Towards step free journeys: the challenge of platform – train interface

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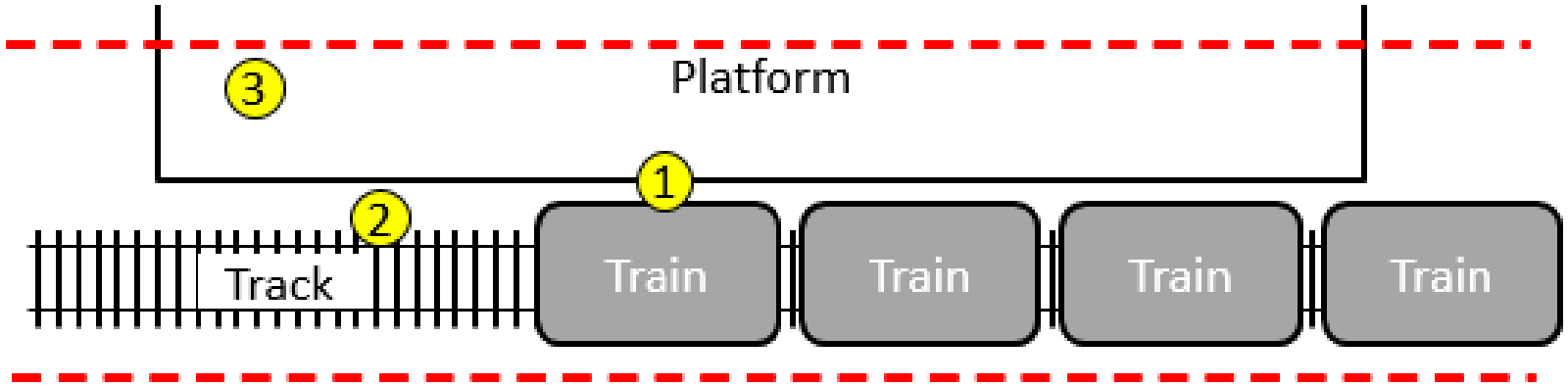
- Maths graduate turned engineer
- RSSB Principal Infrastructure Engineer
- Engineering leader for developing the Platform Train Interface (PTI) strategy
- Honorary Professor in Birmingham Centre for Railway Research & Education (BCRRE)

- Platforms are useful for getting in and out of trains!
- Surprisingly complicated when you start to look at the topic

Overview of Platform Train Interface (PTI) Strategy

- Developed by cross-industry group, chaired by Network Rail with strong involvement from Train Operators - First issued in Jan 2015
- As well as safety it covers:
  - Accessibility
  - Performance and capacity
  - Passenger movement through the station and across the PTI
  - Train stopping positions, dispatch etc
  - Optimisation of step / gap
- Recognises the challenge of a mixed traffic railway with legacy trains and infrastructure
- Taken up by Leading Health & Safety on Britain's Railways (LHSBR)
- Now being picked up in the National Rail Accessibility Strategy (NRAS) & the Whole Industry Strategic Plan (WISP)

Safety events in scope (from PTI Strategy)



Area of platform-train corridor	Type of event
1	Person trapped in train doors
	Contact with train exterior while on platform
	Person falling between train and platform
	Slip, trip or fall across the platform-train interface
2	Fall from platform onto track
3	Wheeled transport rolling off platform (crossfall)

Some R&D projects already completed as part of strategy

- T866 Investigation of platform edge positions on the GB network & T1037 Investigation of passenger vehicle footstep positions to reduce stepping distances and gauging constraints
  - Essential background for the strategy
- T1054 Evaluating Platform gap fillers to Reduce Risk at the Platform/Train Interface and T1062 Platform recess - review of requirements
  - Now incorporated in relevant standards and guidance
- T1098 Identifying mitigations for the risk of unplanned movement of wheelchairs and pushchairs on station platforms
  - Now complete and incorporated in standards
- T1102 Optimising door closure arrangements to improve boarding and alighting
- T1118 Yellow lines and platform markings
  - Now incorporated into standards and guidance

Public awareness: Lend a Helping Hand posters

Towards step f

Public awareness: Respect The Edge posters

Some examples of Platform Train Interfaces: International





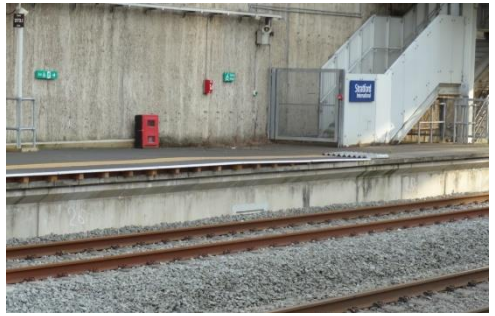




Some examples of Platform Train Interfaces: International

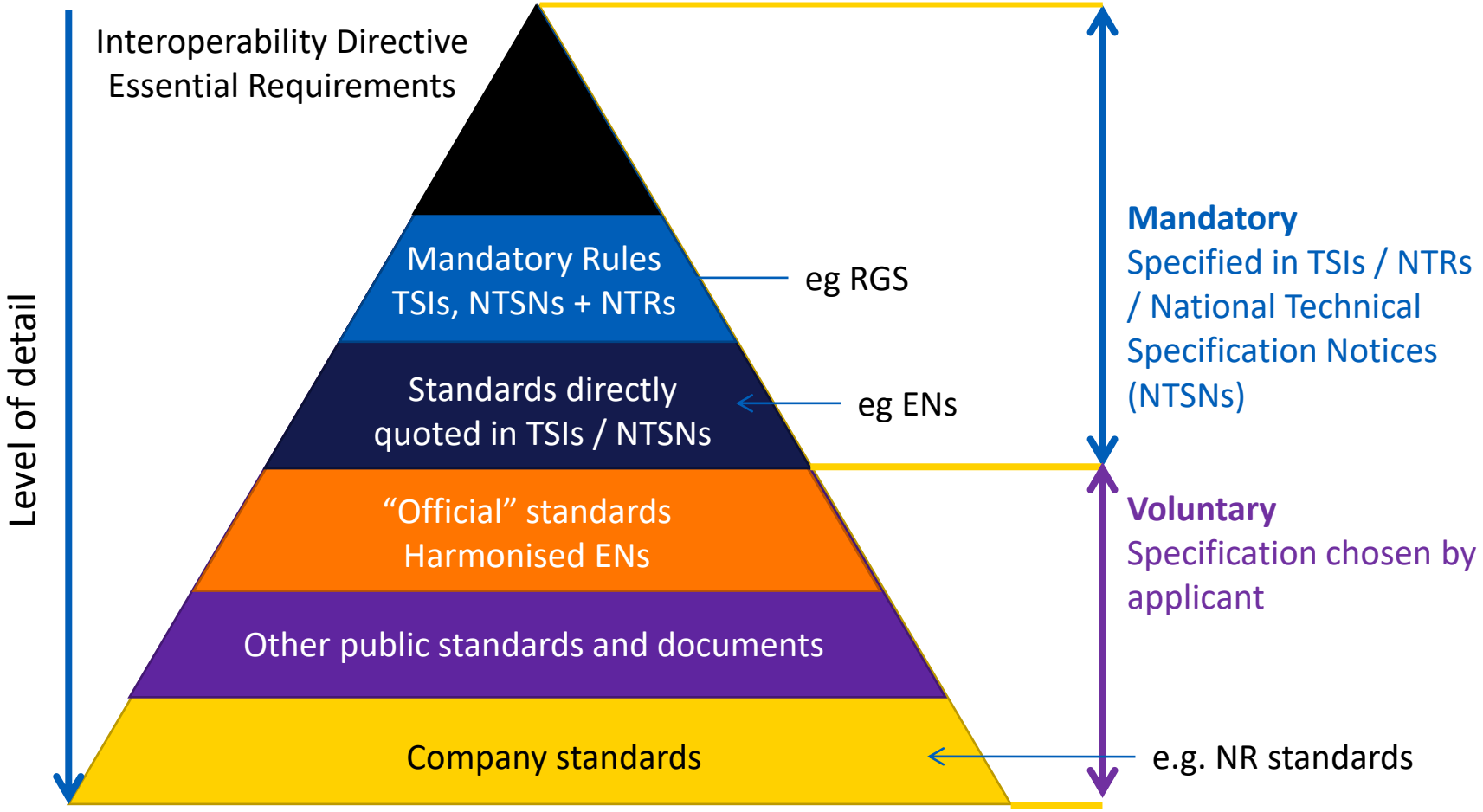
Some examples of Platform Train Interfaces: Great Britain






Railway standardisation pyramid



Standards for the Interface: Platform / Track / Train

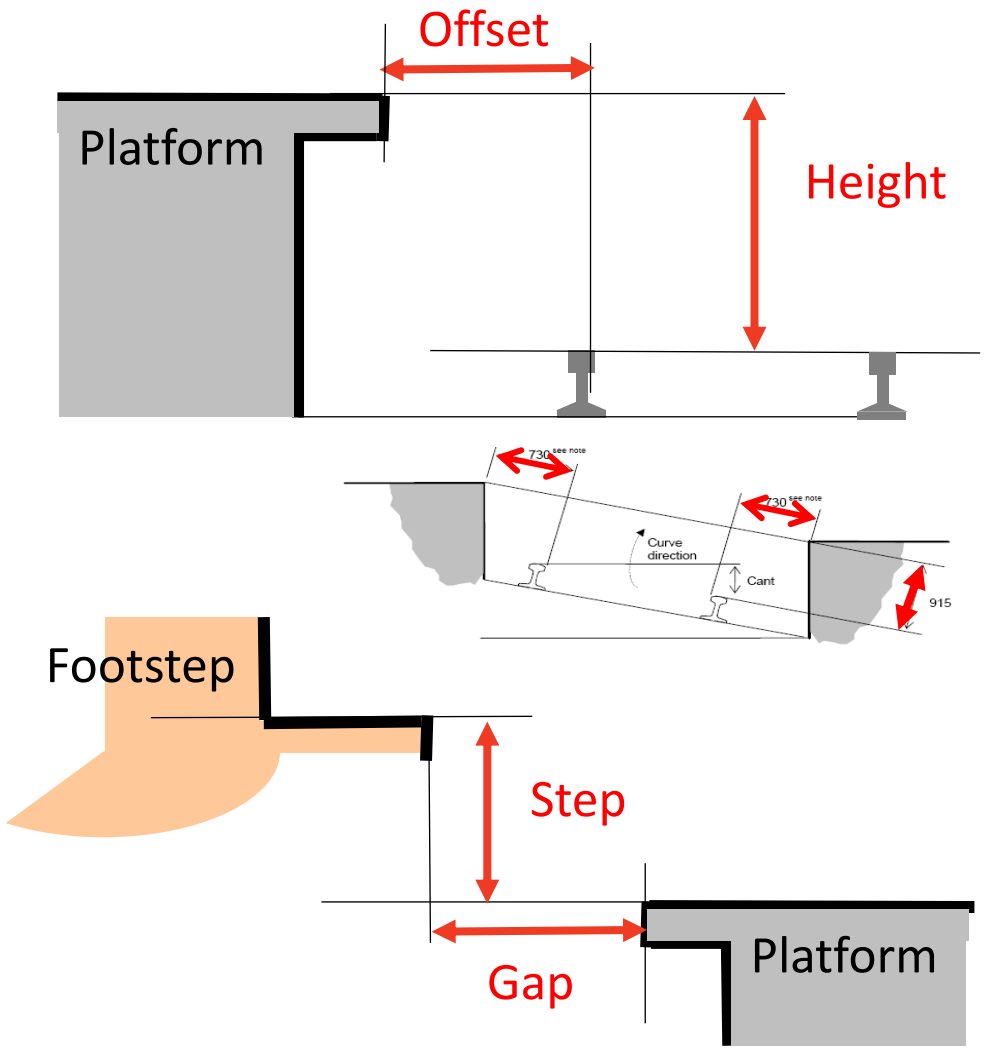
Topic	TSI / NTSN / EN	RGS / RIS
Platform height / offset	INF NTSN Specific Case	GIRT7020 / GIRT7073 / RIS-7016-INS
Platform width	PRM NTSN Open point	GIRT7020 / RIS-7016-INS
Track / platform curve	INF NTSN	RIS-7016-INS
Platform cross-fall	-	RIS-7016-INS
Footstep position	PRM NTSN	GMRT2173
Gauge clearance	INF NTSN Specific Case	GIRT7073
Platform lighting	PRM NTSN	-

- Guidance available in:
  - GIGN7608 Guidance on the Infrastructure TSI / NTSN
  - GIGN8615 Application of the PRM NTSN
- Most standards are not retrospective, only apply when work is undertaken

Definitions

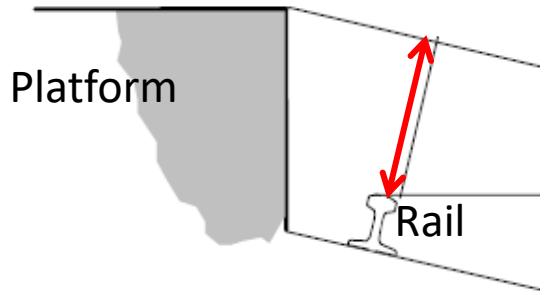
- Platform height:
  - measured from plane of rails
- Platform offset:
  - measured from rail running edge
- More complex on curved and canted track

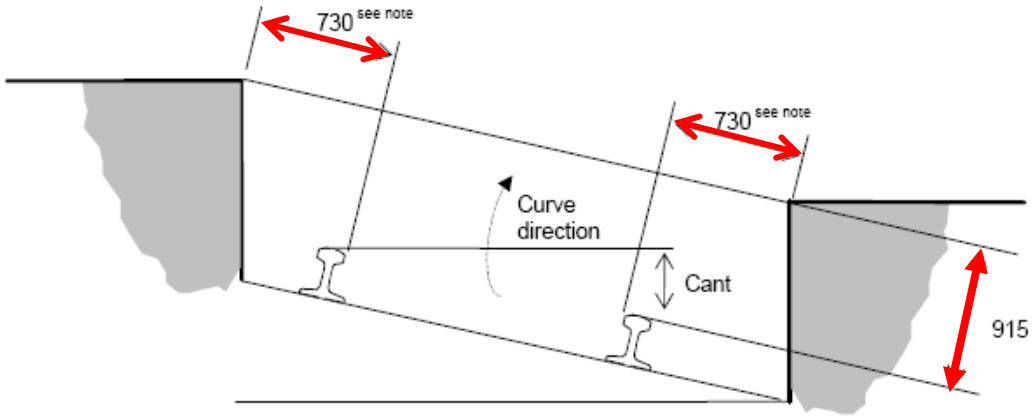
- Platform Train Interface:
  - Vertical step
  - Horizontal gap



Current Requirements – Platform position

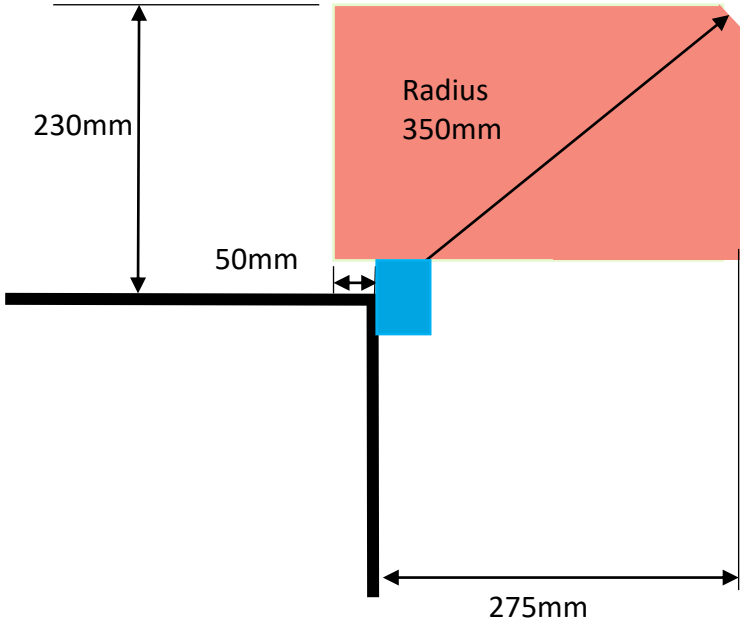
- Infrastructure TSI / NTSN
  - Target platform heights are 550mm or 760mm
    - Measured from the running surface of the rails
  - Target offset according to EN15273-3 (Structure Gauges)
- GB Specific Cases
  - 7.7.17.6 for Platform height, 7.7.17.7 for Platform offset
  - Refers to National rules
    - GIRT7020 for Platform height (915mm)
    - Gauging RGS for Platform offset (generally 730mm)





What is a ‘good’ PTI?

- Operators measure from footstep to actual platforms
- GB standards specify footstep position relative to nominal (not actual) platform:
  - The stepping ‘triangle’
  - But this does not mean the step / gap are ‘good’
- European Technical Specification for Interoperability (TSI) and GB National Technical Specification Notice (NTSN) specifies ‘unassisted boarding’ if:
  - Horizontal Gap ≤ 75 mm and
  - Vertical Step ≤ 50 mm (up or down)
    - But this is for negotiation by a wheelchair
    - May be a trip hazard for other passengers
    - Not all wheelchairs can negotiate this without assistance

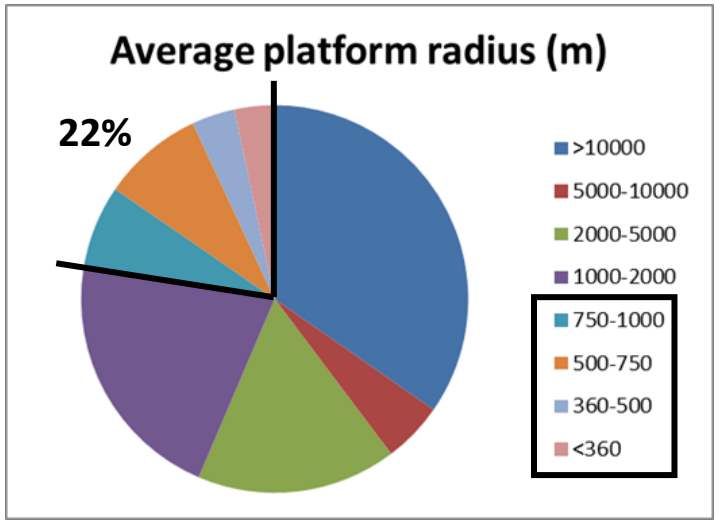


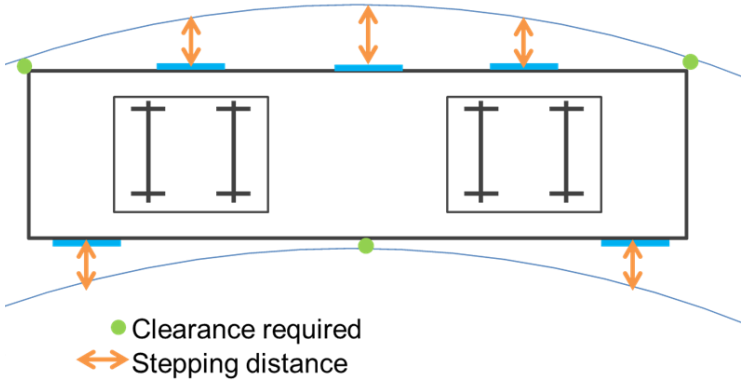
The Ideal World versus the Real World

- The Ideal World
  - All platforms are straight
  - All platforms are in standard position
  - Slab track in all platforms
  - All trains are the same
  - All door positions are the same
  - All trains stop
  - No freight traffic

The Real World: SOME platforms are straight …

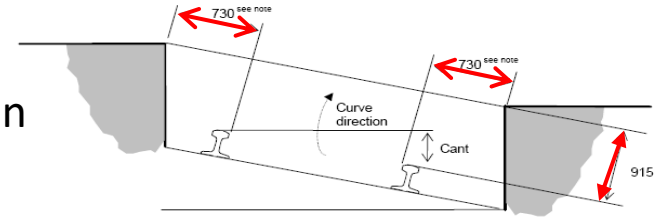
- Large numbers of curved platforms
  - Significant proportion, many in built up areas





- Conflict between
  - required clearance at vehicle ends / centre
  - stepping distance at doors

Installed cant in platforms is an added complication



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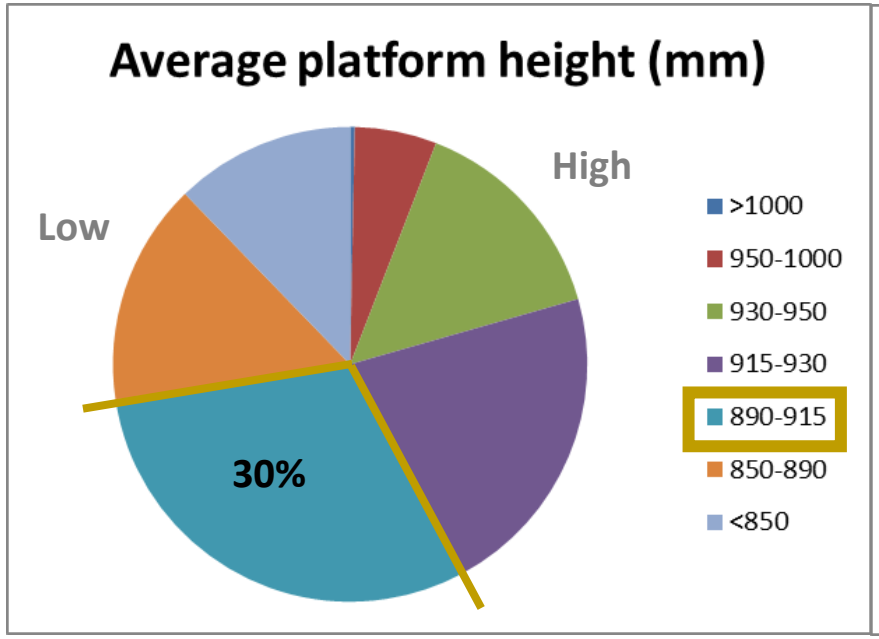
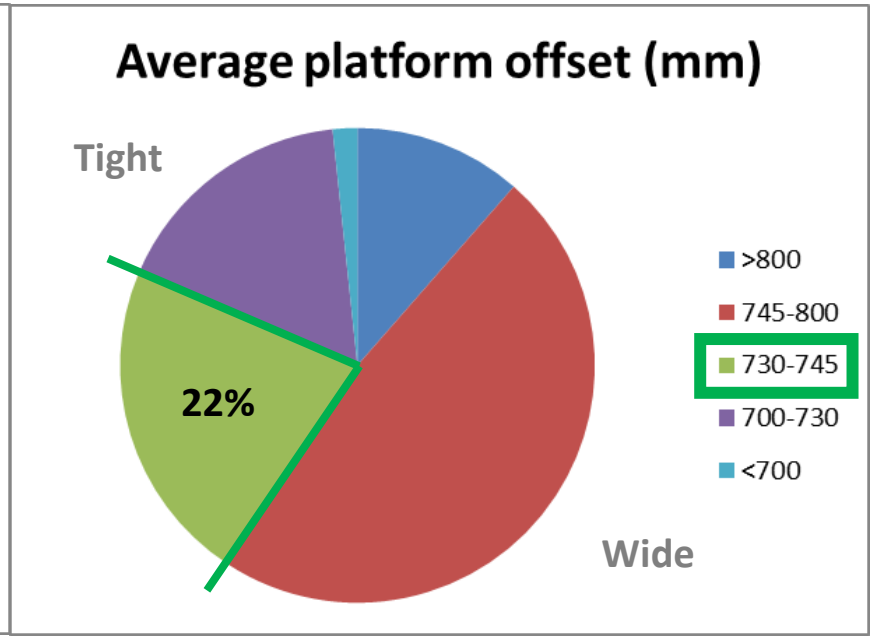
The Real World (GB mainline)

- 22% platforms have R < 1000 m

The Real World: all platform are in standard position?

- Current GB Mainline target position: 915 mm height; 730 mm offset but:
  - Most existing platforms not at this position & no requirement to modify them
  - No budget for major platform works & 'out of scope' of other station works





  - 30% in range for height, 22% in range for offset but **only 7% in range for both**

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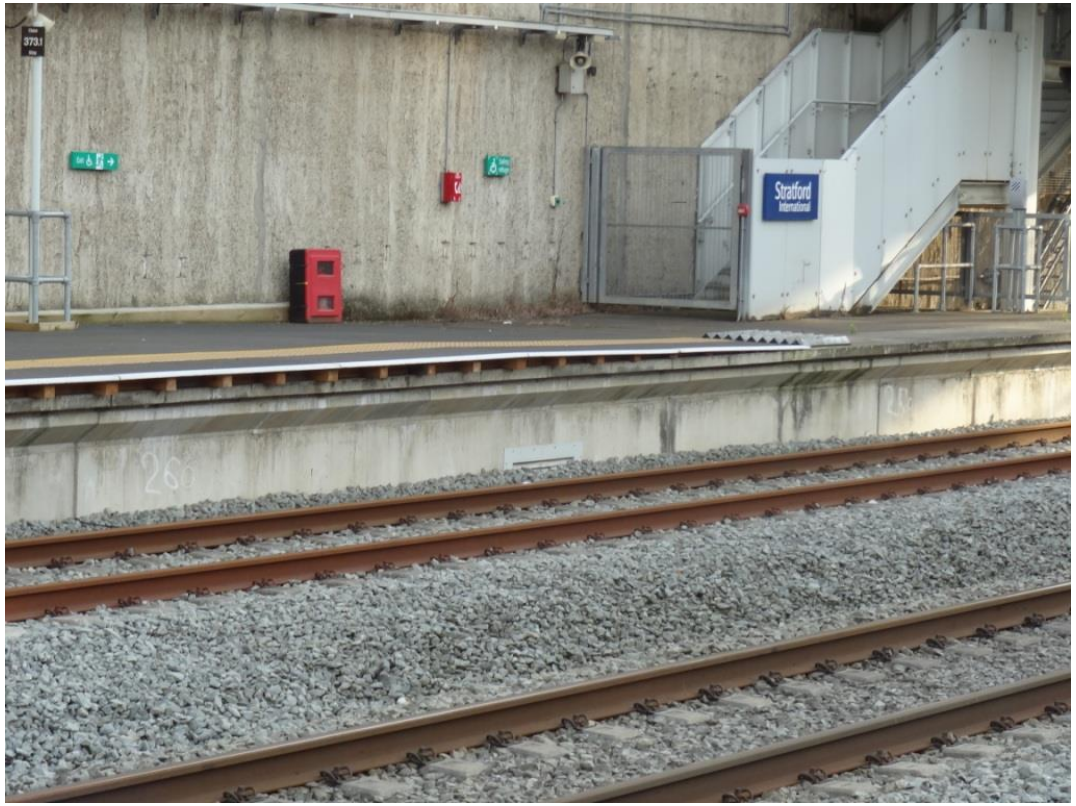
The Real World: slab track in all platforms?

- Most GB mainline track, including in platforms, is ballasted track



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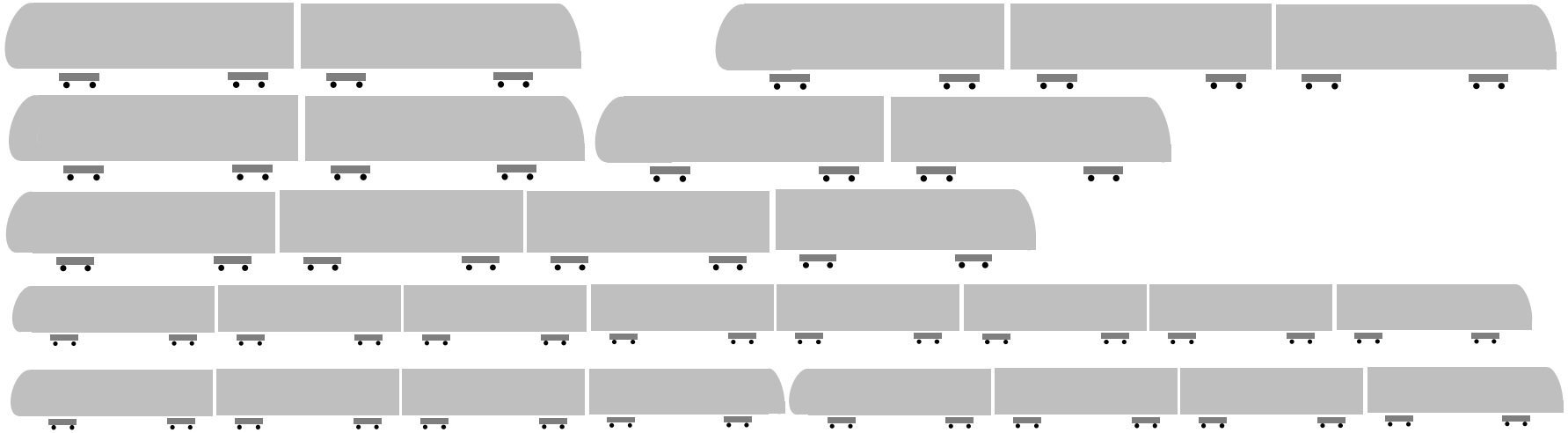
The Real World (GB mainline)

- 22% platforms have R < 1000 m
- 7% platforms are in target position
- Ballasted track in most platforms

The Real World: all trains are the same?

- Wide variety of trains with different:
  - Speeds: up to 125 mph (200 km/h)
  - Steps: fixed / deployable
  - Vehicle lengths:20 m, 23 m, 26 m

  - Number of cars: 2, 3, 4 ,5 ,6, 8, 10, 12 and multiples



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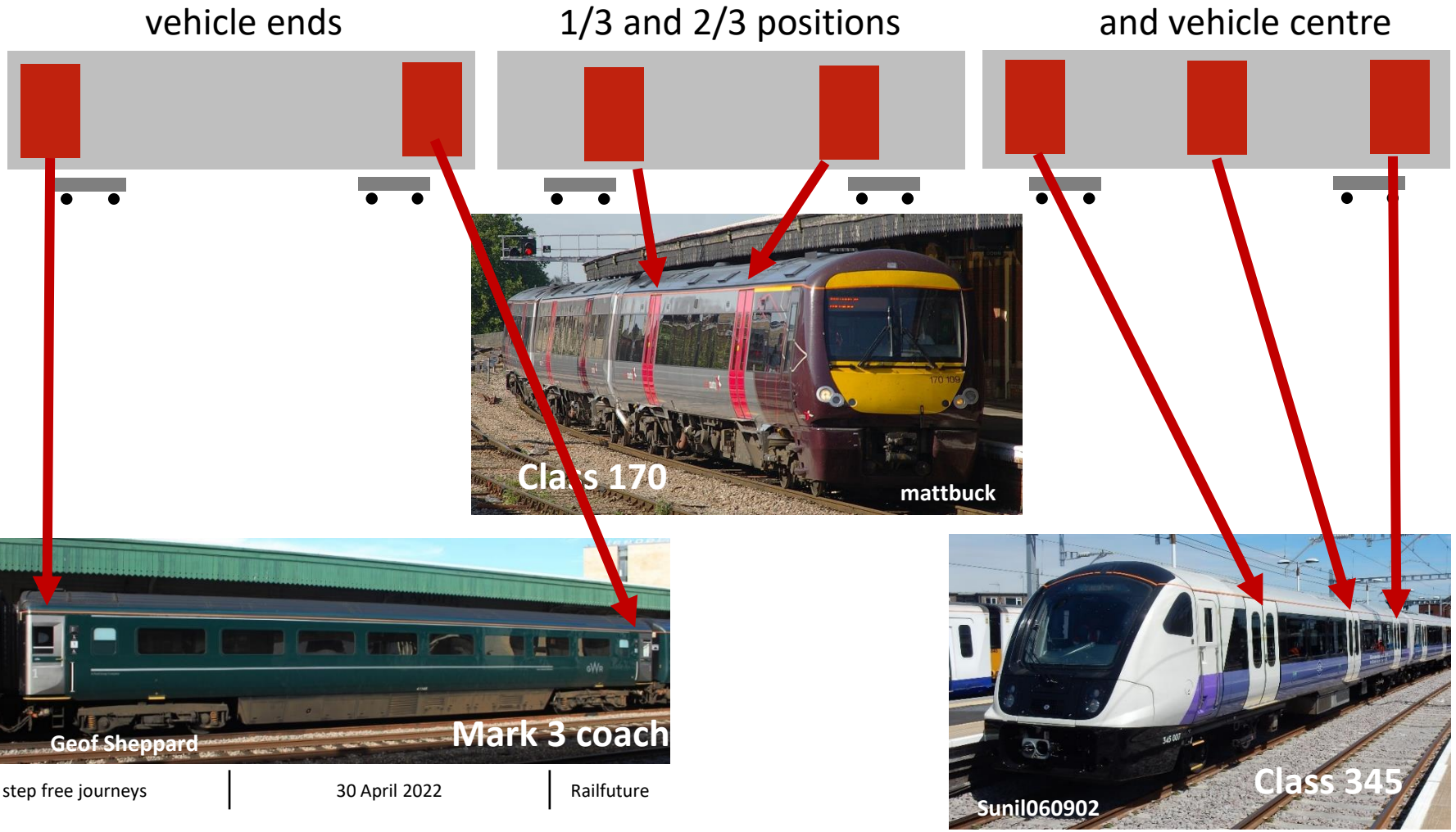
- Many different train designs

The Real World: all door positions are the same?

- Wide variety of trains with doors at:



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- Ballasted track in most platforms
- Many different train designs
- Doors at ends, 1/3 & 2/3, centre

The Real World: all trains stop: University station, Platform 2

Time	From	To	Operator	Vehicles
08:01	Lichfield TV	Bromsgrove	West Midlands	23m, doors: 1/3, 2/3
08:06	Birmingham NS	Hereford	West Midlands	Various
08:11	Lichfield TV	Redditch	West Midlands	23m, doors: 1/3, 2/3
No stop	Leeds	Plymouth	CrossCountry	Not stopping
08:23	Four Oaks	Bromsgrove	West Midlands	23m, doors: 1/3, 2/3
08:31	Lichfield TV	Redditch	West Midlands	23m, doors: 1/3, 2/3
08:36	Nottingham	Cardiff	CrossCountry	Various
08:41	Lichfield TV	Bromsgrove	West Midlands	23m, doors: 1/3, 2/3
08:51	Lichfield City	Redditch	West Midlands	23m, doors: 1/3, 2/3
08:56	Birmingham NS	Hereford	West Midlands	Various

- At other stations may have > 100 mph trains passing platforms

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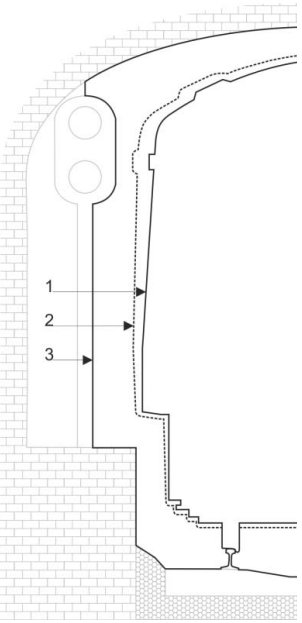
- Many different train designs
- Doors at ends, 1/3 & 2/3, centre
- Many different stopping patterns

The Real World: no freight traffic?

- GB is a mixed traffic railway
- Different types of operation at / past the same platform:
  - Suburban
  - Regional
  - Inter-city
- Freight
  - Range of speeds
  - Container trains

- Need to trade off gauge clearance against stepping distance



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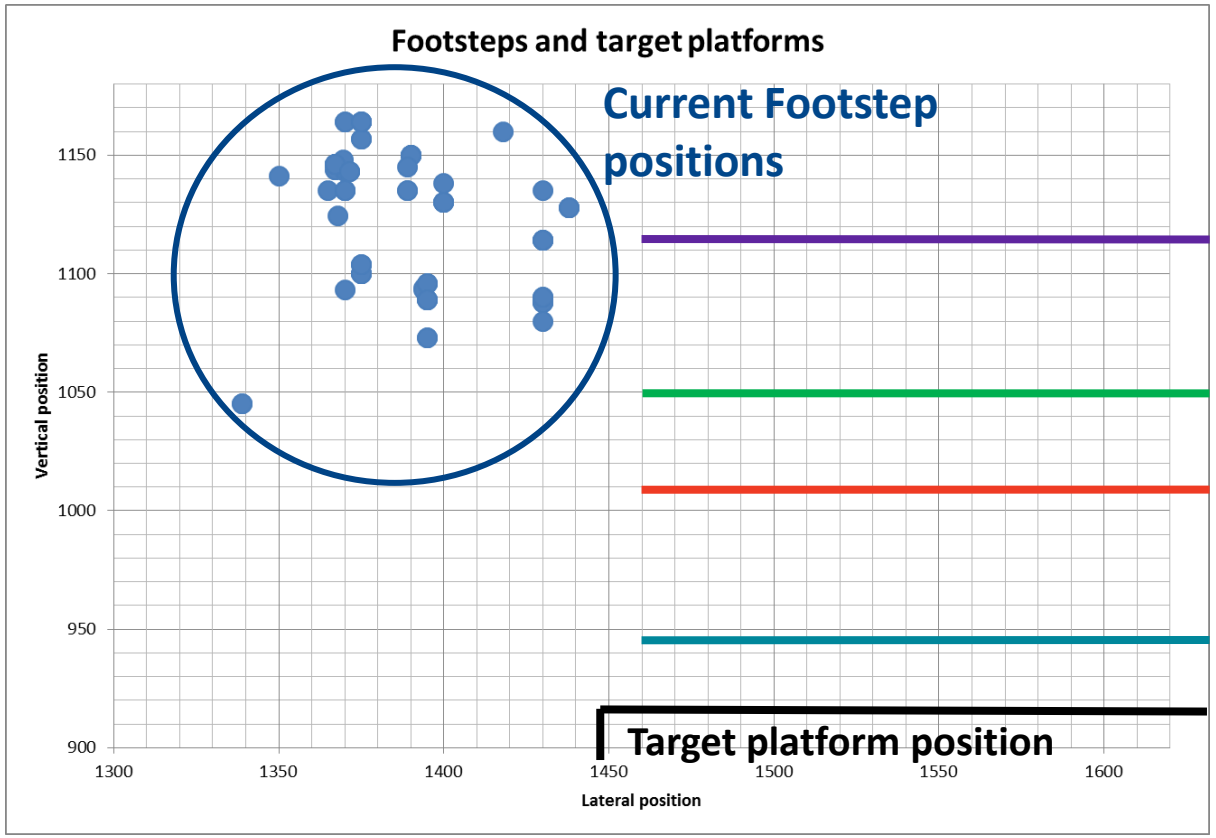
- Many different train designs
- Doors at ends, 1/3 & 2/3, centre
- Many different stopping patterns
- Freight traffic on most routes

- This is a challenge the industry has to recognise and respond to
  - Good things are already happening and we can do more
  - It is not hopeless but it will take time!

More about platform heights …



Possible platform positions

Height 1115

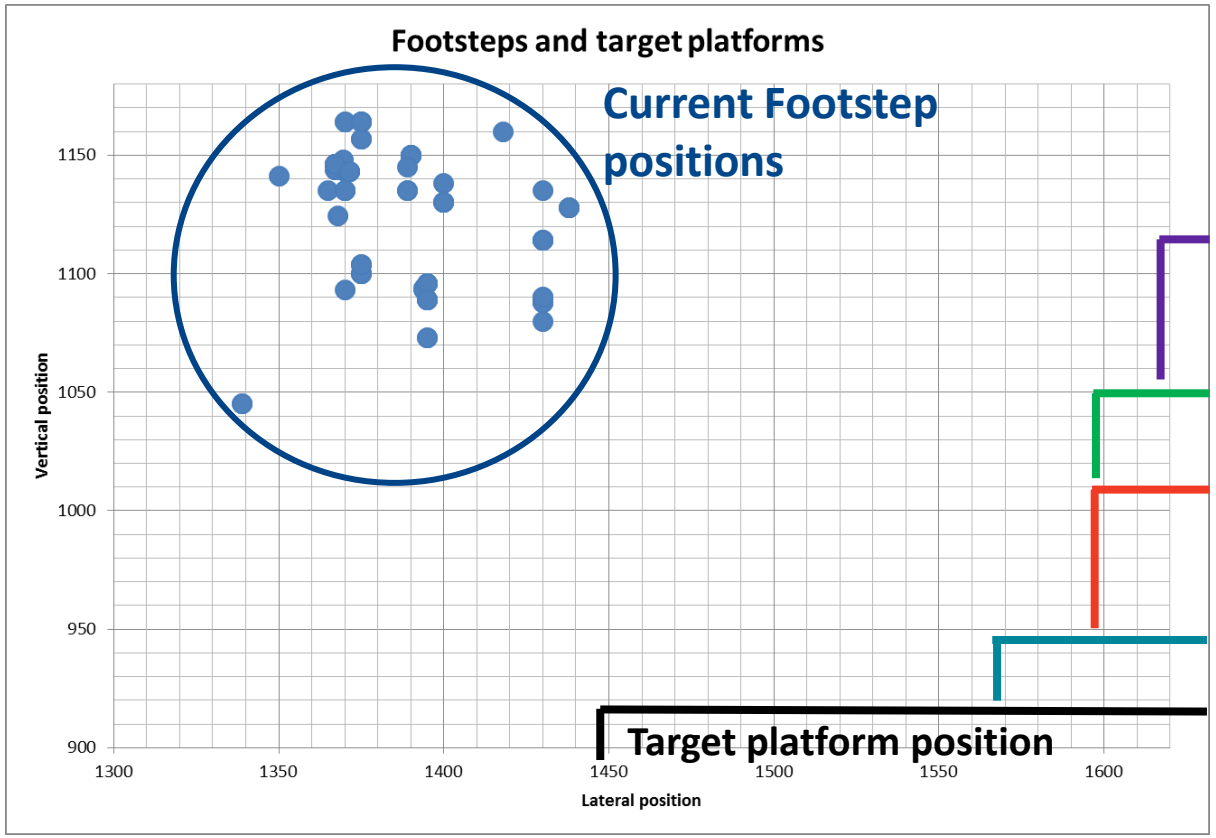
Height 1050

Height 1000

Height 945

Height 915, offset 730

… and resulting platform positions



Possible platform positions

Height 1115, offset 900

Height 1050, offset 880

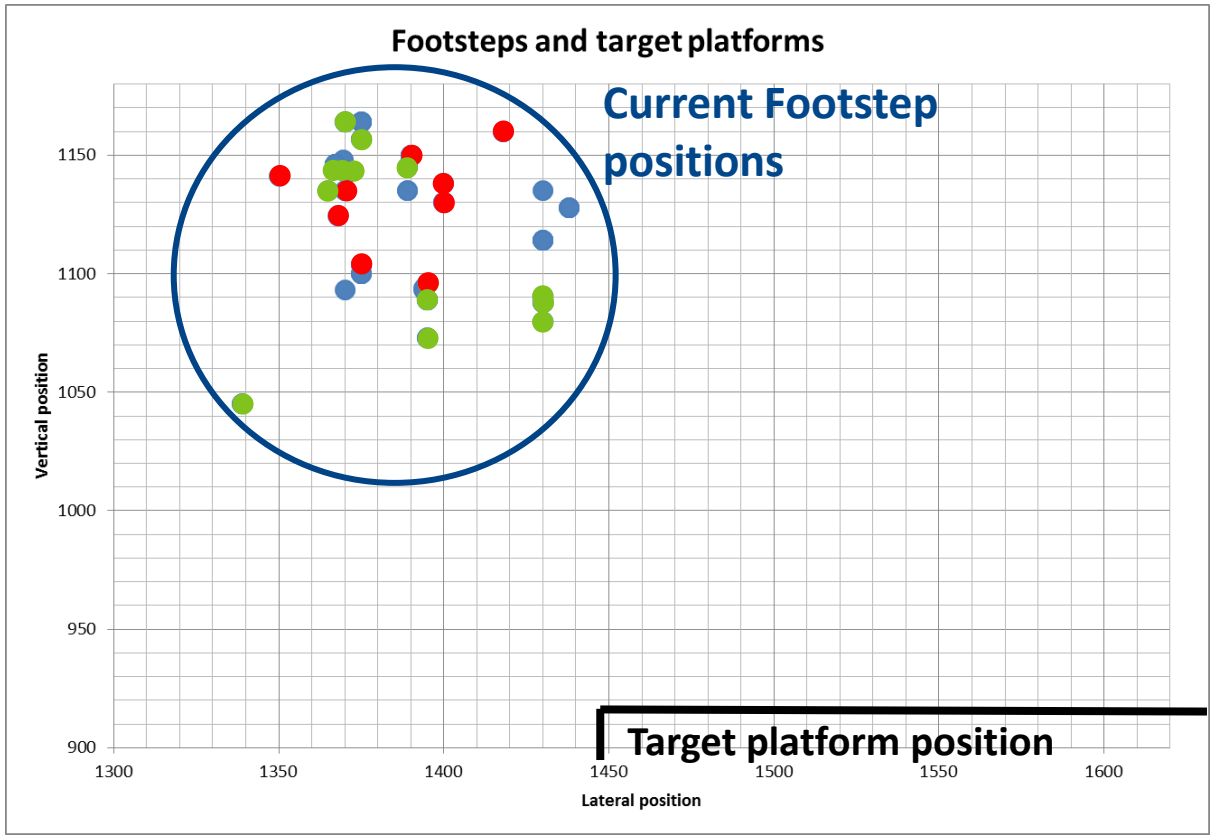
Height 1000, offset 880

Height 945, offset 850

Height 915, offset 730

- Higher platform gives smaller vertical step but larger horizontal gap
- Conclude that 915 mm remains the appropriate target platform height

What about footstep positions?



Pre 1995: scattered

1995 - 2003

2004 - 2011

'Go-anywhere' trains tend to give larger vertical steps and horizontal gaps

Height 915, offset 730

What about (horizontal) gaps?

- Heathrow Express
  - ‘Level’ access
  - Unassisted boarding
  - Small gaps
- But significant number of PTI incidents
- Fitted fixed gap fillers
  - Flexible in along-platform direction in case contacted by train footstep
- PTI incidents avoided
- Conclude that even small gaps can be an issue for some passengers

So what is a good PTI?

- Wheelchairs need ‘level access’ for unassisted boarding
  - But what is ‘level’?
  - HS2 studies identified that more than one small step is a serious obstacle
- What is the optimum PTI for different passenger groups?
  - Adults, children, buggies, luggage, …
- How do we balance a (horizontal) gap with a (vertical) step
  - A small step can be a trip hazard
  - A large step is an obstacle
  - A moderate step is ‘normal’
  - A gap is more disturbing ?
- We must find solutions that work in the real world
  - Not wish that we lived in the ideal world
  - Not hope that the laws of physics can be ignored!

Industry research and industry action since strategy published

Research completed and being implemented

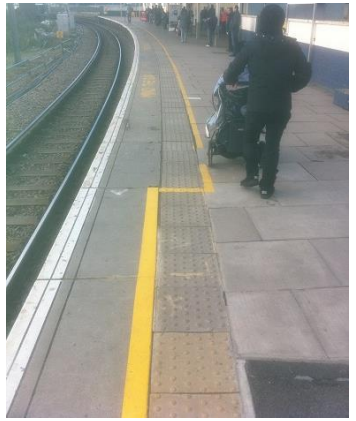
- Consistent platform markings
- Improved door closure alarms and obstacle detection
- Raising awareness of risks (staff and passengers)
- Review of use of train / platform cameras
- Review of ‘high and tight’ platforms

Some examples of platform markings: Great Britain







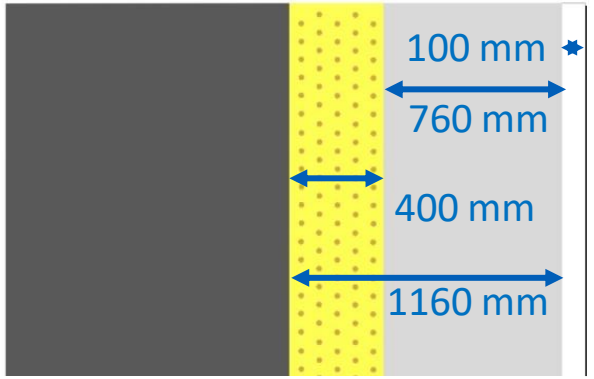






T1118: Optimising the design and position of platform markings designed to keep people away from the platform edge

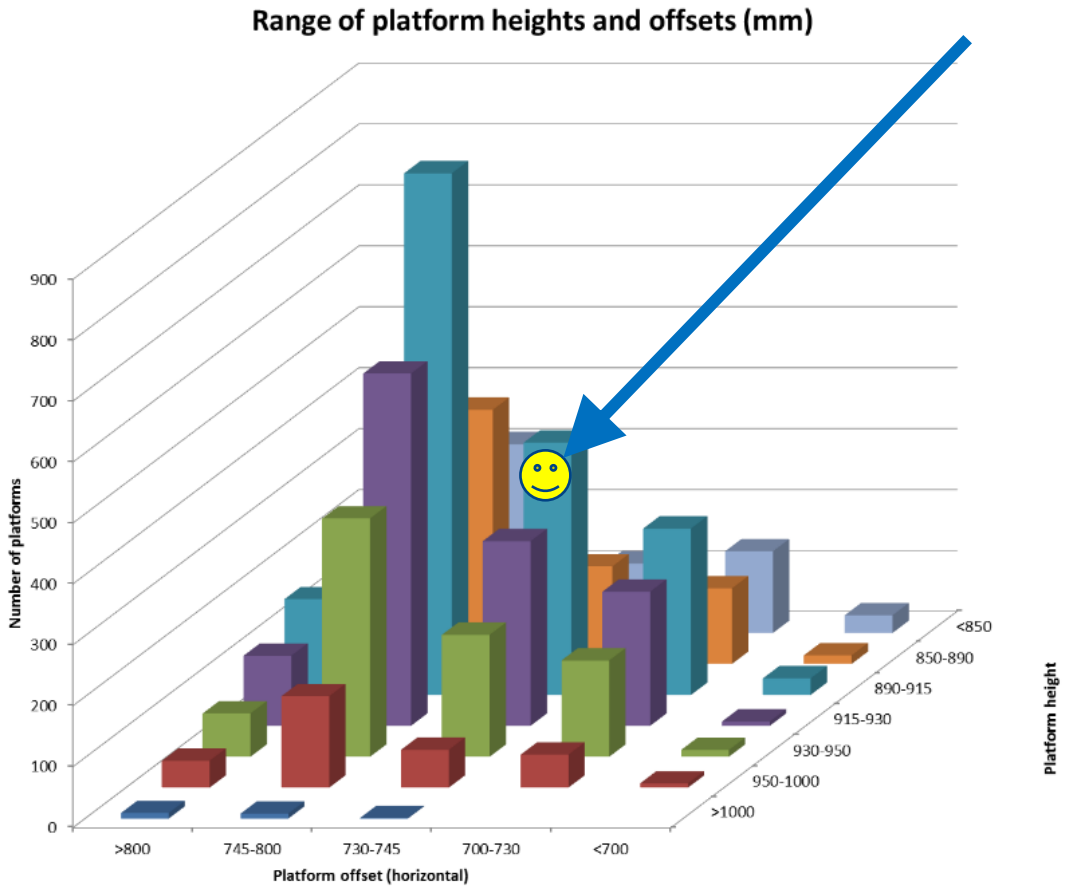
Research concluded that:

- Yellow line and tactile paving are generally understood
- Too many markings are confusing
- Increased consistency could improve understanding of meaning
- Tactile must be standard distance from platform edge on ALL platforms
- Proposed an integrated yellow line / tactile in standard default position
- Separate line & tactile for where default is not appropriate:
  - Aerodynamic risk (line further back)
  - Narrow platforms (line could be nearer)



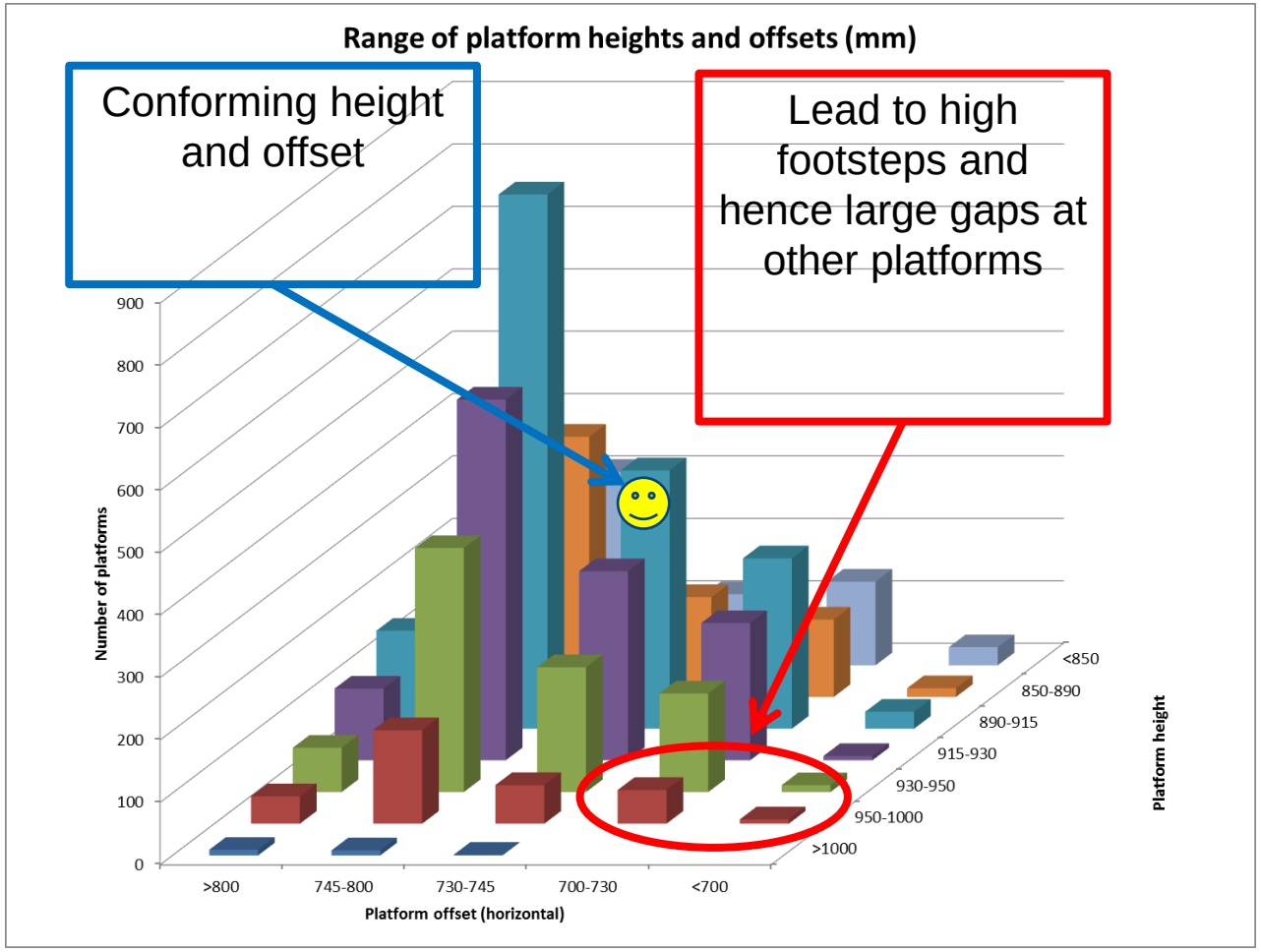
The real world is a challenge

- Work to date indicates that 915 mm remains the target platform height
  - For the GB mixed traffic railway
  - With current vehicle designs
    - Including freight and track maintenance trains
- How do we fund modifications to the many existing platforms that are not at standard height / offset?
  - There are about 2500 stations and 6000 platforms on the network
- Current processes / incentives lead to reluctance to tackle platforms
  - Even when significant station works undertaken



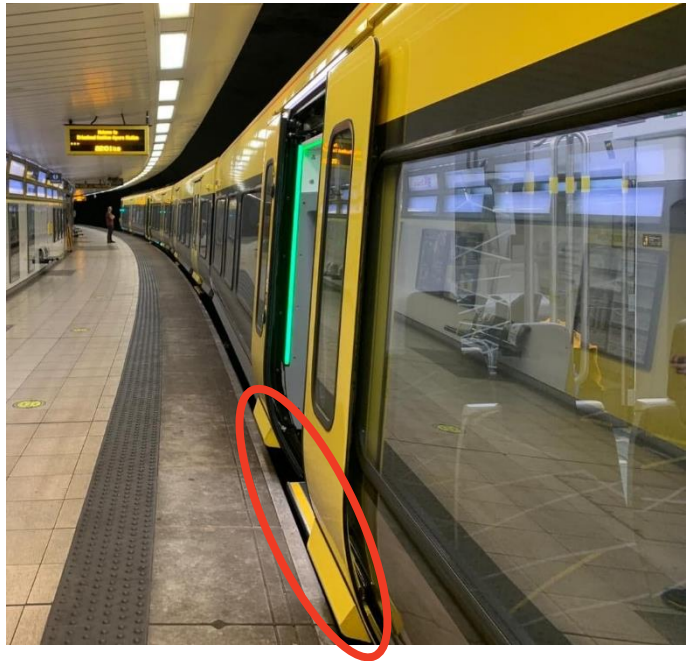
Review of high and tight platforms

- For ‘go anywhere’ trains a very small minority of ‘high’ and ‘tight’ platforms are restricting footstep position
- T1166 scope to :
  - Determine the critical locations
  - Review typical sites to understand the constraints
  - Analyse business case
  - Propose solutions
- Work now complete
  - Demonstrated potential for performance as well as safety and accessibility benefits
- Could lead to:
  - Improved footstep positions
  - Smaller stepping distances



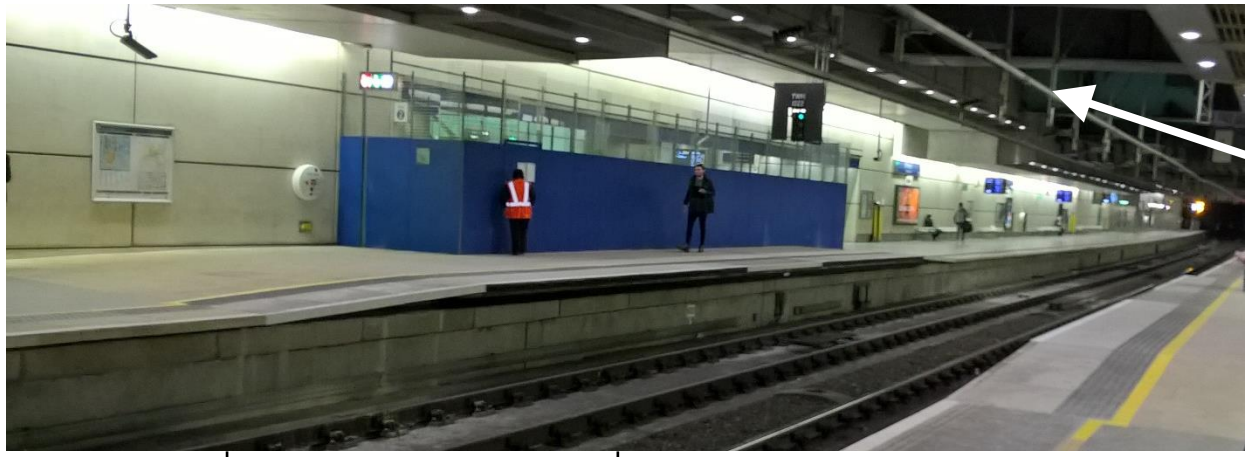
Specific approaches – (1) Lower floors & moving steps

- Greater Anglia: new trains
  - Lower train floors
  - Deployable bridging plate (train based)
- Merseyrail: new trains also have
  - Modified body profile to reduce gap away from doors
  - Lighting effects around doors
- Merseyrail platforms (or track) modified to give standard GB target position:
  - height 915 mm
  - offset 730 mm
  - Allows body side ‘Toblerones’
    - Would foul at non-standard platforms



Specific approaches – (2) Thameslink central core (London)

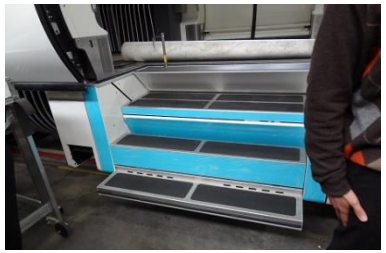
- Raised platform sections
  - For accessible doors
- Single train type
- Consistent door positions
- Gap fillers on platform
- No freight traffic
- Electrical clearances to OLE OK



Rigid electrical conductor

Challenges need solutions

- Modification to the ‘worst’ platforms
  - Example set by Merseyside
  - May require raising or lowering, work to platform or track
  - T1166 project demonstrated potential performance benefit as well as safety and accessibility
- Harrington hump
  - Raises sections of low platforms to target height
- What about vehicle floor / step height
  - More route specific footsteps (with ability to modify if needed)?
  - NOT go-anywhere trains
  - Reduce floor height on new fleets to match the platforms?
- What about deployable, ‘semi-smart’ or ‘smart’ footsteps
  - Already in use on many fleets internationally
- What about gap fillers or ‘smart’ platforms
  - How well do they work in the real world?



Thank you

More information available from:

www.rssb.co.uk

www.sparkrail.org