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# The Importance of Human Factors Integration in the Design of Stations in ensuring Passenger Safety

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# Introduction

Appropriate design at stations matters because inappropriate design can result in risks to the safety of passengers.

- ▶ Human safety, health and performance can be affected by inappropriate design of equipment, work processes, working environments and passenger facilities.

RSR stats indicate that most injuries and deaths that are reported at stations are due to platform-train interface misalignments.

- ▶ approximately 570 cases reported in the 2014/15 FY

# The South African Context

SA has had a railway sector for over 150 years

Over 2 million people using rail transportation daily

SA's extensive rail network is one of the largest in Africa and accommodates passenger services which cover over 28 million train kilometers annually

Rail existed for many years without an independent regulatory body.

- ▶ Station standards do not consider HF elements
- ▶ Operators develop their own station design guidelines and standards.
- ▶ The RSR is not consistently consulted to identify areas that need to be addressed through appropriate design.

Rail also existed for years without Human Factors.

- ▶ Operators are required to have policies to support the structured application of ergonomics in the development or modification of railway infrastructure.

# South Africa's Unique Challenges

- ▶ Stations built years before other structures were erected around them
  - ▶ Taxi ranks
- ▶ Poor spatial planning resulting in informal settlements
- ▶ Aging infrastructure and rolling stock
- ▶ Challenge understanding the role of Human Factors in rail
- ▶ High vandalism rates and commuter violence
  - ▶ Commuters torching the stations because of service disruptions

# Analysis

**Premise:** Stations must provide for the free and safe movement of people to support passenger flow and well-being.

A well designed station must be:

Safe  
Inclusive  
Accessible  
Delightful  
Sustainable

This project, even as a small scale evaluation of the presence of HFI, served as an essential first step in identifying potential gaps in the safety system of the station environment.

# Outline of Analysis

- ▶ A small scale analysis on the design of PRASA stations country wide
- ▶ A total of 25 stations were analysed in the Gauteng, Kwazulu-Natal and Eastern Cape regions.
- ▶ A majority of the stations analysed were bidirectional stations with at least 2 platforms with ballast tracks.



Station exit and access pathway



Footbridge at a Station





Turnstile gates at a station



Information board at a station



Broken elevator at a station



Steps added to gain access to the platform



Two platform station



Passengers waiting at the station



Passenger detraining at a station



Platform-train interface







Passengers entraining at a station

# Findings

- ▶ Footbridges are the main means of access to the stations
- ▶ Limited number of information posters/boards at stations (especially smaller stations)
- ▶ No procedures to manage overcrowding
- ▶ Limited and inconsistent signage at stations
  - ▶ Faded or absent safety alerts
- ▶ Poor external access to stations layout
  - ▶ Poor design of commuter walkways
- ▶ Limited number of public address/commuter announcement systems across stations and no communication guideline
  - ▶ Inconsistent announcements to commuters at stations

# Findings cont.

- ▶ Inadequate security personnel at stations
  - ▶ Vandalised station equipment
  - ▶ Limited access control; commuters accessing stations through platform ends
  - ▶ Commuters attempt to board moving trains
- ▶ Commuters hanging on the train
- ▶ Commuters detraining on the railway line and not on the platform
- ▶ Lack of emergency evacuation instructions, arrangements and assembly points
- ▶ Misaligned train and platform interface leading to platform gaps

# Way Forward

- ▶ HFI; top to bottom
  - ▶ Passenger flow and management does not only exist in the station; there are numerous related systems that must be managed to aid it (the station is merely one of those systems)
  - ▶ A systems view of HFI
- ▶ HFI process must be viewed as being highly iterative and dynamic, and as an integral part of the design and development process.
- ▶ Early identification of issues results in easier and cheaper fixes.

# Way Forward cont.

- ▶ Station re-design with HFI
- ▶ Security management
  - ▶ Securing stations against theft and vandalism
- ▶ Commuter communication
- ▶ Emergency preparedness
- ▶ Inclusion of HF in station standard
- ▶ Creation of customer communication guidelines

# Conclusion

- ▶ Failure by operators to integrate HF into the design and layout of railway stations.
- ▶ The noted failures in HFI may mean safety of passengers at stations is compromised.
- ▶ The existence of ineffective public spaces cripples efficient passenger flow.

Thank you for listening!

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