

Assessment of Vehicle Incursions onto a Railway Station

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Overview

Risks Posed by Station Vehicle Incursions

- Average 28 incursion per year over all 2,534 GB stations (1.1%)
- 1 incident at each station every 89 years
- Vehicle enters station
 - Minor/major injuries to passengers & vehicle occupants
- Vehicle fouls line without train strike
 - Train delays
 - Injuries to vehicle occupants
- Vehicle fouls line and struck by train
 - Derailment
 - Multiple major injuries/fatalities
- How can we reduce the risks posed by vehicle incursions?

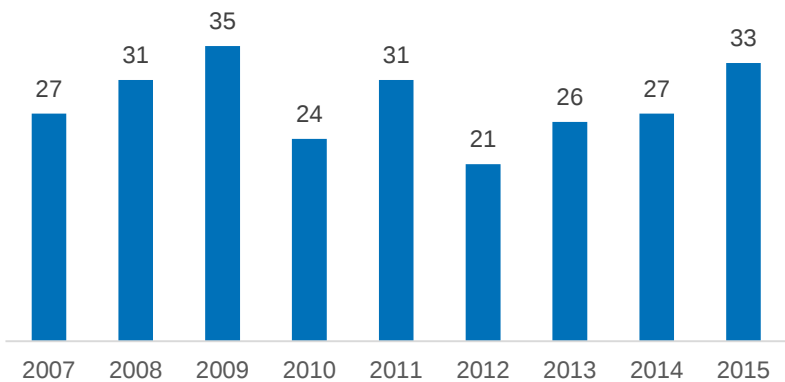


Kempton Park Station, 2015

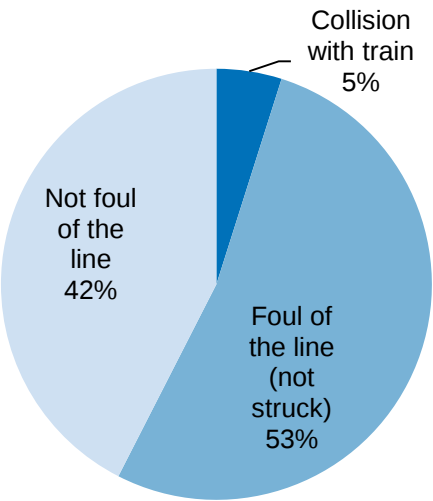
Quantitative Assessment



Average Number of Collision Fatalities per Year (1976 - 2001) (ORR)



Number of Road Vehicle Incursions at Stations (2007 – 2015) (RSSB)



Vehicle Incursion Outcome by Final Resting Place (2005 – 2015) (ASPR)

Kirkstall Forge

- New commuter station near Leeds (Opened 19th June 2016)
 - Low road usage and 30mph speed limit
 - Sharp corners (used by road planners to reduce speeds)
 - Lowered kerbs, “open” feel to station
- ISA raised concerns of potential vehicle incursion onto station and track



Kirkstall Forge Incursion Sites

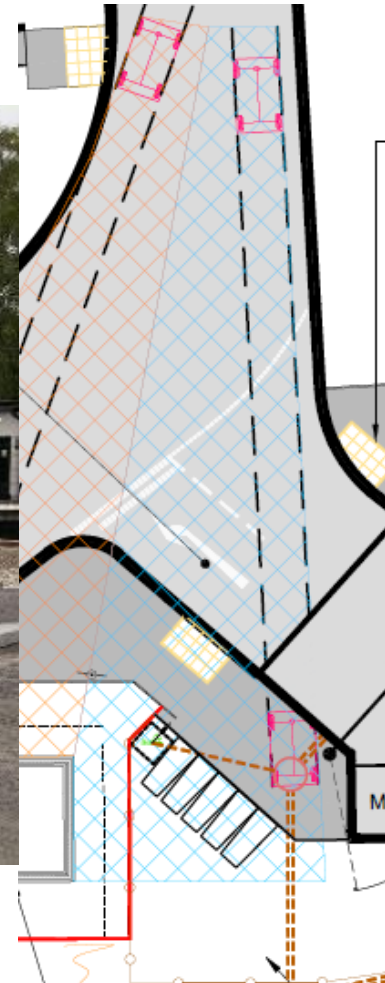
- Vehicle approaches bottom right corner too quickly
- 5 potential incursion sites across the station



Kirkstall Forge Incursion Sites

Site 1

- Bike sheds and fence are not crashworthy – vehicle may travel onto the tracks



Kirkstall Forge Incursion Sites

Sites 2 & 3

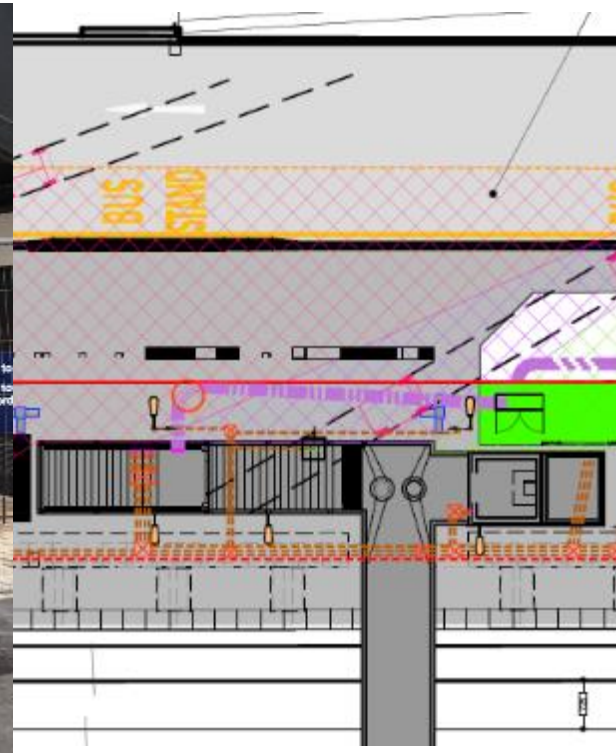
- Fences are not crashworthy – vehicle may travel between/behind substation and onto track
- Lowered kerbs



Kirkstall Forge Incursion Sites

Site 4

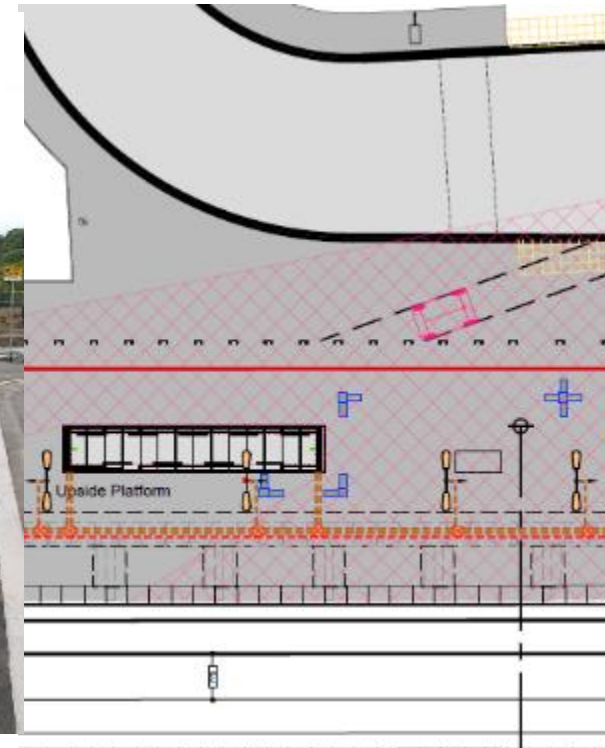
- Bench and fence is not crashworthy – vehicle may travel under the stairs and onto the platform/track



Kirkstall Forge Incursion Sites

Site 5

- Adequately protected by existing bollards



ALARP Review

- Based on NR Standard - risk assessments of bridges and neighbouring sites
- Evaluate each incursion site based on:
 - Vehicle trajectories
 - Existing mitigations
 - Design “gaps”
- Analyse each mitigation measure based on:

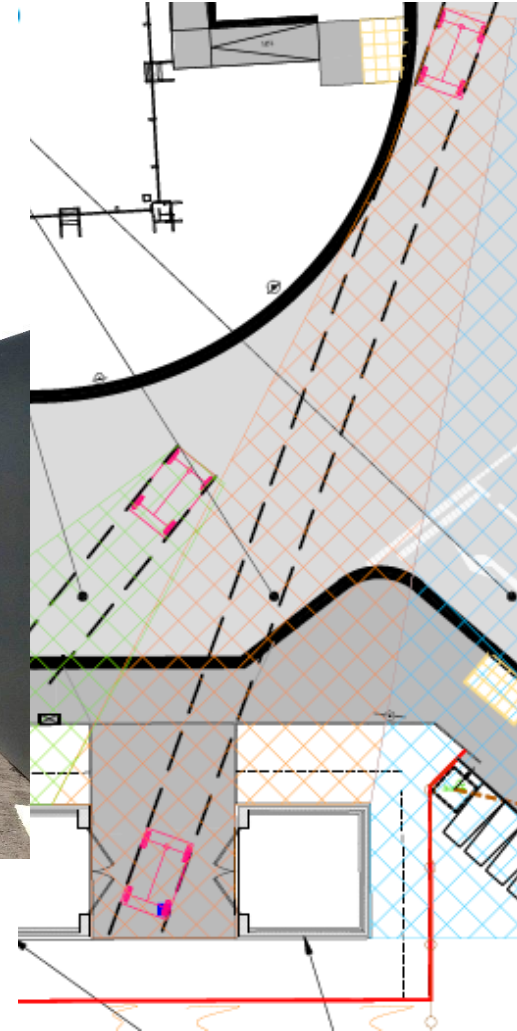
		Effort (cost, time, difficulty etc.)		
		Low	Medium	High
Benefit (risk reduction)	Low	Consider	Do not implement	Do not implement
	Medium	Implement	Consider	Do not implement
	High	Implement	Implement	Consider

The new mitigation measure must be able to withstand:

- Up to 2.5 tonnes (e.g. car or van) travelling at 25 mph
- Up to 13 tonnes (e.g. bus) travelling at 10 mph

ALARP Review

Potential Mitigation Measures – Incursion Site 2 (Between the Substations)



ALARP Review

Potential Mitigation Measures – Incursion Site 2 (Between the Substations)

Mitigation Measure	Benefit	Effort	ALARP Review	Notes
Droppable bollards	High	High	Consider	Deep foundations may disturb buried services. Can be dropped when access is required
Concrete lane guard barrier	Medium	Medium	Consider	May not take the full force of a vehicle impact, may bend or move
Large concrete planters	High	Low	Implement	Shallow foundations which will not disturb buried services. Can be easily moved when required by maintainer



Vehicle Impacts

Please view this [Youtube video](#) demonstrating the moment of impact between a vehicle and a large concrete planter



Conclusion

- The risk of station vehicle incursion is relatively low – 28 incursions per year
- 5% of all incursions result in a vehicle being struck by a train
- Consider vehicle incursions during station design
- Communication between railway and highway authorities
- Crash-worthy street furniture can reduce the risk even further – a wide variety available

