person accountable for this document

Name	Job title
[redacted]	Customer Experience Lead

7 Abbreviations

Abbreviation	Meaning
ATMs	Automated Telling Machines
ATG	Automatic Ticket Gate
AFMs	Advanced Fare Machines
CMS	Cable Management System
LoS	Levels of Service
QBMs	Queue Buster Machine
RODS	Rolling Origin and Destination Survey
SIDOS	Security in Design of Stations
TVMs	Ticket Vending Machines

8 References

Document no.	Title or URL
S1080	The application of fire safety engineering principles to TfL premises
S1092	Escalators & Passenger Conveyors
S1131	Premises – Station platforms
S1132	Premises – Barriers and Fencing (Non Lineside)
S1133	Premises – Stairways and ramps
S1134	Premises – Doorsets and Glazing
S1135	Premises – finishes
S1311	Customer information - stations
S1372	Station Staff Accommodation
S1351	Station Design
S1375	Planning for Ticket issuing Facilities
5-461	Security Standard
G371A	Station Planning Standards and Guidelines
BS 8300-1&2	Design of an accessible and inclusive built environment
SIDOS	Dept for Transport Security in Design of Stations Guide
Rule Book 9	Lifts, escalators and moving walkways

9 Document history

Issue no.	Date	Changes	Author
2-03001-024 A1	April 2005	Issued	LU S&SD
1-371 A2	December 2006	Section 1 changed and sections 3.5.2, 3.10.5.3, 3.11.2.4 and 3.11.7.3 added via PSC S1-01060. Standard renumbered.	LU SQE
1-371 A3	August 2009	Proposed changes to 1.2, 3.3.2, 3.7, 3.10, 3.11.3.3, 3.13, 3.14, 6.1.1, 6.2 and 6.5. Additional changes made to reflect comments on PSC M1-01239	LU S&SD
1-371 A4	November 2010	Put into new Standards template and changes made in accordance with DRACCT Log No 00049 and 00050: New clause 1.3 added; Sentence added to clause 3.13.1; Sentence removed from Note following clause 3.13.3.3; Sentence added to clause 3.14.1.1; Clause 3.14.2.4 removed; New clause 4.3 added; Brought into line with new organisation.	Lynne Holland
S1371 A5	June 2011	Renumbered and as per DRACCT 00398 this Standard was updated in line with recent changes to legislation, changes in customer behaviour and changes in best practice. Also, other minor changes made are intended to improve the clarity of the Standard and remove ambiguity	Christopher Wroe
S1371 A6	September 2016	As per DRACCT 03242, this Standard was updated in line with recent changes to legislation, customer behaviour and best practice, and company policy following the Fit-for-the-Future (Stations) project, and its effects on the LU staffing model. Finally, other numerous minor changes have been made to improve the clarity of the Standard and remove any ambiguity.	Nick McDermott
S1371 A7	February 2019	Significant change where several clauses that apply to other topics have been removed from S1371 and incorporated into other standards so this standard primarily focuses on station capacity planning as per change No. CR-11144. 1. Creation of a new Staff Accommodation standard S1372 with all	Jon Exley

		related content taken from S1371. 2. LU-WN-01589 Written notice pertaining to S1080 – for Evacuation 3. LU-WN-01590 Written notice pertaining to S1093 for - for Lifts Engineering Barriers 4. LU-WN-01591 Written notice pertaining to S1095 – for Lifts – Engineering Barriers 5. LU-WN-01592 Written notice pertaining to S1132 – for Uni-Queue barrier design 6. LU-WN-01593 Written notice pertaining to S1375 – for Ticket Issuing Arrangements.	