T1098 - Identifying mitigations for the risk of unplanned movement of wheelchairs and pushchairs on station platforms

HAZID Workshop Report

March 2016

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1 Executive summary

RSSB undertook two workshops in October 2015 and January 2016 to:

- Identify contributory factors that might have an effect on the unplanned movement of wheelchairs and pushchairs (wheeled transport) without brakes applied on a platform with a slope towards the track;
- Identify mitigations to control the effect these factors have on wheeled transport on station platforms.

The workshops formed part of RSSB research project T1098[1]. T1098 was proposed following a recommendation from the 2014 Rail Accident Investigation Branch (RAIB) report 'Accidents involving a wheelchair rolling onto the track at Southend Central, 28 August 2013; and a pushchair rolling onto the track at Whyteleafe, 18 September 2013'.

The workshops detailed the contributory factors, mitigations and associated qualitative scoring[2] and identified 11 key mitigations to be taken forward for industry consideration[3].

The discussion of the key mitigations resulted in the following main conclusions:

- Platform signage and markings have a role in mitigating risk, however, these should be used sparingly to have a positive impact on passengers and members of the public. Platforms with excessive signage/markings were considered a potential distraction in themselves.
- There is an opportunity for industry to have consistent platform signage[4] across the GB rail network.
- Station managers should ensure that their staff:
    - Are aware of the risk of unintentional movement of pushchairs and wheelchairs towards platform edges;
    - Have the ability to positively inform passengers and members of the public (or intervene) as part of a holistic approach to customer service (supported by training and/or as part of a competency system);
    - Should focus on identifying and acting on distractions (such as ticket and vending machines) that may cause the person controlling the wheelchair/pushchair to leave it unattended and/or fail to apply the brakes.

[1] T1098 Identifying mitigations for the risk of unplanned movement of wheelchairs and pushchairs on station platforms
[2] See Section 4.1 'Contributory factors and mitigations'
[3] See Table 3:
[4] Signage relating to platform cross fall and gradient risk and the application of wheelchair/pushchair brakes

- There appeared to be commitment from attendees that Network Rail and Train Operating Companies (TOCs) could undertake a strong, joined up piece of work to combine the findings of platform measurements and local knowledge to ensure that any investment to mitigate significant hazards are properly targeted.
- There were opportunities to raise wider public awareness, but this should not have a narrow focus on platform cross fall or gradient, rather, this should also include other contributory factors (for example, the need to inform of platform aerodynamic risk) and the steps that should be undertaken to ensure safety on station platforms.
- There is a need to review and update ATOC Guidance Note ATOC/GN022 'Safe Management of Pushchairs and Wheelchairs on Station Platforms'.

2 Introduction

2.1 Project Background

RSSB research project T1098 'Identifying practical mitigations for the risk of unintentional movement of pushchairs and wheelchairs due to slopes towards platform edges' was proposed following a RAIB report which looked into two similar incidents:

1. Wheelchair rolling onto track at Southend Central (28 August 2013);
2. Pushchair rolling onto track at Whyteleafe (18 September 2013).

In both incidents, RAIB identified the immediate cause by stating that 'the wheelchair and pushchair… were able to roll because the brakes were not applied and there were slopes present on both platforms'[5]. The report identified 3 wheelchair and 12 pushchair incidents associated with roll-off type events on GB's mainline railway since 2001 and identified 4 publicised pushchair incidents abroad[6,7]. RAIB issued 4 recommendations to industry, of which the following recommendation (Recommendation 2) triggered T1098's proposal:

- 'Network Rail in consultation with the Association of Train Operating Companies, RSSB and the Department for Transport, should (as part of the national strategy for managing the platform train interface risk) arrange for work to be undertaken to determine when a slope towards the railway could become a significant hazard, and ways of mitigating the risk. The scope of the exercise should consider:
    - All slopes on platforms including those that have been installed intentionally (for example to accommodate changes in level along the platform length);
    - At what point a slope towards the railway makes it more likely than not that a wheelchair or pushchair without brakes applied could roll away, taking account of modern designs of such equipment; and
    - Other factors such as how individuals perceive a slope hazard, the most appropriate way to highlight the hazard, appropriate methods to influence public behaviour, and other ways of mitigating the risk.
- Once the work is complete the industry should publish appropriate guidance, including consideration of standardisation in the contents of signage, announcements, etc…'[8]

Railway Group Standard GI/RT7016 'Interface between Station Platforms, Track and Trains' includes a platform cross fall requirement for new (and altered) platforms, the standard (as is the case with standards generally) is non-retrospective and there are thought to be a large number of platforms on the GB railway that do not conform to current standards. Many of these older

[5] Rail Accident Report 17/2014 - Accidents involving a wheelchair rolling onto the track at Southend Central, 28 August 2013; and a pushchair rolling onto the track at Whyteleafe, 18 September 2013, Rail Accident Investigation Branch, August 2014, PG 28
[6] Ibid., PG 27
[7] Since the publication of the RAIB report, there have been a number of pushchair incidents abroad involving fatalities
[8] Rail Accident Report 17/2014 - Accidents involving a wheelchair rolling onto the track at Southend Central, 28 August 2013; and a pushchair rolling onto the track at Whyteleafe, 18 September 2013, Rail Accident Investigation Branch, August 2014, PG 36

platforms were constructed with slopes towards the track to aid the discharge of surface water. Discussions with industry stakeholders[9] also identified that an increase in pushchair wheel size could result in increased susceptibility to roll-off type events.

Recommendation 3 made by the RAIB was directed at ATOC (now renamed Rail Delivery Group) and required:

- 'As an interim measure, pending the outcome of the research identified in recommendation 2, and in consultation with passenger groups including those representing the interest of disabled passengers, to review the findings of the report and seek to understand the ways in which the risk of wheelchairs and pushchairs rolling onto the track can be more effectively managed by operators. This review should include consideration of:'
    - Locations where passengers may need to remove both their hands from a pushchair or wheelchair because of the nature of another task to be performed (eg at a ticket machine or shop/kiosk);
    - Reference to any existing good practice in this area; and
    - Measures that could most effectively influence the behaviour of passengers using wheelchairs and pushchairs on station platforms.
- The output of the review should be consolidated into suitable guidance for train operators…'[10].

In response to the above, ATOC issued a Guidance Note ATOC/GN022 'Safe Management of Pushchairs and Wheelchairs on Station Platforms' in December 2014. The stated purpose of this document is to provide advice to Station Facility Owners on identifying and mitigating the risks of wheeled vehicles, i.e. pushchairs and wheelchairs, rolling away if left unattended on platforms. The content of this document drew on emerging industry good practice but no attempt was made to compare or quantify the effectiveness of the various mitigations identified.

2.2 Platform-train interface risk

RSSB's Safety Risk Model (SRM) is a quantitative representation of the residual safety risk on the GB railway. It consists of 131 hazardous events (HEs), split into over 3000 precursors, which collectively represent the causes and consequences of potential accidents arising from railway operations and maintenance.

An analysis of the SRM identified the total risk to all passengers and members of the public (non-trespassers) from falling onto or towards the track at 6.128 FWI[11] per annum.

[9] R649 (T1098) idea development meeting, RSSB offices, 27 April 2015
[10] Rail Accident Report 17/2014 - Accidents involving a wheelchair rolling onto the track at Southend Central, 28 August 2013; and a pushchair rolling onto the track at Whyteleafe, 18 September 2013, Rail Accident Investigation Branch, August 2014, PG 37
[11] Fatality and Weighted Injuries

It should be noted that this value encompasses risk to all passengers and members of the public, and it is not specific to wheeled transport as this level of detail is not available. Table 1: shows the SRM hazardous events that have been included to calculate this value. Each HE and precursor is presented in terms of the frequency of occurrence (number of events per year) and the risk (number of fatalities and weighted injuries per year). The FWI weightings equate injuries of differing degrees with a fatality, which allows different risks to be totalled and contrasted in comparable units.

Table 1: **Associated SRM Hazardous Events and Precursors**

Hazardous Event[12] Code	Precursor Code	Hazardous Event	Frequency (events/year)	Risk (FWI/year)
HEN[13]-10	PCONDST--H	Passenger electric shock at station (conductor rail)	1.400	0.8612
HEM[14]-06C	PPDPFALL--H	Passenger fall between moving train and platform - train departing station	3.367	0.8479
HEM-08	PPLTFALL--H	Passenger fall from platform and struck by non-stopping train at station	1.082	0.7467
HEM-08	PPATFALL--H	Passenger fall from platform and struck by non-stopping train at station	1.483	0.5041
HEN-13	PPNLFALL-H	Passenger falls from platform onto track (no electric shock nor struck by train) under the influence	32.05	0.5031
HEM-40A	PMPSTR---H	MOP[15] (non-trespasser) struck by/contact with moving train due to being too close to platform edge	1.286	0.4640
HEM-06C	PPAPFALL--H	Passenger fall between moving train and platform - train arriving at station	2.215	0.4350
HEM-10A	PPLTSTR---H	Passenger struck by / contact with non-stopping train due to being too close to the platform edge	2.856	0.3652
HEM-10A	PPLASTR---H	Passenger struck by / contact with train arriving at station due to being too close to the platform edge	3.390	0.3546
HEN-13	PPNGFALL-H	Passenger falls from platform onto track (no electric shock nor struck by train) due to other causes	17.67	0.2775
HEM-08	PPDTFALL--H	Passenger fall from platform and struck by non-stopping train at station	0.4213	0.1527
HEM-10A	PPLDSTR---H	Passenger struck by / contact with train departing station due to being too close to the platform edge	3.152	0.1305

[12] A hazardous event is defined as an event or an incident that has the potential to result in injuries or fatalities
[13] Non-movement hazardous event (HEN) - An accident causing injury to people, unconnected with the movement of trains.
[14] Movement hazardous event (HEM) - An accident causing injury to people, involving trains (in motion or stationary) but excluding injuries sustained in train accidents (HET)
[15] Members of the public

HEN-13	PPLTVIMP-E	Passenger falls from platform onto track (no electric shock nor struck by train) due to visual impairment	6.211	0.0975
HEN-13	PPLTFILL-E	Passenger falls from platform onto track (no electric shock nor struck by train) due to ill health	5.424	0.0852
HEM-06A	PFALLOTHUH	Passenger fall between stationary train and platform - other *i.e. not boarding or alighting*	13.53	0.0799
HEM-06C	PPTPFALL--H	Passenger fall between non-stopping train and platform	0.2573	0.0627
HEN-52	KCONDCON--H	MOP (non-trespasser) electric shock - contact with conductor rail	0.0834	0.0513
HEM-49	KLGFALL--H	MOP (non-trespasser) fall from platform & struck by train - general causes	0.1000	0.0512
HEN-67	KPNLFALL-H	MOP (non-trespasser) fall from platform onto track (no electric shock nor struck by train) under the influence	2.000	0.0332
HEN-67	KPNGFALL-H	MOP (non-trespasser) fall from platform onto track (no electric shock nor struck by train) - general causes	1.400	0.0226
HEM-41	KPLTFALL-H	MOP (non-trespasser) fall between stationary train and platform	0.3333	0.0016
HEM-06B	PFALLOTHMH	Passenger fall between stationary train and platform and train subsequently moves - other *i.e. not boarding or alighting*	0.0062	0.0004
				6.128

3 Workshops

Two workshops were run[16] to gain industry's views on the risk of unplanned movement of wheelchairs and pushchairs on station platforms and how these risks could be mitigated. Details of how this was carried out can be found in Section 3.4.

3.1 Scope

The scope of the workshops was to identify contributory factors that could have an effect on the unintentional movement of wheeled transport[17] on station platforms towards or, onto the track, and to identify current and potential mitigation measures.

The workshops focussed on the contributory factors that affect this risk which included:

- Station staff (or lack thereof)
- Wheelchair users and 'pushchair and wheelchair supervisors'
- Wheeled items
- Platform design

All types of mitigations were considered, though the discussion was largely focussed on the practical mitigations, especially those mitigations on positively affecting passenger behaviour and minor infrastructure options, rather than those involving a fundamental rebuilding of station platforms to alter the slope. This was to ensure that mitigation cost/disruption implications were not disproportionate to the risk. The workshops did not cover:

- Risks related to the use of mobility scooters, station or refreshment trolleys or any other wheeled items such as suitcases on station platforms;
- Other risks at the platform-train interface not associated with wheeled transport rolling unintentionally towards the platform edge e.g. boarding and alighting.

3.2 Objectives

The aims of the workshops were to:

- Discuss and agree on the factors that can have an effect on the unplanned movement of wheeled transport on station platforms towards, or onto, the track
- Identify mitigations to control the effect these factors have on wheeled transport on station platforms
    - For each mitigation identified, gather further detail on:
        - Whether the mitigation has been implemented before and if so, where

[16] The original workshop was held on 19 October 2015, the follow-up workshop on 6 January 2016

[17] Within this report, wheeled transport refers to wheelchairs and pushchairs

- Ease of implementation
- Expense
- Effectiveness
- Practicality

The qualitative measurements for these can be seen in Table 2:

Table 2: **Mitigation scoring measurements**

Question	Measurement Options
Ease of Implementation	• Easy • Medium • Hard

Expense	• Low
	• Medium
	• High
	• Very High
	  ○ This was added to take account of the much higher costs associated with structural changes.
	• Indirect
	  ○ This was added to take account of mitigations that may require companies outside of the railway industry (or passengers/members of public) to bear the cost.

Effectiveness	• Low • Medium • High
Practicality	• Practical • Impractical • Impossible

3.3 Attendees

The workshops were well attended and represented by 7 organisations, with a total of 19 attendees (16 attendees at the first workshop and 12 at the follow-up workshop).

3.4 Method

A Hazard Identification (HAZID) workshop would usually consist of identifying the hazards. For these workshops the key hazard was already known - wheeled transport on a platform with a slope towards the track, without brakes applied. The main consequences were also known - wheeled transport unintentionally rolls towards or, onto, the track and is potentially struck by a train or electrocuted (see Table 1: for hazardous events considered).

The workshops therefore set out to:

- Identify factors that can contribute to the likelihood of the hazard being released; and
- Identify mitigation measures (both current and hypothetical).

3.4.1 Background

Each workshop began with a short presentation on the background of the project and the reasoning behind the proposal.

3.4.2 Agree scope

Attendees to the workshop were given an opportunity to discuss and suggest alterations to the scope. It was through this discussion that the decision was made to include all mitigations and not to limit suggestions only to ways of manipulating passenger behaviour.

3.4.3 Identify contributory factors

The first task was to identify all factors that might have an effect on wheeled transport without brakes applied on a platform with a slope towards the track. Some initial sections were created to aid this discussion. The final list of contributory factors decided on was:

- Station staff (or lack thereof);
    - Indirect
    - Direct or targeted
- Public influence (or lack thereof);
- Wheelchair users and ‘pushchair and wheelchair supervisors’;
- Wheeled items;
- Platform design.

These factors were broken down into further detail to make the mitigations more relevant to the risks they were mitigating against.

3.4.4 Identify mitigations

For each contributory factor, attendees were invited to put forward suggestions for ways to mitigate against the contributory factors defined in the previous exercise. These mitigation suggestions could be current mitigations that were being implemented or theoretical mitigations.

3.4.5 Mitigation scoring

Each mitigation identified was scored using the scoring measurements in Table 2: Additional detail around the mitigations was also recorded, including whether the mitigation was known to have been implemented already.

3.4.6 Prioritisation of mitigations

To ensure the key mitigations identified were taken forward and considered, the attendees were given the opportunity to choose those they deemed to be most important. These mitigations are detailed within the results section.

4 Results

The workshops provided the following:

- A spreadsheet detailing the contributory factors, mitigations and associated qualitative scoring details[18];
- Identification of 11 key mitigations to be taken forward for consideration[19].

The discussion of the key mitigations resulted in the following main conclusions:

- Platform signage and markings have a role in mitigating risk, however, these should be used sparingly to have a positive impact on passengers and members of the public. Platforms with excessive signage/markings were considered a potential distraction in themselves.
- There is an opportunity for industry to have consistent platform signage[20] across the GB rail network[21].
- Station managers should ensure that their staff:
    - Are aware of the risk of unintentional movement of pushchairs and wheelchairs towards platform edges;
    - Have the ability to positively inform passengers and members of the public (or intervene) as part of a holistic approach to customer service (supported by training and/or as part of a competency system);
    - Should focus on identifying and acting on distractions (such as ticket and vending machines) that may cause the person controlling the wheelchair/pushchair to leave it unattended and/or fail to apply the brakes.
- There appeared to be commitment from attendees that Network Rail and TOCs could undertake a strong, joined up piece of work to combine the findings of platform measurements[22] and local knowledge to ensure that any investment to mitigate significant hazards are properly targeted.

[18] The results of the workshops can be found in Section 4.1
[19] The key mitigations are listed in Table 3:
[20] Signage relating to platform cross fall and gradient risk and the application of wheelchair/pushchair brakes
[21] Examples of platform signage are provided in Appendix A
[22] In October 2014, Network Rail issued a Special Inspection Notice (NR/SIN/140) on the method of measurement and action plan on platform cross falls and gradient. The SIN applies to all station platforms and requires to identify if a hazardous cross fall or gradient exists and to risk rank all the platforms on the basis of the risk matrix provided within the SIN.

- There were opportunities to raise wider public awareness[23], but this should not have a narrow focus on platform cross fall or gradient, rather, this should also include other contributory factors (for example, the need to inform of platform aerodynamic risk) and the steps that should be undertaken to ensure safety on station platforms.
- There is a need to review and update ATOC Guidance Note ATOC/GN022 'Safe Management of Pushchairs and Wheelchairs on Station Platforms'.

Table 3: **Key mitigations identified**

Contributory Factor	Contributory Factor Detail	Mitigation
Station Staff (or lack thereof): Indirect (Detection)	Task procedures (e.g. preventative procedures)	1.1.2 Encouraging staff (including gateline staff) to be proactive with passengers/MOP
		1.1.3 Staff competence (people person skills)
	Staff awareness of cross fall risk	1.2.1 Induction for customer-facing staff (eg gateline and platform staff)
		1.2.3 Previous incident investigation (i.e. identifying if platform cross fall was a contributory factor to incidents)
	Availability (staffing levels)	1.3.1 Staff presence at stations (eg gateline staff, platform staff, ticket office staff) to detect potential hazards This is only relevant where staff are available
Station Staff (or lack thereof): Direct (Targeted actions)	Task procedures (e.g. preventative procedures)	1.5.1 Station announcements (automated) These are more necessary for unstaffed stations.
Public Influence (or lack thereof)	Public's awareness of contributory factors that can lead to the unplanned movement of wheelchairs and pushchairs on station platforms towards or onto the track	2.1.1 Awareness campaign (eg social media campaign through Mumsnet, Disabled Persons Railcard website etc.) to promote awareness of contributory factors that can lead to wheelchairs/pushchairs rolling onto the track (eg failure to apply brakes).

[23] On 18 February 2016, Transport for London (TfL) hosted a 'Buggy Summit', the summit focused on the challenges faced by pushchair and wheelchair users in London and set out ways to make travelling easier by utilising light-weight, foldable pushchairs. The event was completely separate to RSSB's HAZID workshops and did not focus on cross fall or gradient risk.

Wheelchair users and 'pushchair and wheelchair supervisors'	Platform information or other information leading to awareness of cross fall risk	3.1.3 Signs and markings at stations (eg signage about cross fall risk) The limitations of this mitigation should be recognised
	Effect of congregation	3.4.1 Site inspection to determine best options
Platform Design	Topography - (eg any fall, curved platforms, narrow platforms)	5.1.3 Achieving cross fall compliance (where reasonably practicable) This is only viable if funding is available.
	Features leading to lack of supervision of wheeled vehicles and distractions - (eg ticket machines, information services, seating, general ambient noise and refreshment machines on the station platform) A combination of several distractions is considered to have a higher risk to passengers/MOP than individual distractions.	5.4.1 Relocation (including reorientation) of platform features

4.1 Contributory Factors and mitigations

Ref.	Contributory Factor	Contributory Factor Detail	Mitigations (Theoretical or Current)	Has this been implemented before? (Y / N)	Where?	Ease of Implementation *Easy / Medium / Hard*	Expense *Low / Medium / High / Very High / Indirect*	Effectiveness *Low / Medium / High*	Practicality *Practical / Impractical / Impossible*	Additional Comments	Key mitigation?
1	**Station staff (or lack thereof)**										
	INDIRECT (Detection)										
1.1		**Task procedures (eg preventive procedures)**	1.1.1 Staff involved with monitoring CCTV at stations (proactive monitoring of risk)	Y	Abellio ScotRail	Easy	Low (if CCTV already in place) High (if not in place)	Low	Impractical (May be practical in some cases)	Detection of potential hazard requires follow-up action (eg targeted announcement) in order to reduce the likelihood of the hazard being released. In addition to staffing implications, industry requires having a proportion of its CCTV focused on areas of known cross fall risk. **See 1.5.3.**	
			1.1.2 Encouraging staff (including gateline staff) to be proactive with passengers/MOP (members of the public)	Y	c2c	Easy	Low	Medium	Practical	This mitigation requires good line management and targeting of specific users. RAIB Report 17/2014 identified that 'c2c has... revised procedures and re-briefed staff to remind the persons responsible for wheelchairs and pushchairs to apply the handbrake and position the equipment parallel to the railway' (PG 30). This mitigation does not apply to unstaffed stations. **See 1.1.3** and **3.2.2.**	Yes
			1.1.3 Staff competence (people person skills)	Y	c2c	Easy	Low	Medium	Practical	The mitigation needs to be underpinned by suitable recruitment and training processes. Staff should reiterate the key message (as stated in signs and announcements) to passengers/MOP. **See 3.2.2** and **3.3.1.**	Yes
1.2		**Staff awareness of cross fall risk**	1.2.1 Induction for customer-facing staff (eg gateline and platform staff)	N	N/A	Easy	Low	Medium	Practical	Station operators need to be briefed of locations where cross fall is a particular problem. This is a task which needs to be systematically completed throughout the network to ensure that anyone taking duty knows if/where there is a problem. Measure to be undertaken through a competency management process. Mitigation linked to **1.1.2, 1.1.3, 1.2.2** and **5.1.3.**	Yes
			1.2.2 Staff to ensure they do not become part of the distraction for passengers/MOP	N	N/A	Easy	Low	Medium	Practical	**See 1.2.1**	
			1.2.3 Previous incident investigation (i.e. identifying if platform cross fall was a contributory factor to incidents)	Y	Worcester Shrub Hill	Easy	Low	High (as long as the incident investigation is remembered)	Practical	Enabler for other actions to be taken. **See 5.1.3** and **5.2.1.**	Yes
1.3		**Availability (staffing levels)** - *The effect station staffing levels can have on the safety of wheeled transport (eg the absence of staff on the station could lead to risks to wheeled transport not being identified).*	1.3.1 Staff presence at stations (eg gateline staff, platform staff, ticket office staff) to detect potential hazards	Y	Assumed to be in place at some stations but not known where	Easy/Medium	Low	Medium (High if interaction on one-to-one basis)	Practical	Detection of potential hazard requires follow-up action (eg staff providing advice/guidance to passengers/MOP - **See 3.2.2** and **3.3.3**). Guidance detailed in 'ATOC Guidance Note – Safe Management of Pushchairs and Wheelchairs on Station Platforms' (ATOC/GN022).	Yes (where staff are available)

4.1 Contributory Factors and mitigations

Ref.	Contributory Factor	Contributory Factor Detail	Mitigations (Theoretical or Current)	Has this been implemented before? (Y / N)	Where?	Ease of Implementation *Easy / Medium / Hard*	Expense *Low / Medium / High / Very High / Indirect*	Effectiveness *Low / Medium / High*	Practicality *Practical / Impractical / Impossible*	Additional Comments	Key mitigation?
	DIRECT (Targeted actions)										
1.4		**Bookings**	1.4.1 Information provided by staff (eg ticket office staff, customer service staff) to passengers/MOP during bookings	N	N/A	Medium	Low/Medium	Low	Practical	Change in process required. Several factors to be considered including staffs' confidence in dealing with passengers/MOP (**see 1.1.3**), language barriers and passengers/MOP with hearing impairments. Regardless of cross fall risk, passengers/MOP should be reminded to apply brakes at all times, **See 3.2.2** and **3.3.1.**	
			1.4.2 Information provided by staff (eg customer service staff, ticket office staff) to wheelchair users/supervisors during booking of passenger assistance	N	N/A	Easy	Low	Medium	Practical	Staff will include customer service staff at National Rail Enquiries, TOCs and at staffed stations. This mitigation largely applies to bookings over the phone. It was noted that around 70% of wheelchair users/supervisors pre-book passenger assistance. **See 1.1.3, 3.2.2** and **3.3.1.**	
			1.4.3 Information provided by staff (eg customer service staff, ticket office staff) to passengers/MOP during/after applications for rail cards (eg Family & Friends Railcard, Disabled Persons Railcard, etc.)	N	N/A	Easy	Low	Low	Practical	Other campaigns have used a similar method, (eg Arriva Trains Wales scheme for school children). The mitigation could include text messages/emails sent to passengers after bookings to reiterate advice. **See 1.1.3, 3.2.2, 3.3.1** and **3.3.4.**	
1.5		**Task procedures (eg preventive procedures)**	1.5.1 Station announcements (automated)	N	N/A	Easy	Low	Medium	Practical	Automated announcements are considered to have less of an impact than targeted announcements, but are likely to be more reliable and cost-effective to produce. Potential risk that passengers/MOP are overwhelmed by too many announcements. Targeted station announcements can be provided, **see 1.5.3 (see** also **5.4.4** and **5.6.3).** Parallel activity warning for stepping distances has been implemented in some parts of the GB rail network.	Yes (at unstaffed stations)
			1.5.2 On-board announcements (automated)	N	N/A	Medium	Medium (requires reprogramming of automated announcements)	Low	Impractical	Automated announcements are considered to have less of an impact than targeted announcements, but are likely to be more reliable and cost-effective to produce. Mitigation only relevant for passengers interchanging at unstaffed stations. Targeted on-board announcements can be provided, **see 1.5.4.** Parallel activity warning for stepping distances has been implemented in some parts of the GB rail network. There is a technical limitation in the number of messages that can be shared within a given time.	
			1.5.3 Station announcements (targeted)	N	N/A	Easy	Low	Medium	Practical	Potential risk that passengers/MOP may be overwhelmed by too many announcements. There is also the potential reputational risk that passengers/media may perceive targeted messages as surveillance ('Big Brother'). **See 1.5.1** for automated station announcements (**see** also **1.1.1., 1.1.3, 5.4.4** and **5.6.3**). Parallel activity warning for stepping distances has been implemented in some parts of the GB rail network.	
			1.5.4 On-board announcements (targeted)	N	N/A	Medium	Medium	Low	Impractical	Mitigation only relevant for passengers interchanging at unstaffed stations. Face-to-face interaction considered a more effective option. **See 1.5.2** for automated on-board announcements **(see also 1.1.3)**. Parallel activity warning for stepping distances has been implemented in some parts of the GB rail network. There is a technical limitation in the number of messages that can be shared within a given time.	

4.1 Contributory Factors and mitigations

Ref.	Contributory Factor	Contributory Factor Detail	Mitigations (Theoretical or Current)	Has this been implemented before? (Y / N)	Where?	Ease of Implementation *Easy / Medium / Hard*	Expense *Low / Medium / High / Very High / Indirect*	Effectiveness *Low / Medium / High*	Practicality *Practical / Impractical / Impossible*	Additional Comments	Key mitigation?
2	**Public influence (or lack thereof)**										
2.1		**Public's awareness of contributory factors that can lead to the unplanned movement of wheelchairs and pushchairs on station platforms towards or onto the track**	2.1.1 Awareness campaign (eg social media campaign through Mumsnet, Disabled Persons Railcard website etc.) to promote awareness of contributory factors that can lead to wheelchairs/pushchairs rolling onto the track (eg failure to apply brakes).	N	N/A	Medium	Medium	Low	Practical	This form of mitigation would require national organisation and would be a prerequisite for changing passenger/MOP behaviour. It was noted that Mumsnet had been used for a number of other social media campaigns. The PTI Strategy outlines a proposal to develop and implement a national safety communications campaign to influence public behaviour on stations. **See 2.2.1, 3.1.2** and **3.2.1.**	Yes
2.2		**Passengers/MOP alerting wheelchair/pushchair users and supervisors at station platforms that are perceived to be at risk**	2.2.1 Positive message provided by passengers/MOP to wheelchair/pushchair users and supervisors at stations, promoting good behaviour to reduce risk of unattended pushchairs and failure to apply brakes to pushchairs and wheelchairs.	Y	TfL	Medium	*Medium (indirect - See 2.1)*	Low/Medium	Practical	Similar work undertaken on London Underground and TfL buses. **See 2.1.1, 3.1.2** and **3.3.1.**	
3	**Wheelchair users and 'pushchair and wheelchair supervisors'**										
3.1		**Platform information or other information leading to awareness of cross fall risk**	3.1.1 Passenger user groups/forums (eg PRM)	N	N/A	Hard	High	Low	Practical	There are many passenger groups, each with their own agendas.	
			3.1.2 Positive message promoting good behaviour							**See 2.2.1** and **3.3.1 (see also 2.1.1** and **5.4.2).**	
			3.1.3 Signs and markings at stations (eg signage about cross fall risk)	Y	Barking (c2c), Barrhead (Abellio ScotRail), Keynsham (Great Western Railway)	Easy	Medium	Low	Practical	Difficult to undertake a national campaign due to inconsistent design of platform signs and markings. Too many signs can cause a distraction to passengers/MOP. Following Network Rail's Special Inspection Notice (SIN 140 - 'Platform Cross falls: Method of Measurement and Action Plan'), there is an opportunity for industry to push for consistent sign design. Considering language barriers and hearing impairments, the visual simplicity of signs is thought to have an advantage over announcements. **See 3.1.7, 5.1.2** and **5.6.2.**	Yes (however, limitations should be recognised)
			3.1.4. Posters providing guidance to passengers travelling across the rail network	Y	Southern	Medium	Medium	Low	Practical		
			3.1.5 Wi-Fi 'welcome screen' providing advice/guidance to passengers/MOP (where Wi-Fi is available)	N	N/A	Medium/Hard	Low	Low	Practical	Potential distraction in its self. In any case, advertisements would be likely to have priority over safety messages. **See 3.3.2.**	

4.1 Contributory Factors and mitigations

Ref.	Contributory Factor	Contributory Factor Detail	Mitigations (Theoretical or Current)	Has this been implemented before? (Y / N)	Where?	Ease of Implementation *Easy / Medium / Hard*	Expense *Low / Medium / High / Very High / Indirect*	Effectiveness *Low / Medium / High*	Practicality *Practical / Impractical / Impossible*	Additional Comments	Key mitigation?
			3.1.6 Online information	N	N/A	Easy	Low	Low	Practical	Effectiveness dependent upon the number of passengers/MOP searching for/reading appropriate online information. The National Rail Enquiries website was considered the most appropriate site to host the information. It was clarified that the 'Advice and information for wheelchair users at stations and on trains' document (listed on ATOC's site) references platform cross fall. The document states 'If your wheelchair has brakes that could be secured while waiting on the platform, (particularly if there is a slight slope) please use them and then release them before use.'	
			3.1.7 Platform markings replicating station signage (eg cross fall risk)							**See 3.1.3, 5.1.2** and **5.6.2.**	
3.2		**Task reliability (capability) for securing and supervising wheeled items**	3.2.1 Passengers/MOP capability to secure and supervise wheeled items	N	N/A	Hard	*Indirect*	Low	Practical (indirect)	A well positioned sticker on pushchairs and wheelchairs (reminding supervisors to apply the brakes at all times) would be beneficial, however, the chance of this being implemented is highly unlikely, **see 2.1.1** and **4.1.2.**	
			3.2.2 Staff (eg platform staff) providing passenger assistance (i.e. staff reinforcing cross fall risk and appropriate mitigations (eg applying brakes))	Y	Assumed to be in place at some stations but not known where	Medium	Medium	Low/Medium	Practical	**See 1.1.2, 1.1.3, 1.3.1, 3.3.3** and **3.3.4**. Guidance detailed in 'ATOC Guidance Note – Safe Management of Pushchairs and Wheelchairs on Station Platforms' (ATOC/GN022).	
3.3		**Distractions (e.g. children, mobile phones, pets, luggage, etc.)**	3.3.1 Positive message provided by staff and public to wheelchair/pushchair users and supervisors to promote good behaviour (management of distractions) to reduce risk of unattended pushchairs and failure to apply brakes to pushchairs and wheelchairs.							**See 2.2.1 (see also 1.1.3** and **3.2.2).**	
			3.3.2 Automated alert sent by mobile phone providers to passengers/MOP approaching stations to encourage minimal use of mobile phones at station platforms							**See 3.1.5**. This mitigation may paradoxically be a distraction in itself (passengers/MOP distracted by phone alert).	
			3.3.3 Staff presence at stations to alert passengers/MOP of distraction risk							**See 1.3.1 (see also 3.2.2).**	
			3.3.4. Advice provided by staff (eg customer service staff, ticket office staff) to passengers/MOP during/after applications for rail cards (eg Family & Friends Railcard, Disabled Persons Railcard, etc.) highlighting risk of distractions at station platforms							**See 1.4.3 (see also 1.1.3, 3.2.2** and **3.3.1).**	

4.1 Contributory Factors and mitigations

Ref.	Contributory Factor	Contributory Factor Detail	Mitigations (Theoretical or Current)	Has this been implemented before? (Y / N)	Where?	Ease of Implementation *Easy / Medium / Hard*	Expense *Low / Medium / High / Very High / Indirect*	Effectiveness *Low / Medium / High*	Practicality *Practical / Impractical / Impossible*	Additional Comments	Key mitigation?
3.4		**Effect on congregation** - *Crowding, wet weather and train stopping positions can affect where passengers congregate on platforms, i.e. under roofing.*	3.4.1 Site inspection to determine best options	Y	South West Trains and Abellio ScotRail (PTI assessment)	Easy	Low (unless remedial action is found to be necessary)	High	Practical	This mitigation was one of several actions included within Network Rail's Special Inspection Notice. Network Rail requires car stop information from TOCs to ensure successful implementation/action. **See 5.3.5.**	Yes
4	**Wheeled items**										
4.1		**Equipment design -** *(eg wheelchair/pushchair wheel size, weight, stability, condition of braking mechanism and ease of use)*	4.1.1 Safety bands connected to pushchair/supervisor's wrist	Y	Australia	Hard	*Indirect*	Low	Practical (practical solution but low effectiveness)	Requires a combined road and rail campaign to maximise publicity. **See 2.1.1.**	
			4.1.2 Seek to influence pushchair/wheelchair design	N	N/A	Hard	*Indirect*	High	Impossible	Requires reverse of current practice. Given that the majority of pushchair/wheelchair manufacturers supply their products globally, GB rail pushchair/wheelchair passengers only represent a small proportion of its customers. **See 3.2.1**	
4.2		**Maintenance regimes**	4.2.1 Maintenance of TOC/Network Rail owned wheelchairs under PGI (planned general inspection)	Y	Larger stations (eg Abellio ScotRail)	Easy	Medium (business as usual)	Medium	Practical (assuming equipment in place)		
			4.2.2. Wheelchair/pushchair maintenance regimes at stations	N	N/A	Hard	Medium	Medium	Practical (in some places)	Similar to the 'Cycle rail fund schemes' (eg Brookwood Station and Ulverston Station Cycle Hub); requires one-to-one interaction. This mitigation presents an opportunity to engage with passengers/MOP to promote general awareness of safety risk/good practice. **See 1.1.2** and **1.1.3.**	
5	**Platform design**										
5.1		**Topography -** *(eg any fall, curved platforms, narrow platforms)*	5.1.1 Colour contrast around design transitions	N	N/A	Medium	Medium	Medium	Practical/Impractical	South West Trains and Abellio Greater Anglia were noted to use a similar scheme for suicide prevention. London Underground (TfL) has utilised colour contrasting at a number of stations in order to prevent passengers from standing in areas of risk. GTR proposes to utilise colour contrasting to highlight the change in platform height as result of their accessibility improvement programme.	
			5.1.2 Platform markings							**See 3.1.7 (see also 3.1.3** and **5.6.2).**	
			5.1.3 Achieving cross fall compliance (where reasonably practicable)	N	N/A	Hard	Very High	High	Impractical (generally)	Site inspections and local knowledge are required in order to assess the impact of achieving compliance. **See 1.2.3** and **5.2.1.**	Yes (if funding available)
5.2		**Partial implementation of topography mitigations could lead to a hazard or new risk**	5.2.1 Raising/lowering part of station platform to make it more cross fall compliant	Y	Numerous locations where longer trains have been introduced and cross fall has been taken into account	Medium/Hard	High/Very High	Low (limited)	Impractical (generally)	Whilst the mitigation has been previously undertaken for platform extensions, this can create new transitions which themselves represent a risk. **See 1.2.3** and **5.1.3**	
5.3		**Surface condition, surface material and contamination** (eg rain, ice or bird droppings causing surfaces to become slippery may have an impact (eg friction) on how easy wheeled transport is to control)	5.3.1 PGI - assessment of location/condition	N	N/A	Easy	Low (incremental)	Low	Practical/Impractical (limited)	Treatment of platform surfaces is undertaken routinely to reduce the risk of slips, trips and falls. **See 5.3.3** and **5.3.4.**	

4.1 Contributory Factors and mitigations

Ref.	Contributory Factor	Contributory Factor Detail	Mitigations (Theoretical or Current)	Has this been implemented before? (Y / N)	Where?	Ease of Implementation *Easy / Medium / Hard*	Expense *Low / Medium / High / Very High / Indirect*	Effectiveness *Low / Medium / High*	Practicality *Practical / Impractical / Impossible*	Additional Comments	Key mitigation?
			5.3.2 Repairs	N	N/A	Easy	Very high	Low	Impractical	Incremental repairs to platforms may result in an increased inconsistency to surface condition, material and (in some cases) slope.	
			5.3.3 De-icing (eg gritting)							**See 5.3.1 (see also 5.3.4).**	
			5.3.4 Cleaning regimes							**See 5.3.1 (see also 5.3.3).**	
			5.3.5 Coverage of platform under roofing (weather protection etc).							**See 3.4.1,** a change to building orientation may effect wind patterns **(see also 5.4.1)**.	
5.4		**Features leading to lack of supervision of wheeled vehicles and distractions** - *(eg ticket machines, information services, seating, general ambient noise and refreshment machines on the station platform can create a distraction to those 'in control of' the wheeled transport and may lead to passengers forgetting to put on the brakes, or not noticing when the wheeled transport starts moving).* *A combination of several distractions is considered to have a higher risk to passengers/MOP than individual distractions.*	5.4.1 Relocation (including reorientation) of platform features	N	N/A	Relatively easy to identify options (i.e. through Network Rail's Special Inspection Notice, however, implementation opportunities will vary.	Low/Medium/High	Medium	Practical/Impractical	Network Rail's Special Inspection Notice recorded locations where distractions may cause risk. Serious consideration should be given for the location/orientation of ticket machines, given the increasing trend of ticket collection at stations as result of increased online ticket purchases. Mitigations should also consider the 'self-explaining' concept. The fatal Elsenham station incident of 3 December 2005 showed how the location of ticket machines could result in dangerous situations. Whilst not cross fall related, the incident and subsequent RAIB investigation led to the installation of a ticket machine on the Down line at the station.	Yes
			5.4.2 Stickers or on-screen messages on platform features to remind passengers/MOP of cross fall risk (eg 'have you applied the brakes to your pushchair/wheelchair?')	N	N/A	Easy	Low	Medium	Practical	There may not be physical space in order to display the required message. **See 3.1.2.**	
			5.4.3 Reducing passengers/MOP task time at interactive platform features (eg ticket and refreshment machines)	N	N/A	Hard	Medium	Low	Impractical (limited)	Very unlikely to be successfully implemented.	
			5.4.4 Platform/station announcements							**See 1.5.1 and 1.5.3 (see also 5.6.3).**	
5.5		**Lit environment** - *Effects lighting can have on visibility of station platform hazards.*	5.5.1 Ensure lighting (visual perception) highlights cross fall risk	N	N/A	Hard	High/Very High	Low	Impractical	**See 5.5.2.**	
			5.5.2 Reporting and fault replacement procedures for lighting	N	N/A	Easy (required for day to day operations)	Low (day to day operations)	Low	Impractical	Failure to report/replace faulty lighting can lead to reduced visibility of station platform hazards. An accident that occurred at Hereford station (due to a lack of lighting and staff on the platform) was raised at a PTSRG meeting. **See 5.5.1.**	
5.6		**Wind -** *Very strong winds (weather) may have the potential to blow wheeled transport into motion.*	5.6.1 Windbreaks to reduce exposure of station platforms	N	N/A	Medium	High	Medium	Impractical	The installation of windbreaks can potentially result in increased security risk to passengers/MOP (i.e. an increased risk of attack/robbery due to the concealment of platform areas), therefore this mitigation was not considered as a practical option.	

4.1 Contributory Factors and mitigations

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		Platform aerodynamics - *The passage of passenger and freight trains through a platform can affect how the wind flows through a station and the movement of wheelchairs and pushchairs on the station platform.*	5.6.2 Yellow line markings and signage							**See 3.1.3 (see also 3.1.7** and **5.1.2).** Whilst the PTI risk tool is likely to include signage, it is unlikely to directly relate to cross fall risk. It was noted that the majority of platforms on the GB rail network do not have yellow line markings.	
			5.6.3. Platform announcements for passengers/MOP to stand clear of the platform edge and ensure wheelchair/pushchair brakes are applied (eg announcements for specific train types passing through stations)							**See 1.5.1 and 1.5.3 (see also 5.4.4).**	
			5.6.4 Installation of platform screen doors (where reasonably practicable)	N	N/A	Hard	High/Very high	High	Impractical	In order to install platform screen doors, there are multiple barriers that may need to be overcome, these include curved platforms and the ability for freight and on-track machines to pass through the affected stations. **See 5.6.6.**	
			5.6.5 Platform barriers (access/egress to station platforms) where reasonably practicable	N	N/A	Hard (increases train dwell times significantly)	Medium/High/Very High	High	Impractical	Whilst platform barriers are not known to have been installed as result of cross fall risk, barriers have been implemented for other motives. The installation/implementation of platform barriers can be resource intensive, lead to increased overcrowding and result in an increased risk of violence towards staff by passengers/MOP.	
			5.6.6 Amendment to train speeds or routes passing through stations	N	N/A	Hard	High	Low	Impractical	Train speed restrictions were applied to Stevenage station due to overcrowding, following a nearby concert (this was not cross fall related). **See 5.6.4.**	

5. Appendix A - Platform signage

Station	Managed by	Signage location	Date	Credit
Thornliebank Railway Station	Abellio ScotRail	Platform 1 (signage tilted towards main waiting shelter)	15 July 2015	Photo courtesy of Abellio ScotRail

Station	Managed by	Signage location	Date	Credit
Crosshill Railway Station	Abellio ScotRail	Signage installed on Platform 1 and Platform 2s' walls (adjacent to seating area)	2015	Image courtesy of Abellio ScotRail

Station	Managed by	Location	Date	Credit
Barking Station	c2c	Platform 8	24 May 2015	Photos courtesy of Michael Woods, RSSB