आज़ादी का अमृत महोत्सव

G20 भारत 2023 INDIA

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS

स्वच्छ भारत
एक कदम स्वच्छता की ओर

EMBEDDING RESILIENCE IN TRANSPORT SYSTEM

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16th Urban Mobility India Conference & Expo 2023

CONTENTS

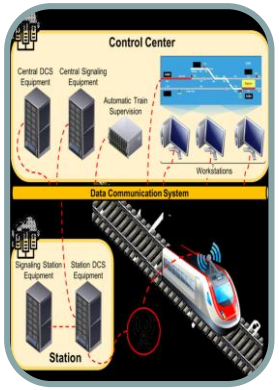
1. Introduction
2. Stations
3. Viaduct – Use of U Girders
4. Systems
5. Operations
6. Role of Consultants

1. INTRODUCTION

Embedding resilience in a transportation system is an ongoing process that requires collaboration between government agencies, private stakeholders, and the community. It involves proactive planning, investment, and adaptability to ensure that the transportation system can withstand and recover from various challenges.

STEAM ENGINE → BULLET TRAIN

HAND SIGNALS → CBTC



MANUAL OPERATION → DTO/UTO

CORNERSTONES OF RESILIENCE

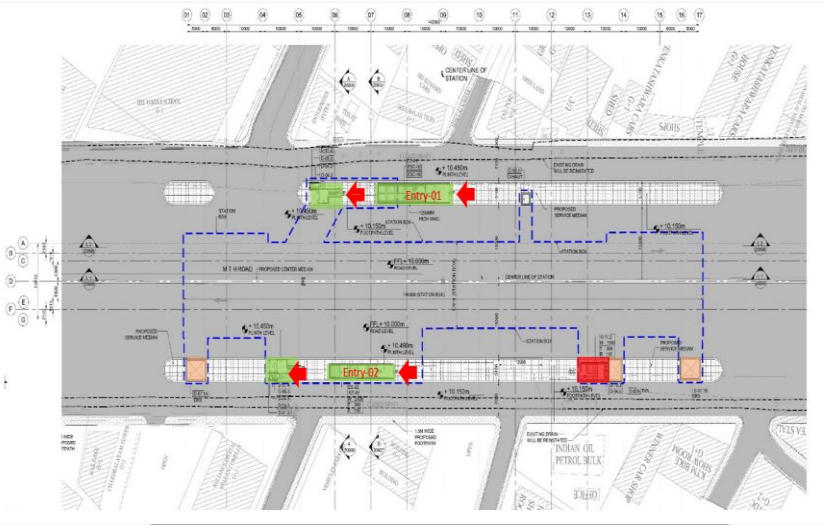
- Passenger Centricity
- Continual Technical Improvement
- Cost effectiveness
- Sustainability

2. U/G STATION

TYPICAL LAYOUT OF A CONVENTIONAL U/G STATION

- Staircases, Escalators & Lifts
- Fire escape staircases
- Ancillary Block
- Shafts

No. of Entries -04
No. of Firemen staircase – 02
Separate Ancillary building - 3 Floors
Station Box Size – 228.6m X 21.20m



TYPICAL LAYOUT OF A COMPACT U/G STATION

- Staircases, Escalators & Lifts
- Fire escape staircases
- Shafts

No. of Entries -02
No. of Firemen staircase – 01
No Separate Ancillary building
Station Box Size – 144m X 18m

2. U/G STATION – COMPACT DESIGN

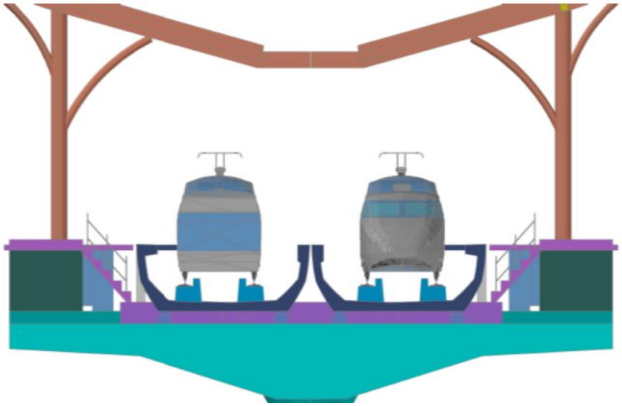
ADVANTAGES

- All functional and redundancy requirements are met with only two TVFs per UG station.
- Nozzle used to get the desired pressure.
- Variable frequency drive fans for OTE. No UPE.
- Using Concourse for TVS, VAC, ASS and other system rooms
- Major Reduction in Civil cost. No ancillary building
- 2 crores per UG station is saved only because of reduction in fans and dampers. Additional savings will include civil space, transformers etc.
- CAPEX & OPEX (Energy) savings just for TVS Innovative design for the entire Chennai Phase 2 will be of the order of 1000 crores for about 40 UG stations

2. U-SHAPED GIRDER METRO STATIONS

The U-Shaped Girder can be implemented for Metro Elevated Stations with following advantages:

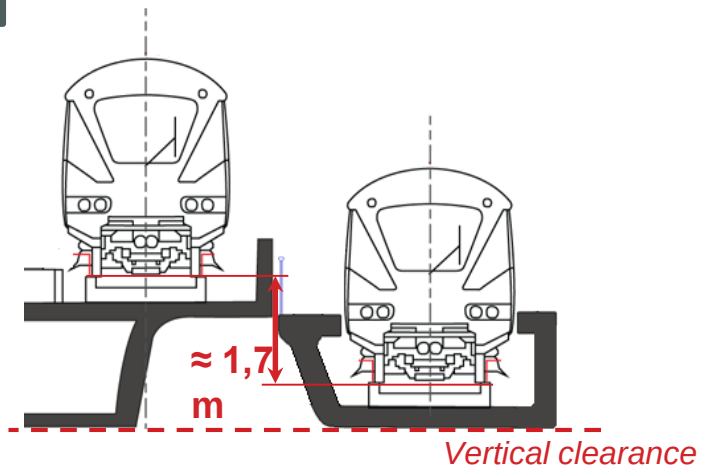
- Rail level can be reduced by 1.8m to 2.0m
- Construction of station will be faster by using U-shape viaduct.
- U-girder outer web top flange can be used as platform & for PSD installation
- Larger Grid spacing can be considered for reducing no. of substructure.
- Platform cross arm can be full precast type.

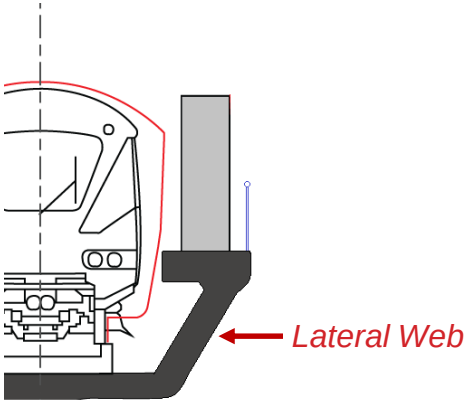


3. U-SHAPED VIADUCT

ADVANTAGES

- Reduced piers reinforcement due to lower bending moments at pier base
- Reduced foundations size and station height
- Reduced overall visual impact of MRT line
- Lateral web works as noise barrier, walkway and anti-derailment wall while providing cable supports.

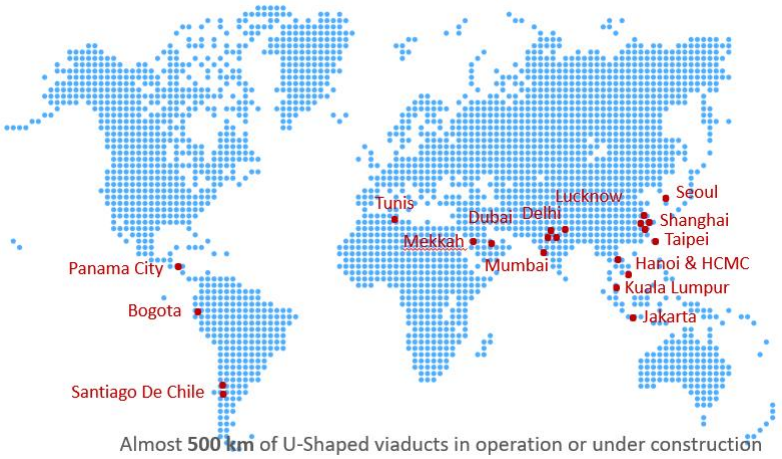




OTHER BENEFITS:

- Most economical as compared to other forms.
- Least time required for erection of U-girder.
- Precast piercap reduces overall construction time.
- Flexibility to use longer spans.

3. U-SHAPED VIADUCTS AROUND THE WORLD



FARIDABAD DMRC LINE-6 (BHARAT)

HANOI LINE 3 (VIETNAM)

SHANGHAI LINE 8 (CHINA)

MASHAEER METRO IN MEKKAH (SAUDI ARABIA)

DUBAI METRO & 2020 EXTENSION (UAE)

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4. SYSTEMS

ROLLING STOCK – Use of better material including composites instead of plywood and glass fibre (**Carcinogenic**) to improve insulation and noise absorption characteristic.

ROLLING STOCK - Install advanced communication systems that allow for real-time monitoring and data sharing between Rolling Stock and control centers. This enables proactive response to issues and improved passenger safety.

ROLLING STOCK –Equip Rolling Stock with redundant systems, especially critical components like braking and propulsion systems. Implementation of advanmced monitoring and diagnostics systems to identify issues before they lead to failures.

ROLLING STOCK –Design Rolling Stock with passenger safety in mind, including limiting **Jerk**, secure seating, handrails, and emergency communication systems.

3. SYSTEMS

Signaling – Standardise on CBTC to make it vendor independent with adequate redundancy and suitable for GOA4.

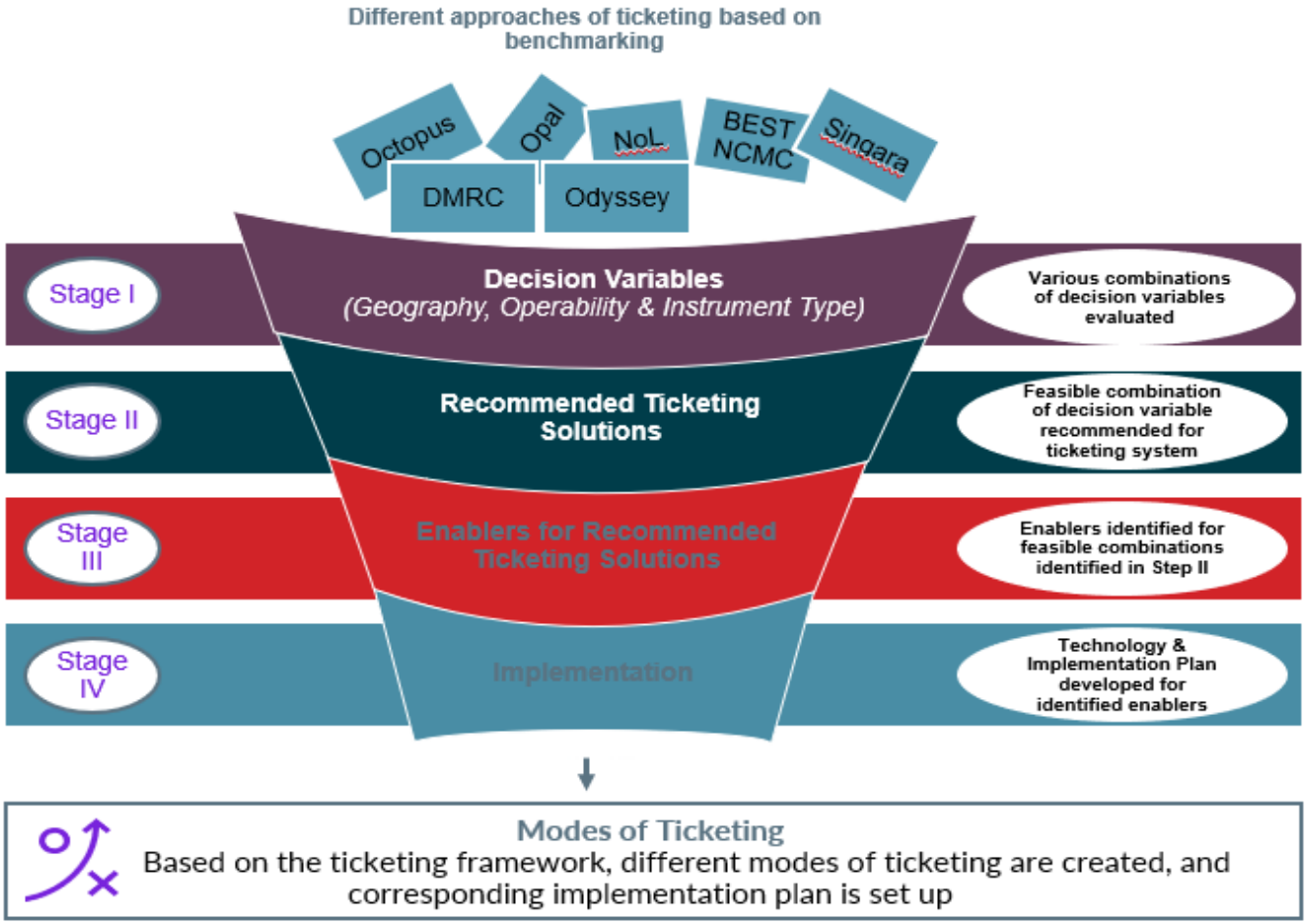
Signaling – In case the ultimate traffic requirement does not need less than 5 minutes headway then go for a simpler signaling system.

Data Encryption and Security: Implement robust data encryption and cybersecurity measures to protect against cyber threats and unauthorized access to signalling systems.

Resilience in Signalling

Hand Signalling → Absolute Block → Automatic Block → Moving Block(CBTC)

3. SYSTEMS – AFC



Key here is to go for a technology which is simple, easily available, upgradable and economical.

3. SYSTEMS - POWER SUPPLY AND TRACTION

- Implement redundant power sources, such as dual feeds from the electrical grid. Use of **green power** to the extent possible and all stations etc to be equipped with green power generation.
- Invest in OHE and third rails that are designed to withstand extreme weather conditions, vandalism, and other challenges.
- Implement **surge protection and proper grounding** to safeguard against electrical surges, lightning strikes, and other external threats.
- Optimise size of sub-stations specially for elevated stations. Sub-stations can be containerised and placed on the road median or verge.
- In metros using DC traction, use inverters in sub-stations based on economic considerations.
- Minimise use of control wiring by replacing it with Fibre optic cables in building management functions wherever possible.

5. OPERATIONAL RESILIENCE

Operational Resilience refers to operational adaptability to meet the changing mobility needs. It needs to be built into the system right from the inception of the project

Design

- ❑ Prioritize reliability and redundancy
- ❑ Emergency preparedness in terms of flexibility in infrastructure
- ❑ Durable and maintenance free systems/ infrastructure
- ❑ Surveillance & Cyber Security measures while maximizing digitalisation

Maintenance

- ❑ Maintenance planning for abnormal scenarios
- ❑ Condition-based and predictive maintenance,
- ❑ Remote maintenance

Operations

- ❑ Operational planning for abnormal scenarios and staff training accordingly
- ❑ Joint exercises with external agencies
- ❑ Public communication and awareness
- ❑ Flexibility is capacity utilization w.r.t demand
- ❑ **Highest priority to be given for intermodal integration**

6. ROLE OF CONSULTANTS

World wide experience	• Can provide different globally time tested solutions and technologies • Can provide alternative solutions and alternative analysis
Independent view	• Since they are neutral, they can provide a view which can be acceptable to all stake holders.
Integrated approach	• Consultants have experience in overall project delivery and can integrally deliver project. • They can provide a robust system to dovetail testing and commissioning with passenger operations.

THANK YOU

CONFIDENCE MOVES THE WORLD

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