

# Key Escalator Events and Some Issues

A look at escalator events and factors which have served to drive change, as well as a few issues that remain contentious and unresolved

by Colin Craney

**A**s the focus of ELEVATOR WORKD UK is upon escalators, here I reflect upon a few of the less widely considered issues which have arisen together with a few incidents I have experienced during my career and also look back upon some landmark moments. I considered the technical development of the escalator in the U.K. in EWUK 104, and here, I reflect upon the significant events and factors which served to drive change and a few issues which remain perennially contentious and unresolved.

## King's Cross

The tragic event at King's Cross Station on 18 November 1987 was a watershed in terms of the culture and management of safety in the London Underground (LU), as it then was.

At 7:30 that evening, a lady advised station staff, "Excuse me, I think there's a fire on the escalator." The London Fire Brigade dispatched four units, the first arriving at 7:42. At 7:45, the fire erupted from the escalator well into the crowded Ticket Hall. Thirty-one people died, including a fire officer, and with one victim only identified some 16 years later.

The start of the fire was attributed to the ignition of accumulated grease and detritus in the tracks of the escalator due to a discarded match. The subsequent inquiry revealed that the tracks of the escalators, which had been installed in 1939, had never been completely cleaned and that it had not been LU practice to remove the steps to enable cleaning. A previous inquiry following a serious fire which destroyed escalators at Paddington in 1944 had identified 77 escalator fires between 1939 and 1944. These were, in the main, attributed to the ignition of accumulated debris by discarded smokers' materials.

The 1987 inquiry resulted in changes to fire regulation and in the enforcement of the existing no-smoking provision on the LU, together with the replacement of combustible materials in escalators and the introduction of fire detection and sprinkler systems. Other far-reaching changes related to Fire Brigade and Police communications and management systems and, most importantly, a culture change in LU's approach to the management of safety, which, I am pleased to say, prevails to this day. I also recall projects in which we replaced balustrade panelling that encompassed combustible materials and replaced steps which incorporated phenolic treads which, whilst purported to be fire-resistant, produced toxic fumes when ignited.

Traditionally, and particularly in the aftermath of King's Cross, the annual clean down was considered a significant event in the escalator maintenance cycle. As well as minimising the combustion risk, the extensive dismantling and strip-down assured the cleanliness and

lubrication of the installation together with a check of the continuing integrity of fixings, brackets and structural elements. I am sorry to say that the emphasis once placed upon the annual clean down and inspection has diminished in recent years, which is of concern in that this annual event provides the fundamental assurance of the continuing integrity of so many elements of an escalator installation.

## Skirt Deflectors

Having considered skirt deflectors in some depth in previous articles, I won't reflect upon the technicalities here. What does interest me is the inordinate length of time that it took for what is now considered a ubiquitous safety provision to receive wider acceptance. Whilst it may be argued that the skirt deflector is not an elegant engineering solution, which I suspect goes some way in explaining the reticence in take-up, it has certainly proven effective.

Two accidents involving young children arose in my hometown of Birmingham back in the late 1970s and then raised in Parliament in 1981 by the then-Member of Parliament (MP) Jocelyn Cadbury. Improvements advocated by Cadbury included compulsory reporting of accidents, skirt switches, comb switches, handrail intake switches, additional emergency stops, yellow lines on steps, improved warning notices, skirt deflectors, staff training and public awareness campaigns.

Hansard records that issues relating to escalator safety had been raised periodically in the U.K. Parliament as far back as 1938 and, in 1971, issues similar to those raised by Cadbury 10 years later were debated.

Cadbury's tenacity eventually bore fruit in the 1983 publication of Health and Safety Executive (HSE) PM34, which, as well as setting out general hazards and risks to be addressed, provided for skirt deflectors on all new escalators ordered after



1 January 1984. I would suggest that the 45-year period between the raising of the side of step entrapment issue in Parliament in 1938 and the implementation of a solution was too long. Subsequently, skirt deflectors became mandatory for new escalators within the EU in February 2005.

## Remote Controls

When I started working with escalators in the 1970s (outside of airports, moving walks were few and far between), we used the start key and stop button to undertake maintenance and repair works. This was considered normal practice.

In 1982, an Otis engineer was fatally injured in an accident during a rechainning operation in which the step chain was being hauled off and on to the escalator under power by way of the start key and stop button. The engineer fell into the moving step band, which, in the absence of a hold to run control or isolated maintaining circuit, continued to rotate until a manual stop was operated.

A contemporary safe system of work involved isolation of the self-maintaining contacts/circuits of the drive control whilst works were in progress (which meant that the start key would need to be manually held in the start position to move the step band) was applied. However, following HSE's investigation, the method of movement during rechainning and other repair operations was restricted to that of manual hand winding unless the escalator was equipped with a proper set of engineer's controls.

A similar accident involved injury to an engineer who was in the truss when the control panel, standing upright on the upper landing at the time, was knocked over, causing the drive switches to engage and the step band to move. Thereafter, the instruction to isolate the self-maintaining contacts/circuits of the drive control whilst works were in progress was reinforced, although the defined safe system of work required electrical isolation (the method to be adopted whenever personnel are in the step band) and, if required, mechanical locking of the step band.

## Stop Switches

The introduction of HSE PM34 resulted in a rush to install "accessible" emergency stop switches, which in effect meant the addition of clearly visible and evident emergency stops, located out of reach of children, at each landing. The underlying argument revolved around a balance of the need to provide a clearly evident and accessible emergency stop facility for use in case of emergency and the extent to which a visible and accessible emergency stop in itself encouraged misuse and a subsequent risk to passengers on an escalator. The PM34 provisions are carried into the current SAFed Guidance, which, given the importance of PM34, is hardly surprising given the generally inaccessible and largely invisible location of most allegedly compliant EN 115-1 stops.

## Handrail Intake

The debate around the most effective design for a handrail intake has been on-going for some years and continues today. The underlying theories relate to whether the intake should be disguised, hidden or guarded such that access is prevented or

restricted, or whether an exposed and effective guard and protective electrical stop device provide the most effective protection.

My general experience of the guarded/disguised/hidden design is of a good design principal ineffectively implemented. The clearly visible design seems to have become predominant as the intake design has developed such as to reduce the running clearance between handrail and intake device. Given that the requirements of EN 115-1 are quite limited in this respect, this element of design provides a means for aesthetic expression by which designers may differentiate their products, assuming, of course, that consumers appreciate the design.

One aspect of escalator work which has improved is that of handrail replacement. At one time, a number of carcinogenic materials were routinely utilised in the jointing process. One was benzene, the use of which is controlled in the U.K. and the U.S. The risks were known many years ago, and I recall that engineers who had been exposed to benzene through the jointing process were required to undergo ongoing health monitoring, so serious were the concerns.

## Auxiliary Brakes and Brake Monitoring

In a paper published in *Elevation* Issue 93, I raised the contrary logic of the EN 115-1 provision requiring auxiliary brakes only on escalators of vertical rise in excess of 6 m. I have nothing to add except that I hope to see change in the next revision of EN 115-1.

## Inclination

In the U.K., we have accepted a maximum angle of inclination of 35° (up to 6 m vertical rise) since its inclusion in the BS 2655-4 1969 Standard. This is interesting in that a maximum incline of 30° applies in other English-speaking jurisdictions, including in the U.S. and Australia, and, traditionally, British Standards had been influenced by the U.S. A.17 Code. Perhaps the foreword to BS 2655-4, in its explanation of the use of the imperial and metric systems, provides an indication of contemporary thought at the time, in that this includes consideration of the "practical problems involved" and "current Continental practice." In addition, the inclusion on the committee of representation from the retail sector and Royal Institute of British Architects (RIBA) may have resulted in the adoption of a more flexible approach.

Interestingly, BS 2655-4 provided for a maximum step-to-skirt clearance of 5 mm (rounded-up from 4.826 mm) and a maximum sum on both sides of 6.5 mm (rounded-up from 6.35 mm). I know from personal experience of the difficulty in attaining these clearances in certain escalator designs predating the 1969 Standard. The ILO Code of June 1972 had proposed a maximum clearance of 5 mm with 7 mm in relation to the sum of the clearances. The current convention of 4 mm maximum and 7 mm in the sum of both sides was adopted in BS 5656 (EN 115) 1983, seemingly by way of convergence between existing standards and a pragmatic view that a clearance of 5 mm was excessive and that a reduction to 4 mm, coupled with a 0.5 mm increase in the sum of the clearances, provided a satisfactory compromise which could be accommodated in

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engineering practice whilst not unduly discriminating against any manufacturer.

## Steps

Whilst step design has pretty-well consolidated upon the now ubiquitous pressure die cast aluminium alloy unistep, I have recently encountered a new example of an assembled step design. Fabricated steps were the norm when I first worked with escalators and were, in the main, of very high quality, although expensive. Unfortunately, this cannot be said of this new design which, to be frank, scared me, and I for one won't be recommending this. When viewing these steps, I concluded that the design and construction were substandard, albeit that the steps came with an EN 115-1 Type Test Certificate. On reflection, I concluded that the only justification for the design could be cost. This was confirmed when I reviewed the procurement documentation, which highlighted a cost saving in relation to the steps in question. Needless to say, these steps did not originate in Europe or the U.S. in that manufacturing costs would have been prohibitive in comparison to that of a pressure die cast aluminium step. Whilst I've encountered this step design only once, I view it as a retrograde step.

A further unresolved and perennial issue involves provisions for hazard demarcation markings on steps, in effect the various applications of yellow lines. PM 34 provided for 50 mm wide yellow line side-of-step demarcation for escalators to which skirt deflectors could not be retrofitted, and advocated these even when deflectors were installed. Whilst EN 115-1 requires only the demarcation of the rear edge of the step, I encounter many variations which include front edge, rear edge and side demarcation and, occasionally, passenger standing positions. The practice of painting warnings to step risers that say, "KEEP FEET CLEAR OF SIDES," etc., appears to have dwindled, probably as a result of the increase in cleated riser steps.

Whilst a level of research from the 1970s onward has been undertaken in relation to the so-called Wallpaper Illusion, said to present an increased risk of passenger disorientation and falls, this seems to have bypassed those who promote step advertising, although this is perhaps a topic for another day.

***Why is it that so many relatively new escalators generate cyclical roller/track noise, more often at the lower landing, but sometimes at the upper landing or at both landings?***

## Noise Issues

As an engineer with an interest in escalators, I invariably observe operation and am aware of noise generated during operation whenever I travel upon one. Why is it that so many relatively new escalators generate cyclical roller/track noise, more often at the lower landing, but sometimes at the upper landing or at both landings? I once encountered this noise at the lower landing of a new escalator which was being

inspected by client engineers and was astounded when the contractor's manager said, "They all do that." Not the response I expected and hardly a credit to his employer. I recorded this as a defect.

## Component Supply Chains

Back when I started in escalators, component supply was almost invariably from the OEM, and whilst this is unfortunately no longer the case, the position has deteriorated to the extent that one is no longer able to rely upon the veracity and integrity of even OEM-supplied components. Overall, quality in the supply chain is, in my opinion, at an all-time low.

However, it is not just the escalator sector that is affected. In 2021, Italian authorities seized components intended for use in the construction of Boeing 787 aircraft. Prosecutors reported that the components "were produced using titanium and aluminium of different quality and origin from those prescribed by the customer and in breach of the relevant technical specifications." The cost of fix and reworking is reported to be up to GBP 1 billion.

The large financial values inherent to the engineering supply chain render it susceptible to improper practices and/or criminal activity, and our formal quality assurance systems do not appear effective. Action is required; I would suggest at the EU level (U.K. escalator manufacture is pretty-well non-existent, and Brexit doesn't assist as we appear committed to adopt and/or reflect the EU position in relation to product regulation, and unilateral U.K. regulation would most likely prove impractical and ineffective), in relation to the security, quality and integrity of engineering supply chains.

Overall, whilst today's escalators are not as mechanically robust as those of yesteryear, they do incorporate more and improved safety devices, although there is still work to be done in a number of areas.

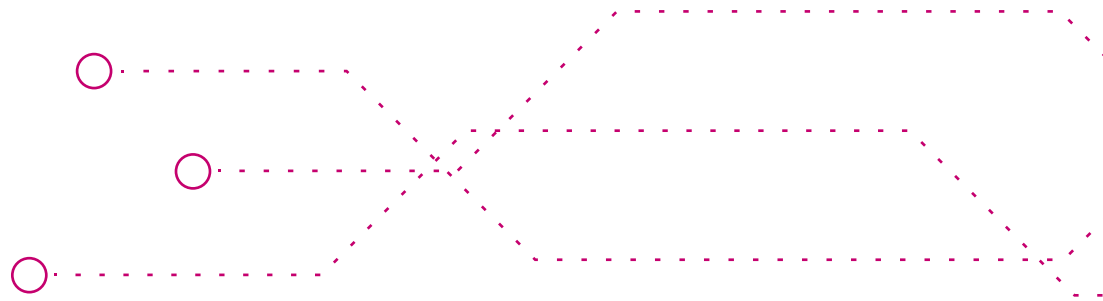
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# HydroElite Delivery Times

From order to delivery

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**5 weeks** standard  
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