

# Planning and designing for safer escalator use at stations



*Asset Management Services Guidance*

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**Document Identity**

<p>Planning and designing for safer escalator use at stations</p>
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## 1 Introduction

Escalators are a long-established and universally used mechanical means of changing level which have been incorporated into railway stations since the 1920s and their application continues to expand with each new station development proposal.

The fact that escalators have on the whole been substantially invariable in their general form throughout their history suggests that they are considered to be a reasonable, acceptable and optimum design solution for the function they perform.

However, escalators do not provide a 'step free' solution in respect of Persons of Reduced Mobility (PRMs) and lifts or ramps shall also be provided.

Steps shall also be provided as an alternative means of escape.

While escalators provide great benefits, they do also present potential hazards, as reflected in the record of passenger accidents at stations.

## 2 Purpose

The purpose of this guidance note is to provide practical design recommendations to ensure that the planning and design of the installation of escalations is optimised from a safe operations and passenger convenience perspective.

### Areas of Use – Application

This document has been produced by Network Rail Asset Management Services to provide design teams and premises managers with practical advice for the planning and management of escalators including highlighting the dangers associated with escalator use that need design attention.

## 3 Scope

This guidance is applicable to all new construction, refurbishment, renewal, maintenance and enhancement projects across all Network Rail owned operational assets, regardless of scheme funding and delivery stream.

This includes all Managed and Franchised stations.

The guidance only relates to the planning and design parameters related to escalator installation within a station environment and not the design of the escalator itself.

## 4 References

### Legislation:

DfT Code of Practice

*Accessible Train and Station Design for Disabled People – Section V*

*The Building Regulations 2010*

*Regulatory Reform (Fire Safety) Order 2005*

*The Fire (Scotland) Act 2005*

*Technical Specification for Interoperability : Accessibility for Persons with Reduced Mobility*

*Section 4.1.2.17 – Ramps, Escalators, Lifts, Travelators*

*Health and Safety (Safety Signs and Signals) Regulations 1996*

### **Group Standards**

*RIS-7700-INS*

*Rail Industry Standard for Station Infrastructure*

*RIS-7702-INS*

*Lighting at Stations.*

*GI/GN7515*

*Railway Group Guidance Note : Guidance on Automatic Ticket Gates at Stations*

### **British Standards**

*BS EN 115*

*Safety of escalators and moving walks*

*BS 8300*

*Design of buildings and their approaches to meet the needs of disabled people. Code of practice*

*BS EN 7010:2012*

*Graphical Symbols, Safety Colours and Safety Signs, Registered Safety Signs*

### **NR Standards**

*NR/L2/INI/CP0047*

*Application of the Construction Design and Management Regulations to Network Rail Construction Works (?)*

*NR/SP/ELP/40067*

*The installation and upgrading of Escalators and Passenger Conveyors*

### **Other Standards**

*HSE / Safety Assessment Federation*

*Guidelines for the safe operation of escalators and moving walkways*

## **5 Roles and responsibilities**

The following roles have been identified with specific reference to compliance with this document who should aim to incorporate its content

within their design, construction and operational management practices. However, the list is not exhaustive and this document should be passed to project team members who have input into the procurement and selection of escalators to be utilised within the operational railway.

### **Route Asset Manager/ Asset Engineer**

Asset Managers are the custodians of NR assets within their portfolio and as such are responsible for their assets safety and regulatory compliance and that asset condition remains at an acceptable level to provide optimum, safe and efficient performance and operation.

### **Designer/Designated Project Engineer**

Responsible for ensuring that the recommendations of this document are fully considered and incorporated into the design process for all escalator installations within a project design submission.

### **Contractor**

The contractor is responsible for ensuring that all specified products procured as part of project works comply with the product specifications within this guidance note.

### **Facilities Manager**

The organisation, or delegated representative, responsible for the day to day control of an operational property asset, including safety, public liability, security, maintenance work etc, and in the case of stations as Station Facility Owner, licensed under the Railways (Safety Case) Regulations 1994, to operate a Railway Station.

### **Scheme Project Manager / Project Manager**

The Manager acting on behalf of the delegated budget holder (sponsor) to co-ordinate the various parties involved, in developing and delivering back to the Sponsor the completed Project.

## **6 Definitions**

**Run-off** – The space immediately adjacent to, and leading away from an escalator or staircase where passengers re-orientate themselves and move away from the element. This space should be kept free of obstructions and queues and, ideally, any cross circulation or decision points.

**Run-on** – The space immediately adjacent to and leading to an escalator staircase where passengers re-orientate themselves and move towards and onto the element. This space should be kept free of obstructions and, ideally, any cross circulation

## **7 Hazards associated with station escalators**

It should be recognised that the pattern of escalator usage at stations is different to most other locations where escalators can be found, and this can result in different and additional hazards, particularly where the conveyance of luggage and intensity of usage at peak times is involved.

It is often the case that the flow capacity of escalators contributes to the overall performance of the station and the train services contained within it. Certainly, crowds, dense and heavy flows of people together with potential conflicts of movement have a significant influence on the safety

performance of escalator assets. These aspects in combination with the often unconventional locations and tightly planned spaces associated with station sites contrive to produce a higher risk of incident.

Other known contributory factors, although perhaps less well understood overall, are the significant change of behaviours that have been adopted by station users. These include wearing light or flimsy footwear and attire that can get snagged in the treads or handrails; general distraction and inattention through reading, eating, texting etc whilst not holding handrails; and the widespread use of wheeled luggage, shoulder bags and laptop rucksacks whose bulk not only takes up space and impedes progress but can inadvertently knock people off balance if the owner moves unexpectedly.

Further dangers occur when escalator users are intoxicated or are using headphones or mobile phones and become oblivious to any hazards around them.

## **8 Statement (Summary of policy)**

As part of Network Rail's plan to improve the safety and sustainability of its assets, the following policy has been drafted to cascade escalator safety out to the major stakeholders within the railway buildings environment.

## **9 Addressing safer escalator design**

There are four principal aims in addressing how to reduce the risks and hazards posed by the presence and use of escalators. These are:

- To avoid the provision of escalators unless necessary and beneficial
- To design to applicable safety standards and recognised good planning practice, particularly that relating to circulation space and choice of location
- To deter or prevent the inadvisable or hazardous use of escalators by passengers
- To encourage safe passenger behaviours when using escalators

In turn, these can generally be addressed and resolved by the following measures –

- assessment of passenger flow options and escalator suitability
- provision of warnings, advice messages and wayfinding signing
- availability of alternative routes and means of changing level, particularly those relating to the provision of lifts
- monitoring, management and maintenance of operations and equipment

## **10 General Performance Requirements**

### **10.1 Space planning – dimensional criteria**

It is important to provide run-on and run-off space in front of escalators to pull passengers away and to provide a clear landing area for following passengers. These areas provide orientation time (to allow passengers to

move clear and decide where to go next), decision / action time (to decide which escalator to use or how to attend to luggage or to move to a lift) and queuing time (where passengers can accumulate or marshall themselves in a safe and orderly fashion)

The critical dimensional criteria when planning escalator installation relate to the clear, conflict free space at the approaches and exits to escalators and recommended run-offs and run-ons are provided in table 1 below. This also addresses the positioning of escalators in the vicinity of circulation routes, platforms and ticket gate-lines.

The dimensions given are the minimum and an assessment of usage and passenger flows is still required to determine the actual dimensions needed. The calculation needed for these purposes is shown in Diagram 2 below. (abstracted from Table 2.4-4 in NR Station Capacity Assessment Guidance)

It is acknowledged that in many cases, particularly where installations are proposed in existing premises, these minimum lengths may be difficult to achieve, in which case a full risk assessment should be undertaken to ensure that the risks introduced are as low as reasonably practicable (ALARP)

It should be noted that these clear distances alone are not necessarily sufficient to prevent hazards and risks and further consideration needs to be given to such things as the placement of wayfinding signage and onward travel information etc. to ensure that no unexpected changes of direction or hesitation are undertaken by passengers in these areas.

Further information on the planning of facilities and the role escalators play in these purposes is to be found in Network Rail’s Station Capacity Assessment Guidance May 2011.

Table 1 - Recommended Run-Offs and Run-ons	
Run off / Run on types	Min. lengths
Escalator / travelator to gateline	8m – 12m
Gateline to escalator / travelator	8m – 12m
Escalator / travelator to escalator / travelator	8m – 12m
Passageway / street / exit / concourse / platform to escalator / travelator	6m
Escalator / travelator to passageway / street / exit / concourse / platform	6m
Escalator / travelator to stairway	6m – 10m
Stairway to escalator / travelator	6m – 10m

**10.2 Planning and design considerations – General**

Escalators should be aligned naturally with general circulation flows whenever possible, and should always be parallel, rather than at right-



angles, to platform orientation. The ends of escalators and travelators should preferably be open to view rather than enclosed to ensure visibility to and from adjacent areas, thus reducing any potential instances of collision, obstruction or hesitation.

As already mentioned, stopping, hesitation or doubt by passengers when leaving escalators, or accumulation of other passengers at the head or foot of escalators can create a blockage and cause instant and potentially hazardous 'backing-up' situations on the escalator behind.

It is therefore crucial to avoid such problems by ensuring the immediate flow and dispersal of passengers away from escalator ends. This requires good placement and prominent visibility of signing immediately beyond the stair or escalator exit, and the provision of other useful information such as CIS screens in an evident but safely distanced position away to encourage dispersal.

For similar reasons, distracting advertising and promotions should not be placed in the direct vicinity of escalators or their run-on / run-off areas to reduce the possibility of inattention and hesitation.

It is recognised that the conveyance of luggage, particularly large trolley cases, is now a major factor in the difficulties encountered on escalators. This is of concern on the escalators as well as within the run-on and run-off areas where hesitation on the part of the carrier and the extension of his 'footprint' can both cause obstructions, collisions or falls. In this context, the visible proximity of alternative means of changing level, such as lifts, needs to be considered at the earliest stage in the development of a project or how best this could be achieved retrospectively to an existing arrangement. This latter may involve partial re-planning of premises or, at a minimum, clearance of clutter and the provision of effective signage.

### **10.3 Planning and design considerations – Guardrails and Bollards**

The use of guardrails and/or bollards extending forwards beyond the ends of escalators may be useful in defining an extent of run-off and creating a useful area of visibility and queue alignment on the approach or exit of the escalator. However, such physical barrier devices must not be spaced narrower than the clear width of the escalator to avoid hazardous constriction and reduction in passenger flow, or infringement of evacuation width requirements. Whilst such bollards may deter those with larger luggage this is only likely to be truly effective if a good visible alternative route to a lift of the appropriate capacity is available.

It is only through the naturally identifiable and easily accessible provision of adjacent lifts as well as stairs as alternative routes, emphasised in addition by signing, that passengers will be successfully and safely diverted from using escalators for luggage, buggies, bicycles, etc.

To further discourage the use of escalators in favour of lifts, the key deterrent, as detailed below, is two-fold: strong and prominent warning signs against the use of luggage on escalators, always in combination with equally good directions to conveniently adjacent lifts.

## 10.4 Planning and design considerations – Signage

Where escalators may be operated bi-directionally on occasion, then appropriate attention will be needed to the following applicable signing requirements at both ends of the escalator and in both directions along the escalator.

### 10.4.1 General wayfinding

This is the structured system of signing throughout a station environment to direct passengers to areas, facilities and routes.

All wayfinding signage should be in accordance with the Network Rail Corporate Managed Station Wayfinding Guidance (August 2011) available from Government and Corporate Affairs. This incorporates internationally recognised pictograms / symbols for escalators, lifts and staircases

It is essential that directions to alternative means of changing level are dispersed throughout the station rather than only in the close proximity of the escalators. This is to avoid late decision making on the approach to escalators which can cause dangerous bunching and conflicts of movement. Onward signage after escalator use needs to be sufficiently evident but also safely distant from the escalator so as not to cause hesitation or indecision in the run-off area.

Wayfinding direction signs to lifts in particular, and stairs when not located alongside an escalator should be positioned overhead as is generally conventional and preferably at least 12m in advance of the escalator entry, with all main approaches to the escalator addressed if possible. Floor signing with direction arrows for the lift can also be an effective secondary wayfinding mechanism, but clearly are more effective in quieter times of station use when not obscured by crowds of people.

### 10.4.2 Escalator deterrent signage

This signage aims to inform and emphasise the risks to passengers and direct those with heavy luggage, bicycles, buggies etc to lifts.

This can take the form of the corporate wayfinding system or be part of a wider station campaign in the form of framed posters or other campaign measures. As with the wayfinding principles any such signs should be dispersed throughout the station so that people can pick up on the advisory messages in advance of the escalators.

Which ever method is adopted this should be positioned so that people are making their way towards lifts or staircases in advance of the run-on areas of the escalators. It will still, however, be necessary to position deterrent signs and wayfinding directional signs to lifts within these areas but it is hoped that the earlier signage will have already diverted the majority of users so encumbered.

### 10.4.3 Escalator safety signage

This is the signage which displays warnings about escalator use such as that related to holding handrails, carrying dogs, prohibiting pushchairs, holding children etc. These should take the form of standard mandatory, prohibition, warning and information signs as recommended by BS EN115:2008 + A1 2010.

These should be located immediately within the vicinity of the access points to the escalator, repeated throughout its travel distance and sited between 1400mm and 1700mm above finished floor level.

To be in accordance with the relevant British Standard, prohibition signs need to be of round, annular shape with red circular edging on a white background and a black pictogram indicating the prohibited activity/equipment with a red diagonal line through the pictogram.

The mandatory signage needs to be of round shape with a blue background and a white pictogram indicating the mandatory activity.

Examples of these signs are provided below:



Figure 1 Prohibition sign 'pushchairs are not permitted'



Figure 2 Mandatory action sign 'Use handrail'



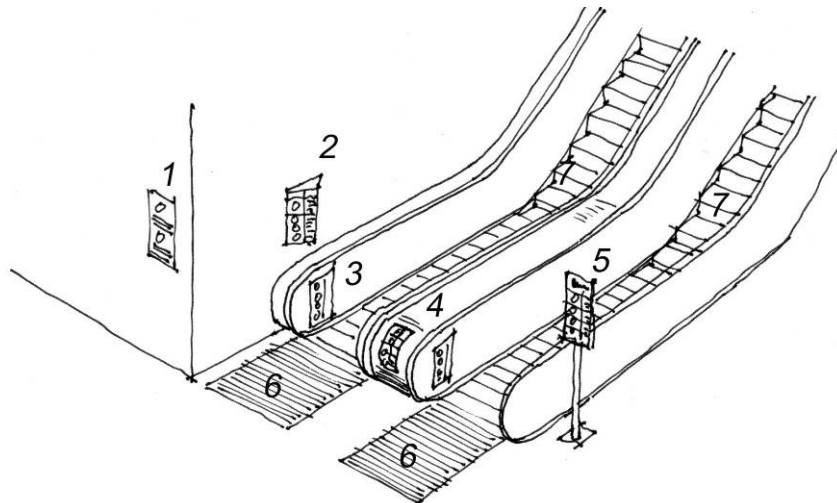
Figure 3 Mandatory action sign 'Small children shall be held firmly'



Figure 4 Mandatory sign 'Dogs shall be carried'

The location of these signs in relation to an escalator will be dependant on the particular circumstances but it is preferable to display them at reasonable eye level immediately adjacent to the entry point of the escalator and facing the oncoming escalator user to prevent distraction or diversion from the route of travel.

Where walls are present alongside the escalator entry, these are likely to be the preferred location for mounting the signs. An alternative is to mount the signs on a post or totem in advance of the escalator, perhaps in conjunction with guardrails and always so that the post itself does not cause a hazard or obstruction. If neither walls nor posts are possible, eg. where escalators are free-spanning elements with glass balustrades, or where the warning totem sign may not be appropriate due to limited space or circulation requirements, then the warning pictograms and messaging may need to be placed on the balustrades at the escalator ends, although this is not ideal in terms of visibility. Figure 5 below illustrates these preferred and alternative locations:



- 1 Forward warning re heavy luggage located on approach to escalator
- 2 Standard escalators warning sign mounted on adjacent wall
- 3 Standard escalator warning sign mounted on inner balustrade
- 4 Standard escalator warning sign mounted on adjacent structure
- 5 Standard escalator warning sign mounted on post where there is no suitable wall

Figure 5 Optional escalator safety signing positions

In addition to conventional warning signage it is advisable to provide other visual warnings and markings on the escalator structure itself including the machine gear cover plates, the step risers and the sides of the treads. See Figure 6 below. A good cleaning regime will be needed for the escalator to preserve its anti-slip performance generally, as well as to retain the visibility of the safety warning markings.



Figure 6 safety signage on escalator step

## 10.5 Planning and design guidance - miscellaneous

Recommended lighting levels are provided in RIS-7702-INS *Lighting at Stations and also in the DfT Code of Practice 'Accessible Train Station Design for Disabled People'*.

Retractable access control to escalators should be incorporated into the ends of the escalators or the adjacent structures such that the travelling public can be prevented from gaining access during times of closure for maintenance purposes etc.

## 11 Compliance

Escalator design, construction and maintenance shall comply with: RIS-7700-INS *Rail Industry Standard for Station Infrastructure*

BS EN 115 *Safety of escalators and moving walks*

NR/SP/ELP/40067 *The installation and upgrading of Escalators and Passenger Conveyors*

GI/GN7515 *Railway Group Guidance Note : Guidance on Automatic Ticket Gates at Stations*

All escalator designs shall be submitted in accordance with Engineering Assurance (as defined in NR/L2/CIV/003). Such designs will then be subject to an 'inter-disciplinary review'.