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# **Floor Safety for Rail Passengers - the future needs, based on past experiences**

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# Agenda

- The biggest passenger safety issue - Slips, trips and falls
- Operator Duty of Care and Legislation
- Safety Floors – why use them, how they work?
- What to consider when specifying flooring
- Pictorial Case Studies

## ***“Slips and trips do happen!”***

Andy Byford – Chief Operating Officer, RailCorp, NSW

Sydney Morning Herald, May 29, 2010

- Slips, trips and falls – 79.4% of all passenger injuries requiring hospitalisation (436)
- 29% of those were on the train or the train/platform interface (126)
- Ave 1.5 passengers injured from falls per million passenger journey.
  - NSW Rail Industry Safety Report 2008-09



# It's our responsibility, all of us...

## Duty of care - EU Directive 2004/49/EC

“All those operating the railway system, infrastructure managers and railway undertakings, should bear the full responsibility for the **safety of the system**, each for their own part..”

“(6) The responsibility .....does not preclude other actors such as manufacturers, maintenance suppliers, wagon keepers, service providers and procurement entities from assuming responsibility for their products....”

## ...even more important for high risk passengers...

- Disability EU regulations – Flooring surface Requirements
  - “All floor surfaces shall be slip resistant in accordance with National Rules for public buildings.” 2008/164/EC
  - Aim of this is to **reduce the risks of disabled passengers slipping and falling within the vehicle**, both when it is stationary and when it is moving.
  - Flooring must be slip resistant even in wet conditions.

## ...governments enforce it...

An Example -

California Public Utilities Commission –

- Oversees the safety of passenger rail systems by conducting inspections, accident investigations, and taking enforcement action.
- Responds to and investigates **complaints of unsafe carriers.**

# ...rail operators are liable...

## EC REGULATION 1371/2007 ON RAIL PASSENGER RIGHTS (from 3 Dec 2009)

### Liability in case of accidents

The railway shall be liable for the loss or damage resulting from the death of, personal injuries to, or any other bodily or mental harm to, a passenger, caused by **an accident** arising out of the operation of the railway and happening **while the passenger is in, entering or alighting** from railway vehicles.



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**...so what can you do?...**

**Design safety features into your  
project.**



## ...safety flooring in passenger trains...

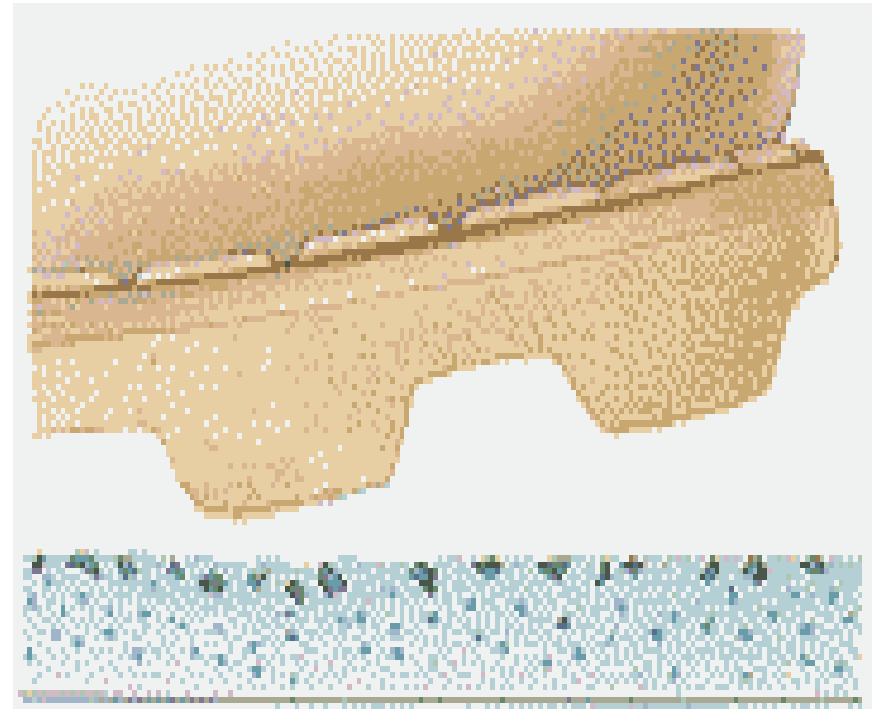
- Why? Reduces the likelihood of slips and falls
- Slips and falls are a leading source of injury for passengers
  - elderly, young and disabled are high risk groups
- There is a greater risk on a moving vehicle
  - Provides underfoot stability
- Areas prone to becoming slippery when wet need greater slip resistance
  - Near entry & exit points where it is most dangerous, is also where it is most likely to be wet.



## ...how does a safety floor work...

A good quality resilient safety flooring should:

- Firstly: Achieve Pendulum > 36 or R10 for slip resistance
- The pressure created by walking over the flooring causes the aggregates embedded in the flooring to push up and rub against the shoe causing friction.
- Because of this it remains slip resistant even when wet.
- When pressure is released the floor regains its original, smooth, easily cleaned surface.
- Alleviates need for dirt-collecting raised studs or other profiles



## ...and for the visually impaired...

### Light Reflectance Values (LRV)

- Light Reflectance Value is a measurement commonly used in interior design, which expresses the percentage of light that is reflected from a surface
- Used to assist orientation and navigation within a space by visually impaired passengers.
- “The critical surfaces within the passenger saloons are the floor, the wall panels, the ceilings, the doors and the seating. In a **best practice vehicle** these surfaces will be distinguishable from each other.” UK Rail Vehicle Accessibility Regulations 1998
- 30% differential in LRV is minimum between areas.
- Flooring suppliers should publish the LRV values to assist specification

## ...and vehicle accessibility...

### Step nosings –

- Particularly important to highlight where flooring ends and where the platform, gap or step down begins –
  - A high colour contrast step nosing assists visual recognition.

*UK Rail Vehicle Accessibility (Non-Interoperable Rail System) Regulations 2010 (RVAR):*

- (6) At a **passenger doorway** in the side of a rail vehicle the floor must have a band of single colour running parallel with the full width of the entrance
- All rail vehicles, both heavy and light rail, must be ‘accessible’ by no later than **1 January 2020**.



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## ...assisting passengers even more...

- Floor Signage examples
  - Mind the Gap
  - Keep Clear
  - No Standing
  - Wheelchair positioning
  - Bicycle



# ...into the future...

## SAFEINTERIORS

- Research Program backed and funded by EU
- Expected to set benchmark for **Train Interior Passive Safety**
- Research by consortium of major industry players
- Expected results to include:
  - Appraisal of state-of-art design practices for interiors and identify gaps in design practices
  - Requirements for People with Reduced Mobility with identification of other associated functionalities
  - New design specifications for interior equipment, furniture and layouts.
- Full Report due by end 2010 after 4 years research

## ...when considering flooring...

- Lifecycle Assessments
  - Durability becoming increasingly important
- Lightweighting
  - recent study shows a 10% reduction in vehicle mass equate to a 7% savings in energy consumption  
(Carruthers et al -Proceedings of Institute of Mechanical Engineers Vol 223 Part F)
- Ease of cleaning and your cleaning regime
- Comfort under foot
- Aesthetic design
- Compliance



## ...compliance to European standards...

- Relating to reducing spread of flame; ignitability; heat release; smoke; toxicity.
- Most countries have existing requirements for conventional rolling stock
- Currently floors in Europe must meet one of five national standards:
  - British BS 6853
    - Also often used in Asia
  - French NFF 16-101
  - German DIN5510 (with toxicity tests)
  - Italian UNI CEI 11170
  - Polish PN-K-02511
- These requirements due to change to the **new** pr EN 45545-2 to standardise the national regulations over the next couple of years.
- Note - **New European specifications are already starting to include this new standard.**

## ...some case studies...



Virgin Trains 'Shop' - Altro Transflor MET 20



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# Hong Kong MTR





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# Shanghai line 2

## Altro D25

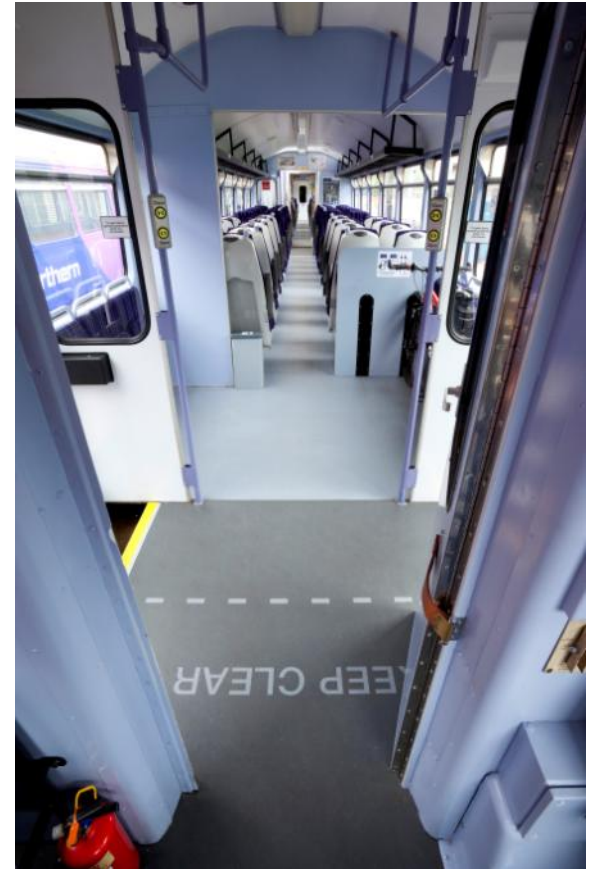
[www.altrotransflor.com](http://www.altrotransflor.com)

# Bangkok BTS Skytrain





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Northern Rail Altro Transflor MET 20

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## ...in summary

- Slips and falls are the major cause of passenger accidents
- We all have duty of care to provide safe public transport
- Government legislation and enforcement
- International trends are towards increasing liability for operators and stricter compliance levels...



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**...safety is the future.**



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