Photographs by:

Paul Bigland, ATOC
Page 29: Ant Davey, RSSB

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What is RSSB?

RSSB facilitates the resolution of difficult cross-industry issues and builds consensus.

RSSB delivers a unique mix of products and services to the industry – supplying knowledge, analysis, a substantial level of technical expertise and powerful information and risk management tools.

RSSB is a not-for-profit company owned by major industry stakeholders, working together to:

- Continuously improve the level of safety in the rail industry
- Drive out unnecessary cost
- Improve business performance

The company is limited by guarantee and is governed by its members, a board and an advisory committee. It is independent of any single railway company and of their commercial interests.
A key part of RSSB’s product range is the research and development (R&D) programme that it manages on behalf of the railway industry. The programme is funded by the Department for Transport (DfT) and aims to assist the industry and its stakeholders in achieving key objectives:

- Improving performance in terms of health and safety, reliability, and punctuality
- Increasing capacity and availability
- Reducing cost
- Integrating all of these to compete effectively with other transport modes (or complement them as appropriate) and deliver a sustainable future for the railway

The RSSB-managed rail industry research programme focuses on industry wide and strategic research that no individual company or sector of the industry can address on its own. The programme is also instrumental in supporting the development of a future vision that can be best delivered. In addition, RSSB manages the rail industry strategic research programme which has been specifically developed to support industry and its stakeholders in the delivery of ‘step changes’ in industry strategy in 10, 20 and 30 years time – as outlined in the Rail Technical Strategy.

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Operations and Management Research

Operations and management research covers seven major research topics, which are:

- Health
- Road-Rail Interface
- Operations
- Public behaviour
- Workforce development and competence
- Sustainable development
- Safety policy and risk management

This booklet focuses on the Operations area of RSSB research covering stations.

- Informing you about research that has been done
- Showing you where to find the results of the research
- Encouraging you to find out more including registering to receive the RSSB R&D e-newsletter

The R&D programme has generated substantial knowledge, information and resources – all specifically designed to support the rail industry’s day-to-day operations, at senior level and on the front line.

This booklet provides only a brief insight into the projects – the best way to find more information about each project is to go to the Research and Development section of the RSSB website – www.rssb.co.uk – where you can find more details, including links to the reports and outputs.
Station safety

Stations are open interface points with the railway line. There are over 2,500 of them on the mainline network, from which more than a billion journeys begin and end every year.

Despite the perceived risk from train accidents, the onus is very much on the individual in the station environment. The industry can advise on appropriate behaviour and proper use, but a number of human factors will always be involved. Most slips, trips and falls, for example, occur due to running on stairs or the platform; most assaults take place in connection with ticket or train time disputes. Along with other factors, alcohol can be a contributor to these types of incident.

Nevertheless, the industry has a duty of care and a responsibility to put in place any practicable control measures that reduce the risks to passengers at stations and the platform / train interface.

Research in the Station Safety area looks at the risks associated with station operations, including the following issues:

- **Train dispatch and the operation of platform based equipment.**
- **Modifying station operations to improve passenger experience and customer perception.**
- **Investigating the primary causes of accidents that happen to the public at stations and at the platform / train interface, and the extent to which they can be reduced in number and severity.**
• Station design/layout, including signage and the use of glazing materials, flooring materials and tactile surfaces.

• Taking precautionary measures to alleviate the hazards caused by frost, ice and snow.

• Managing large numbers of people at stations and on trains.

• Improving access and ease of use for disabled passengers.

Some of this work has been undertaken in collaboration with non-railway bodies such as the HSE and the Construction Industry Research and Information Association (CIRIA).

The research outputs include clear, consistent guidance on the steps required to manage the risks effectively.
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### Station safety projects published

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<th>T038</th>
<th>Glazing materials at height in stations and other public buildings</th>
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<tr>
<td><strong>Description</strong></td>
<td>Providing advice on all safety aspects of the use of glazing materials at height within public buildings, including stations. Developing risk assessment guidelines for design, specification, installation, operation, maintenance and refurbishment.</td>
</tr>
<tr>
<td><strong>Abstract</strong></td>
<td>This research, undertaken for RSSB and other organisations outside the railway by the Construction Industry Research and Information Association (CIRIA), in conjunction with the Centre for Windows and Cladding Technology, examined the safety issues associated with glazing in the structures and roofs of public buildings, including stations. Many stations are over 100 years old and some are listed, which presents particular difficulties to Network Rail and station operators. The research aimed to minimise the risk to passengers and staff from hazards such as falling glass and from maintaining and cleaning such roofs. A Clients’ Guide and a detailed guide to Glazing at Height for expert practitioners were published, to meet industry’s needs for clear, consistent guidance on: design; performance requirements and applications; risk assessment; understanding of failure modes and the control and mitigation of risk during design, construction, installation, maintenance and refurbishment; and consideration of extreme event breakage such as storm damage.</td>
</tr>
<tr>
<td><strong>Published</strong></td>
<td>May 2005</td>
</tr>
<tr>
<td><strong>Current Position</strong></td>
<td>The guides are of use to those maintaining or renewing glass roofs or similar structures at railway stations. The research brief is published on the RSSB website and the guides are available via the CIRIA website at <a href="http://www.ciria.org/">http://www.ciria.org/</a></td>
</tr>
</tbody>
</table>
## T132  Train dispatch - risk tool

| **Description** | Improving the understanding of risk associated with current train dispatch procedures, and with the operation, provision, and replacement of platform based equipment. Developing guidance to mitigate this risk. |
| **Abstract** | This research examined risk associated with the maintenance, provision and replacement of platform based equipment for train dispatch under driver-only operation. Safe train dispatch is an essential control measure in managing the risk from train/platform incidents. The research identified the tasks involved in dispatching a train, the associated errors and the possible recovery steps. It also examined the station hardware issues relating to train dispatch. A train dispatch risk management tool (in the form of a spreadsheet and a user manual) developed as part of the research project, was published by RSSB. The tool enables station operators to assess dispatch risk for each platform, as required by the former Railway Group Standard (GO/RT3475). The tool is designed to be easy to use, and the manual is provided to guide the interpretation of results, so that together they provide a powerful aid to reducing risk. |
| **Published** | May 2004 |
| **Current Position** | The tool has been superseded by T743 Improving the arrangements for train dispatch from stations. |
# T157a  The best flooring materials for stations - Phase 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Reviewing literature on reducing slips and other hazards relating to flooring materials used at stations. Understanding the physical and behavioural causes of slips, trips and falls. Assessing potential mitigation measures.</th>
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<tr>
<td>Abstract</td>
<td>This research comprised a literature search as a first step towards an investigation of how to reduce risk from slips, trips and falls at stations. It aimed to understand passenger behaviour leading to slips, trips and falls and the impact of weather on walking surfaces. The research reviewed accident statistics and contributory factors and identified the use and properties of flooring materials used at stations on floors, stairs, ramps and escalators. It covered a wide range of influencing factors, giving an outline of the physiology of walking, the types of surfaces used, how these surfaces can be tested, and standards and codes of practice governing their use. Finally, it considered what mitigation measures could be effective. The findings have formed a valuable input to further work being developed in this area by HSE in which RSSB is participating.</td>
</tr>
<tr>
<td>Published</td>
<td>April 2004</td>
</tr>
<tr>
<td>Current Position</td>
<td>Largely superseded by the publication of T157b Safer surfaces to walk on – reducing the risk of slipping. Nevertheless, this is still a useful summary of the subject of slips, trips and falls, although the data is now several years out of date.</td>
</tr>
</tbody>
</table>
T157b  Safer surfaces to walk on - reducing the risk of slipping

Description  Reducing slips and other hazards relating to flooring materials used at stations. Understanding the physical and behavioural causes of slips, trips and falls. Assessing potential mitigation measures.

Abstract  HSE conducted research on slips and how their incidence in public buildings can be reduced. RSSB provided technical advice (the literature search already undertaken has been made available) and co-funding. This work, managed by the Construction Industry Research and Information Association (CIRIA), included a major study of existing standards and assessment techniques being undertaken by ARUP, which evaluated prior research undertaken by the Health and Safety Laboratory (HSL). RSSB’s participation on behalf of the railway industry ensured that there was a particular emphasis on the use, maintenance and cleaning of the types of surfaces which can be used in stations and their protection from water and contaminants. The work took into account the needs of station users, who are often in a hurry, may be weighed down by luggage, and are often uncertain of their route and specific destination. Users include people with young children, the elderly, and those with mobility problems and other disabilities.

Published  February 2006

Current Position  The intention is that the guide will be kept up-to-date and reissued at regular intervals in the future. Recently this has been taken forward as T829 Safer surfaces to walk on: an updated guide.
### T158 Station tactile surfaces

#### Description
Investigating the use and location of tactile surfaces at stations. Reviewing potential new materials. Assessing benefits and risk of extending their use to the tops of stairs and escalators and as guideways for people with disabilities.

#### Abstract
This research was carried out for RSSB by TRL and follows the literature review already undertaken to investigate the type and location of tactile surfaces at stations. The research addressed issues such as: the differences in current standards for various public places; preferences and recommendations of stakeholder groups; possible inconsistencies in approach that need to be resolved; whether current guidance for tactile surfaces is logical and consistent or makes it overly difficult or expensive to add tactile surfaces to existing areas. It also looked at whether alternative approaches are feasible; whether existing tactile surfaces create additional safety risk; whether any such risk is greater than the risks tactile surfaces are designed to mitigate; and what mitigations are practicable. This research concluded that the benefits to vision impaired people by the provision of tactile surfaces at stations outweighed any additional risk to passengers from slips, trips or falls.

#### Published
April 2004

#### Current Position
There is still a great deal of work to be done in this area as people with disabilities need consistency and the industry has not yet implemented tactile edges at all stations. Further discussions are taking place with Department for Transport as part of its Railways for All programme and Network Rail is reviewing its plans and strategy covering this issue.
Managing large events and perturbations at stations

Description
Evaluating techniques, including modelling and contingency planning, for improving crowd management for large events and major perturbations at stations.

Abstract
This research addressed how to manage crowds that form at stations as a result of major events or operational perturbation. The project had four phases. The first was an initial report on best practice findings, including: recommendations from academic research; commercial products (models, management systems, barriers etc) and their availability and relevance; user requirements for station management systems and passenger flow modelling; a technical review of passenger flow modelling packages; and the findings of interviews with rail stakeholders and domain experts from other fields. The second was an assessment of the generic risks in relocating passengers away from crowded stations and how this activity should be managed (in conjunction with the police and others). The third was the final report on requirements and a recommended process for pedestrian flow modelling. The fourth was the production of a 'Good Practice Guide' for crowd management and planning at stations, based on the findings of the project.
The Good Practice Guide was launched at the RSSB Station Safety Conference in November 2004 and has been made available through the RSSB R&D website since. There have been many presentations to industry groups on this work (and the parallel T307 Health and safety effects of crowding research). Further work on crowd management on trains has been published: T605 Management of on-train crowding and, in conjunction with the Construction Industry Research Information Association (CIRIA) research covering crowds in the wider built environment: T656 Designing for crowd behaviour. All the reports are available on the RSSB website.
Assessing the health and safety risk arising from crowding on the National Rail and LUL networks, in relation to both trains and stations.

Crowding on the railway continues to be a major source of concern to passengers, as evidenced by complaints to operators, user groups and regulatory bodies. It is sometimes suggested that crowding gives rise to risks to the health and/or safety of those affected. This project examined this issue to ascertain if, when and where crowding exacerbates the risks encountered in the course of rail travel. It examined both the National Rail and the London Underground Limited (LUL) networks in relation to both trains and stations. Health and Safety Laboratories, who undertook this work on behalf of RSSB, found that little evidence was available regarding crowding so a development to a full quantitative analysis is not currently practicable. However a number of management and research issues have been identified and will be reviewed for future action with stakeholders.

The Good Practice Guide was launched at the RSSB Station Safety Conference in November 2004 and has been made available through the RSSB R&D website since. There have been many presentations to industry groups on this work. Further work on crowd management on trains has been published: T605 Management of on-train crowding and, in conjunction with the Construction Industry Research Information Association (CIRIA) research covering crowds in the wider built environment: T656 Designing for crowd behaviour. All the reports are available on the RSSB website.
T321  
Research into signage and wayfinding at stations

Description
Assessing the benefits, costs and issues associated with standardising station signage. Investigating the possibility of developing standards / guidance for non-safety signage and the need for a signage hierarchy. Considering signage placement and lighting.

Abstract
There is a great deal of signage at stations, relating to wayfinding, commercial and safety functions. This has the potential to lead to conflicts that could affect the delivery of key safety information. This research investigated the function of station signage in relation to the needs of station users. It considered the most appropriate form of that signage and in particular the relationship between the different kinds, including the case for standardisation of all station signage and/or the introduction of a signage ‘hierarchy’. The positioning and lighting of signage, including its visibility from trains, and the requirements of different social groups, including tourists, disabled people and commuters, was investigated. The research produced a report on an ‘Assessment of potential to change’ and a good practice guide ‘Wayfinding at stations’.

Published
June 2006

Current Position
The signage good practice guide was produced for distribution to those involved in planning signage and those managing stations. RSSB continues to invite feedback to see if it is helpful and to assess what follow up actions could be undertaken. The research has been used by ORR inspectors as part of their toolkit to help station operators to understand good practice and to help identify possible improvements. It is available on the RSSB website or as a hard copy from RSSB. The signage good practice guide was produced for distribution to those involved in planning signage and those managing stations, and remains a popular resource.
An investigation into trespass and access via the platform ends at railway stations

Description
Investigating causal factors of trespass via station platform ends, and legitimate access requirements of authorised persons. Developing options for measures to mitigate the former without impeding the latter.

Abstract
This research investigated key factors influencing trespass and unauthorised access to the Network Rail infrastructure via platform ends and the apparently conflicting requirements of railway workers to gain legitimate access from the same locations. The methodology consisted of desk-based research, site visits to formulate in-depth case studies and a review of experience outside Great Britain. As a result two tools to help local station staff and managers, who may work for a train operating company or for Network Rail, assess the level of problem, the specific factors causing it, and potential measures that can be introduced to reduce the incidence of trespass have been developed. Additionally a set of industry guidelines has been written to provide a simple guide to assist local staff with this problem. Essentially, this research endeavours to offer practical solutions to help reduce unauthorised access overall, which will contribute to the reduction of accidents, incidents and vandalism on the Network Rail infrastructure.

Published
December 2005

Current Position
RSSB has publicised the report and the guidance material within the railway industry so that station operators will be able to use the tools to help drive down the levels of trespass from stations. It is recognised that this process will only have a partial effect and needs to be seen in the context of other activities sponsored by the industry, the users and its neighbours as a whole.
T328  Human factors of CCTV monitoring

Description  An investigation of human factors questions associated with the use of closed circuit television (CCTV) on the railway, and production of a toolkit for the effective application of CCTV.

Abstract  The rail industry uses CCTV in a wide range of applications, including level crossing control tasks, driver-only operation (DOO), crowd management and security at stations, and in-train security monitoring. However, there are a number of fundamental human factors questions associated with many CCTV monitoring tasks. This project identified how operator tasks should be defined to minimise fatigue and maximise effectiveness; selection and recruitment criteria appropriate for CCTV operators; how the operator’s mental model of the monitoring task can be supported by the CCTV system; appropriate image quality measures; issues of driver workload and CCTV with DOO; how many separate images /monitors an operator can perceive and interpret; and what the benefits and issues are surrounding distribution of real-time CCTV imagery to mobile devices (hand held or cab-based displays, etc). The resulting toolkit is provided to give guidance about how to design and apply effective CCTV technology and operations to particular work environments.

Published  May 2007

Current Position  The CCTV Toolkit is designed to help anyone who has to specify, select, install, maintain, or manage a CCTV system. It provides a resource which:

- Leads the user through each stage of the system lifecycle – from definition and procurement, through day-to-day management, to replacement and decommissioning.
- Provides information on specific CCTV-related subjects, eg design of control rooms, operator selection and training.
- Answers frequently asked questions.
- Illustrates good and bad practices through real-life case studies, including forward-facing CCTV in drivers’ cabs, level crossing CCTV, experience from the British Transport Police and the Home Office.

To request a copy of the CCTV toolkit (on CD-ROM), please email: enquirydesk@rssb.co.uk
T426  Minimisation of accidents at the train / platform interface

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**Description**

The research investigated accidents that happen at the platform / train interface, exploring the primary causes of such accidents and the extent to which they can be reduced in number and severity. The project examined public (and staff) behaviours and made recommendations on how minor changes to operational procedures or designs could make cost-effective improvements.

**Abstract**

Numerous minor accidents, and some serious, occur as passengers and staff board and alight from trains. Passengers make many complaints about this issue and it is a major contributor to passenger risk. This project investigated these accidents, exploring the primary causes and the extent to which they can be reduced in number and severity by minor modifications to vehicle and platform design. Given the very large number of passenger movements between platforms and trains (and vice versa) each year, the level of accidents is relatively low, although each case can be painful, costly and, where a fatality results, tragic. Adoption of relevant, and often low-cost, measures (operational procedures or designs) can help enhance the existing safe practices and help reduce further the level of accidents at the platform/train interface on railway stations in Great Britain. For example, it was suggested that consideration should be given to the communication arrangements between platform staff and the driver as the train departs from the platform, to mitigate the risk from accidents caused by peoples’ clothing or luggage being trapped in train doors.

**Published**

June 2006

**Current Position**

The attention of all station operators has been drawn to this report to ensure that they are aware of its findings. The issue was presented to attendees at the Station Safety Conference in May 2009 and a video of the event is available to view via Opsweb: [www.opsweb.co.uk](http://www.opsweb.co.uk). OFG is currently leading follow on work on this subject.
### T532  An evaluation of frost, ice and snow precautions at stations

**Description**  Identifying the most appropriate de-icing products for use on and around stations, including platforms, footbridges, footpaths and car parks, in terms of their suitability and their functional and cost effectiveness.

**Abstract**  Rock salt, widely used for de-icing at stations, is known to cause damage to certain building materials (such as reinforced concrete) and to affect track circuits. However, alternative products are generally considered to be less functionally effective and / or are many times more expensive than rock salt. This project, undertaken by TRL, identified and evaluated the effectiveness and suitability of available de-icing products for use at stations. The following recommendations were made, for station operators to continue to use the cheapest option, rock salt, in station car parks; to use corrosion inhibiting additives to salt to protect metal infrastructure on concourses; to use acetates (sodium and potassium) on platforms for effective de-icing while limiting damage to the track, trains and other sensitive equipment; to use appropriate equipment to spread materials effectively at the recommended application rate; and to store de-icing products correctly away from moisture.

**Published**  November 2005

**Current Position**  ATOC has reported that its delegates found the recommendations useful, and issued summary guidance for station operators. A further piece of research on the use of rock salt is in development.
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<tr>
<th>Description</th>
<th>Assessing the impact on the safe and effective completion of passenger monitoring and door-closing of train drivers being presented with increased numbers of CCTV views while operating in driver only operation (DOO) mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>At the present time, CCTV monitors for use with trains working in driver only operated mode can only cope with trains up to eight cars in length. This is because current standards are based on a maximum of two monitors per cab, split into four ‘views’ each. Proposals exist to increase the number of CCTV views displayed in the driving cab to monitor long trains (more than 8 cars) when they are at a station stop, ready for departure. However, there are concerns about the potential effects on driver performance, in particular on drivers’ ability to detect potential incidents such as people trapped in the train doors, and on station dwell times. The purpose of this research was to assess the impact on the safe and effective completion of passenger monitoring and door-closing of the driver being presented with increased numbers of CCTV views while operating in DOO mode. The results, which suggest that ten and twelve car trains can be operated safely with CCTV screens split into six views, will be used in considering whether to change Railway Group Standard GE/RT 8060 to permit six images per cab-based monitor. There are also recommendations on the likely impact on station dwell times.</td>
</tr>
<tr>
<td>Published</td>
<td>November 2005</td>
</tr>
<tr>
<td>Current Position</td>
<td>The outcome of this project has been applied by one train operator so far, in assisting it to achieve an approved derogation to the standard. A number of additional TOCs are also looking to use this work for derogations, which may ultimately lead to a review of the Railway Group Standard. Further work to develop guidance focussing on the human factors elements of CCTV, which can be applied practically by those involved in specifying and procuring CCTV systems, was carried out as T328 Human factors of CCTV monitoring.</td>
</tr>
</tbody>
</table>
### T605  Management of on-train crowding

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>Evaluating techniques, including modelling and contingency planning, for managing crowded trains as a result of service disruption, local events or sheer weight of rush hour traffic.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abstract</strong></td>
<td>Crowded trains are a feature of busy suburban networks and many long-distance services. Two previous projects have looked at the ‘Health and safety effects of crowding’ (T307) and ‘Crowd management at stations’ (T161). The Railway Industry Advisory Committee asked the Rail Safety and Standards Board to consider the management of on-train crowding by closing out the principal issues raised in the report on ‘Health and safety effects of crowding’. The issues ranged from how crowding is defined by the industry, to developing a consistent approach across the railway network and to better understand the controls that might be put in place by station and train operators. The research gauged the effectiveness of such measures and examined incident recording of crowding related events, in particular their codification, to improve data. Analysis of public behaviour patterns by observation and interviews were also an important feature of this research. The principal client group was Operations Focus Group. However, the work was originally sponsored by the Rail Industry Advisory Committee.</td>
</tr>
<tr>
<td><strong>Published</strong></td>
<td>March 2009</td>
</tr>
<tr>
<td><strong>Current Position</strong></td>
<td>See also notes under T161 Crowd Management at Stations.</td>
</tr>
</tbody>
</table>
### Description
This project provides guidance for train operators and adoption groups on good practice in station adoption based on research of British and international experience.

### Abstract
Station adoption is a way of improving the environment at railway stations through the involvement of individuals and local communities. The concept is based on the premise that a well-cared-for station with no graffiti or vandalism encourages more people to use the train than if the station was in a poor condition or appeared to be potentially unsafe. It is also argued that involvement of local communities in caring for their local stations creates greater local awareness of the railway leading to greater use by local people. This project draws upon the experience of station adoption schemes in Great Britain initiated by train operating companies or by community groups. It also explores the relationship between station adoption and the community railway concept. A review of similar schemes in other countries provided useful advice but led to the conclusion that station adoption is more widespread in Great Britain than elsewhere. Examples of good practice guides which can be downloaded and customised are provided.

### Published
December 2007

### Current Position
There is a premise that a well cared for station with no graffiti or vandalism encourages more people to use the rail service than a station which is in a poor condition or appears to be potentially unsafe. It is also argued that the involvement of local communities in caring for their stations creates an increase in local awareness of the railway itself, leading to greater use by local people. Communities wishing to participate in such schemes will find this guide a useful starting point in realising their aspirations. The research has been publicised on the RSSB website, through other RSSB publications, and as exhibition material at the 2008 Railway Community Safety Forum in Birmingham. The two good practice guides can be downloaded and customised by individual train operators or community groups to meet their specific needs.
T656  Designing for crowd behaviour

Description  Producing guidance for designers and managers of buildings and open spaces where large crowds can be expected.

Abstract  The Construction Industry Research and Information Association (CIRIA) is a body which manages research in, principally, the construction industry and the built environment. It was commissioned to lead a project to give guidance on the planning and management of crowd movements in buildings and public spaces, including retail, sporting and transport facilities. There were presentations on particular topics and the findings were recorded and analysed by CIRIA, leading to the preparation of a guidance document. Following the projects already undertaken by Rail Safety and Standards Board (RSSB) (including ‘Health and safety effects of crowding’ (T307) and ‘Crowd management at stations’ (T161)), CIRIA and RSSB participated in this research. Other funders included Transport for London. The principal client group for this work was Operations Focus Group.

Published  March 2009

Current Position  The guide is published as report C675 (ISBN: 978-0-86017-675-6) and hard copies may be purchased from CIRIA at Classic House, 174-180 Old Street, London EC1V 9BP or via email at enquiries@ciria.org. It is also available to rail industry users as a PDF document at http://www.ciria.org/downloads/01/c675.pdf. See also notes under T161 Crowd Management at Stations.
T743  Improving the arrangements for train dispatch from stations

Description  A review of the current arrangements, considering risk and human factors, for train dispatch at stations.

Abstract  The requirements for dispatch of trains from stations are set out in Section 6 of Module SS1 of the Rule Book. This states that unless specific local arrangements are in place, bell or buzzer communication must always be used in preference to any RA (Right Away) indicator to indicate to the driver that the train is ready to start - unless the train is Driver Only Operated. However, the rules may not be appropriate for current requirements, noting in particular that effectively all trains now have central locking and/or power operated doors under the direct control of the train crew. It was therefore appropriate that the existing arrangements were reviewed in the light of current operations, taking risk and human factors principles into account.

Published  November 2009

Current Position  The findings from this project are being used to inform the development of a new Rail Industry Standard, RIS-3703-TOM ‘Passenger Train Dispatch and Platform Safety Measures’.
Yellow lines are mandatory on platforms where trains pass at 100 miles per hour and have been used in the third rail network where train speeds are less than 100 mph. However their use was intended where slam door trains were in operation and now they have been withdrawn, the contribution of the yellow lines has been questioned.

On the former Southern Region third rail lines, and elsewhere, many platforms that do not have trains passing at speeds in excess of 100 mph have for many years (and certainly since the 1980s) been provided with a yellow line parallel to the platform edge and at some distance back from it - often at the rear edge of the coping stones. These lines were provided to encourage passengers to stand well back from trains as they ran into platforms because of the risk of slam doors being opened with the train in motion (posters warning commuters of this risk can be traced back to the 1920s and earlier). There was, as far as can be established, no specification as to the distance between line and platform edge. With the abolition of slam-door stock from the network, the value of maintaining these yellow lines has now been questioned. Additionally, the three Southern TOCs have recently considered implementing a consistent and risk-based policy for the future on the basis of cost-benefit analysis. Various views have been expressed as to the value of these lines. The proposal was therefore for a review of the use and benefits (or otherwise) of yellow warning lines of this nature. The research found that there was considerable staff and customer support for the retention of yellow lines at lower speed platforms and an overall economic benefit for their retention. It was considered, however, that the standards relating to their positioning and use needed to be reviewed and this process has now been initiated. This research was sponsored by Operations Focus Group.

Published April 2010
This research confirmed that there are wider benefits from retaining yellow lines at stations where trains do not pass at speeds of above 100mph. The research led to changes in Railway Group Standard GI/GN 7616 to help clarify the right position of safety for staff and passengers to take in platforms. A new Railway Industry Standard on the operational affects of train dispatch is also in development – currently out for industry consultation.
### T772 Alleviating passenger bottlenecks at terminal stations

**Description**
Currently, spring loaded buffer stops in bay platform must not be covered. This research examined whether it would be possible to cover this area to improve passenger flow to and from platforms.

**Abstract**
At a number of terminal stations passenger flow is being impeded by bottlenecks created by a combination of (i) the ticket gates (or revenue protection staff) (ii) the floor area available through which passengers are able to flow, and (iii) greater passenger numbers than were considered at the time the original schemes/layouts were designed and installed. The problem is only set to get worse as passenger numbers are predicted to further increase by 30% over the next Control Period 2009 to 2014. In a number of locations it is thought that passenger flow could be improved through installing flooring/decking over the ‘space’ behind the buffer stops. Such ‘space’ is usually provided to enable friction buffer stops to move in the event of a train colliding with the buffer stops, in a way that may provide sufficient retardation of the train before it collides with the end impact wall (principally slow speed and relatively low energy collisions). By installing flooring/decking over this area it might be possible to remove some passenger bottlenecks by providing additional platform space through which passengers could pass. If it designed to be collapsible (in a controlled manner) the train retardation zone could still be maintained. Such floors/decks have already been in use at Manchester Piccadilly, Liverpool Lime St, within Europe (eg Munich), and are planned for installation at Leeds, and whilst temporary works are undertaken at London Bridge and Cannon Street. For these schemes a site specific risk assessment has been undertaken and often the solution has not been planned to be permanent. This research was sponsored by Operations Focus Group. Network Rail and train operating companies are considering the outputs of this research relating to the implementation of collapsible decking at busy terminal stations on a case by case basis.

**Published**
April 2010
Given the compelling business case for the implementation of decking, Network Rail and train operating companies can now give consideration to the implementation of collapsible decking at busy terminal stations on a case by case basis. Collapsible decking is only one option of a range of possible methods of reducing crowding and increasing passenger flow rates. Network Rail is considering the outputs of the research and, if necessary, will make a proposal to change the relevant Railway Group Standards.
T829  Safer surfaces to walk on: an updated guide

Description  This research has updated existing guidance (previously published under T157b) on how to reduce slips and other hazards relating to flooring materials at stations, including understanding physical and behavioural causes of slips, trips and falls as well as an assessment of mitigation measures.

Abstract  This collaborative research was undertaken by the Construction Industry Research and Information Association (CIRIA) and updated existing guidance published under T157b (Safer surfaces to walk on - reducing the risk of slipping). It also included new information and in particular new research by HSL (the Health and Safety Laboratory/the Health and Safety Executive) into different flooring surfaces and treatments and into different types of footwear.

The research gathered together new information available from HSL and other sources, and considered what supplementary guidance is necessary. Subsequently, supplementary guidance was produced and the updated information has been published on the web. Finally, dissemination to raise awareness of the supplementary guidance through websites, newsletters and other means has also occurred. The client group for this research was Operations Focus Group.

Published  June 2010

Current Position  The web-based information is freely available through www.ciria.org/service/slips and is also being published on the RSSB website as project report T829. Operations Focus Group (OFG) has been devoting a great deal of effort to the reduction of risk at stations and the imminent publication of this handbook was discussed at its meeting in early June 2010. Further publicity is to be arranged and media such as www.opsweb.co.uk and Red Alert will be used to get the message across to the industry, as well as direct mailings to key duty holder representatives. An OFG working group is investigating further work in this area.
### T834 Reducing accidents through inclusive design: steps, stairs and ramps

**Description**
This piece of research has produced a Specifiers’ Handbook on stairs, escalators, moving walkways and ramps in non-domestic buildings (including stations), providing guidance on design and detailing in relation to inclusive design.

**Abstract**
This project has been initiated by the Centre for Accessible Environments (CAE), as part of the Specifiers’ Handbook series, and will be funded by a number of organisations including RSSB, the Department of Health, London Underground, and the British Council of Shopping Centres. Steps and stairs are a significant cause of accidents to all, though at particular risk are people with reduced mobility or visual impairments. This risk can be minimised if the steps and stairs and their associated handrails are designed and detailed in accordance with current best practice guidance. Escalators can also present practical problems for users and, similarly, good design can minimise these. Ramps and inclined moving walkways can cause slips and trips, particularly if they are not clearly identifiable, are too steep, move too fast, or have a slippery floor finish. In public buildings these facilities must be designed to accommodate a reasonable capacity of users safely, including possible use in an emergency as part of the escape route. This guidance should enable those responsible for the design and specification of each element to make decisions that will result in the procurement of the most appropriate product that meets current best practice guidance. This will result in steps, stairs, escalators and moving walkways that are safer, convenient and easier to use by everybody, including disabled and elderly people, and parents with small children. The information gained will also assist those responsible for maintenance and cleanliness to understand the importance of regular inspection, cleaning, repair and upkeep, and the implications for disabled people and other users if failure occurs. The principal client group is Operations Focus Group.

**Published**
June 2010
The web-based information is freely available through: http://www.cae.org.uk/guidance.html and has been published on the RSSB website as project report T834. Operations Focus Group (OFG) has been devoting a great deal of effort to the reduction of risk at stations and the imminent publication of this handbook was discussed at its meeting in early June 2010. Further publicity is to be arranged and media such as www.opsweb.co.uk and Red Alert will be used to get the message across to the industry, as well as direct mailings to key duty holder representatives. This subject is also being assessed by an OFG working group.
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<th><strong>T862  Station safety seminar</strong></th>
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<td><strong>Description</strong></td>
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T881 Evaluating wayfinding systems for blind and partially sighted customers at stations

**Description**  
Assessing the benefits, costs, and practicability of installing the RNIB REACT system at stations; and investigating other assistive navigation technologies for visually impaired people.

**Abstract**  
A number of train operating companies have been approached by the Royal National Institute for Blind People (RNIB) to invest in the ‘RNIB REACT’ system at stations. This is a navigation system which provides audio sign-posting for visually impaired people. Research was commissioned to independently evaluate this system. The evaluation was to determine whether: the system would be practical and affordable; the benefits returned would justify the investment; more cost-effective or appropriate technologies than RNIB REACT are, or may become available. The project evaluated whether RNIB REACT is worth pursuing and whether other systems are available. This work was carried out at the request of the Association of Train Operating Companies and with full support from the Department for Transport, Transport Scotland, Network Rail, and the Disabled Persons Transport Advisory Committee (Rail). The benefits of undertaking the research include the provision of a clear evaluation of the options available; enabling a decision to be made regarding the usefulness or otherwise of the RNIB REACT system; and the development of a strategy for future investment in assistive navigation technologies generally. This project was designed to produce information to assist with decision-support and help confirm the optimal solution for users, operators, and funders. The principal client group for this work was Operations Focus Group.

**Published**  
December 2010

**Current Position**  
DfT has considered this research and its findings and concluded that the rail industry should not, at present, commit to large scale investment in wayfinding or assistive technologies. In particular it should stop any further investment in the RNIB REACT system. However, technological developments should be kept under review.
### Station safety projects in progress

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<th>T759</th>
<th>Improving the methods used to provide access to and from trains for wheelchair users</th>
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<tr>
<td><strong>Description</strong></td>
<td>To evaluate what improvements should be made to ramps provided to allow wheelchair users to join and alight from trains, and their methods of use.</td>
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<tr>
<td><strong>Abstract</strong></td>
<td>Disability access on the railways has grown up piecemeal. Over the years the methods of getting wheelchair users on and off trains have varied. British Rail introduced the ‘warden ramp’ on wheels usually for access to or from a train’s guards van. Since then there have been various developments, often stock-specific, with some operators having introduced alternatives such as the ‘folding boarding ramp’. This can cause problems because different trains have different designs of lugs for the ramps to engage with (to ensure that there is a stable platform for the user) and there have been examples where the lugs have been knocked off so they will fit any train. This makes them unstable and could lead to accidents to wheelchair users, other passengers or rail staff. In addition, some trains present particular problems because of their height from the platform. The Disabled Persons’ Transport Advisory Committee (Rail) has asked RSSB to manage research into the best ways of overcoming these and related difficulties with the support of ATOC, DfT, and Network Rail. It is anticipated that guidance documents will be produced for rail staff and for wheelchair users, although these could be combined. The anticipated benefits of the research include improved safety and convenience for wheelchair users; a safe system of work for rail staff; and the reduction of risk to all involved. This project is sponsored by Operations Focus Group.</td>
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Where can I find research?

All the research outputs that have been published since RSSB began its programme can be found at ‘Research Topics and Projects’:

www.rssb.co.uk/research/pages/ResearchandDevelopmentTool.aspx

We suggest you click the Topic heading in the list of projects and then scroll down to the bottom of the Operations projects to find some of the most recent ones. If you know the reference number for the project – eg TXXX - or key words in the title, you can use the ‘search’ field at the top of the list.

The previous pages contain listings of the published and current Station safety projects – correct at the time of publication.

We hope this helps you find the information that is most relevant to you.

If you can’t find what you’re looking for, please contact us – enquirydesk@rssb.co.uk
Each project has a research brief that provides a concise summary.

The full report can be downloaded to drill down to more detail.
More Information

The RSSB R&D e-newsletter is an email bulletin that keeps the industry updated on the latest research projects to be started or published.

To view the most recent edition and to sign up for your own copy, visit:

www.rssb.co.uk/research/research/Pages/randde-newsletter.aspx

If you have enquiries about research – contact research@rssb.co.uk or the RSSB Enquiries Desk – enquirydesk@rssb.co.uk, tel 020 3142 5400

You can also access more information - including research - from Opsweb, the website of the Operations Focus Group, facilitated by RSSB. It’s easy to sign up for access on-line and from there you can obtain a wealth of information and good practice from across the industry. Go to www.opsweb.co.uk