

Advanced Programme - Planning, Design _ Construction of Long Span Bridges- (Batch I) - 22

INNOVATE LAUNCHING OF MAJOR BRIDGES

National Rural Infrastructure
Development Agency



Ministry of Rural Development

Engineering Staff College of
India (ESCI)



Hyderabad

Lecture 7

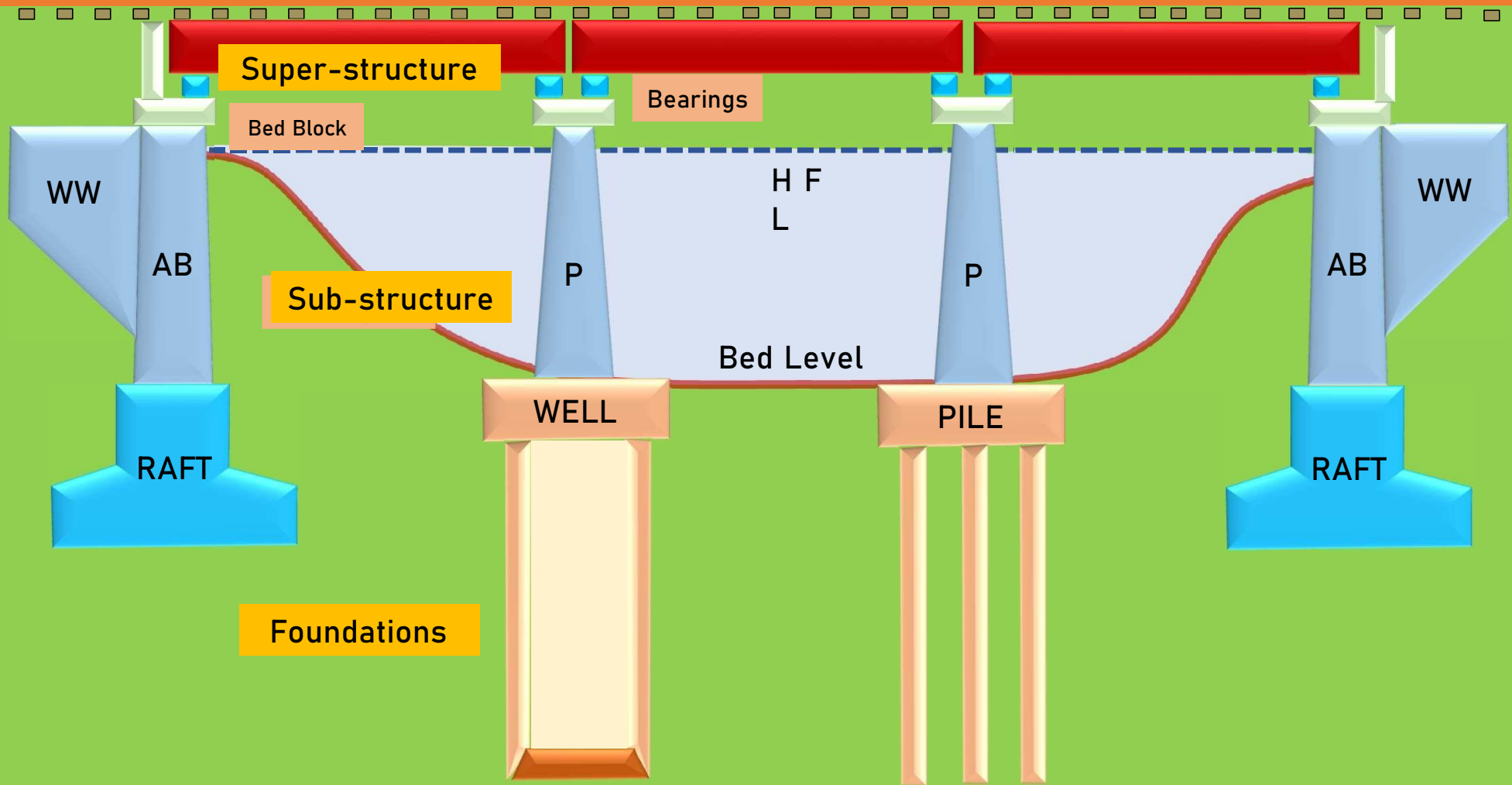
INNOVATE LAUNCHING OF MAJOR BRIDGES

TOPICS

- Introduction
- Launching techniques
- Case Studies
- Conclusion

INTRODUCTION

Bridge Components



BRIDGE CLASSIFICATION

BRIDGES

Material

Stone

RCC

PSC

Metal
(Steel)

Composite

Configuration

Arch

Slab

Box/ Pipe

Girder:
I/ T/ Box

Open-Web/
Semi-through

Service

Road

Rail/
Metro

Pedestrian

Fluids

Mixed

Span Arrangement

Minor

Major

Important

Viaduct

Long-span

**LONG SPAN
BRIDGES**

Arch

Suspension

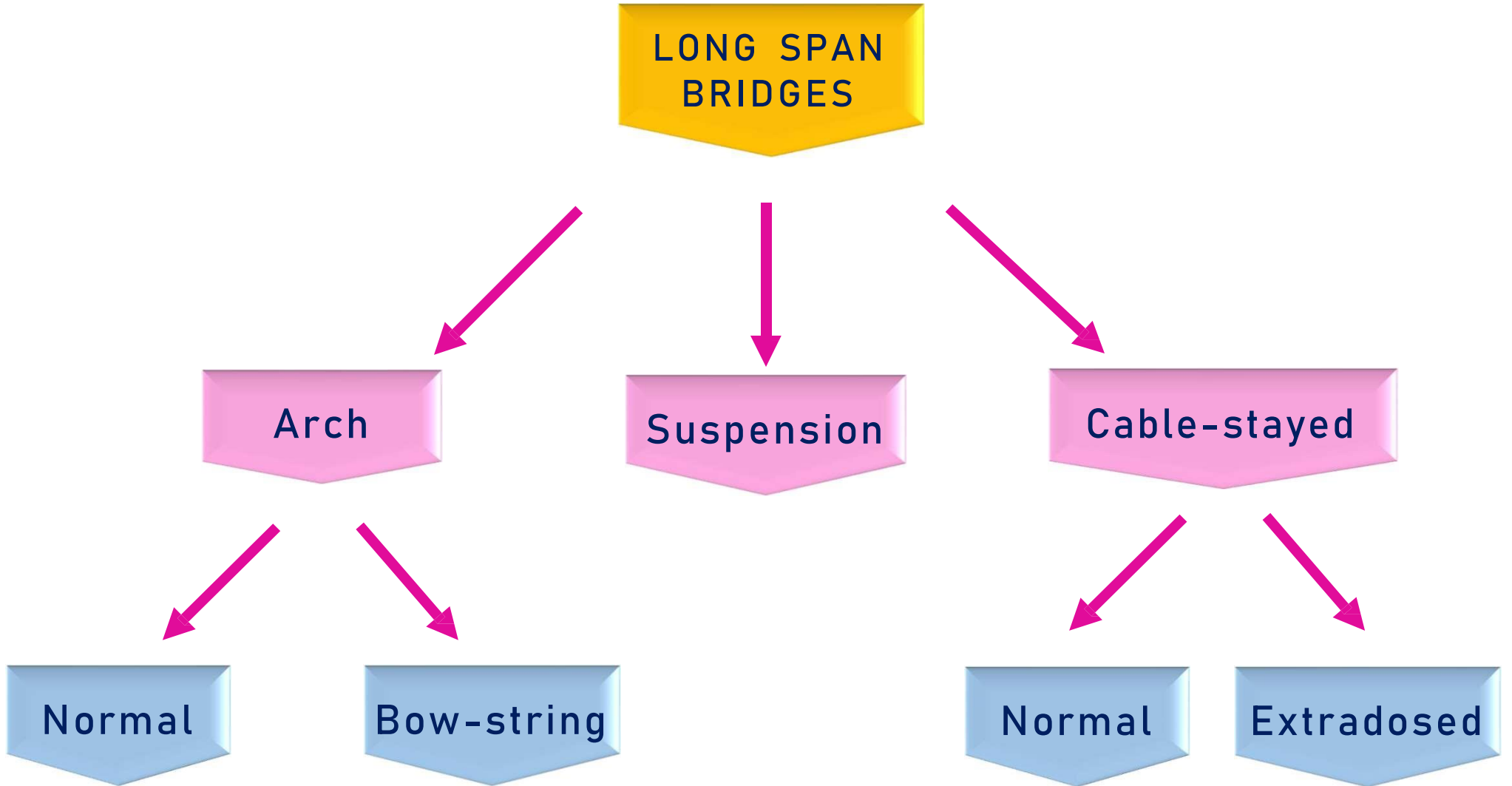
Cable-stayed

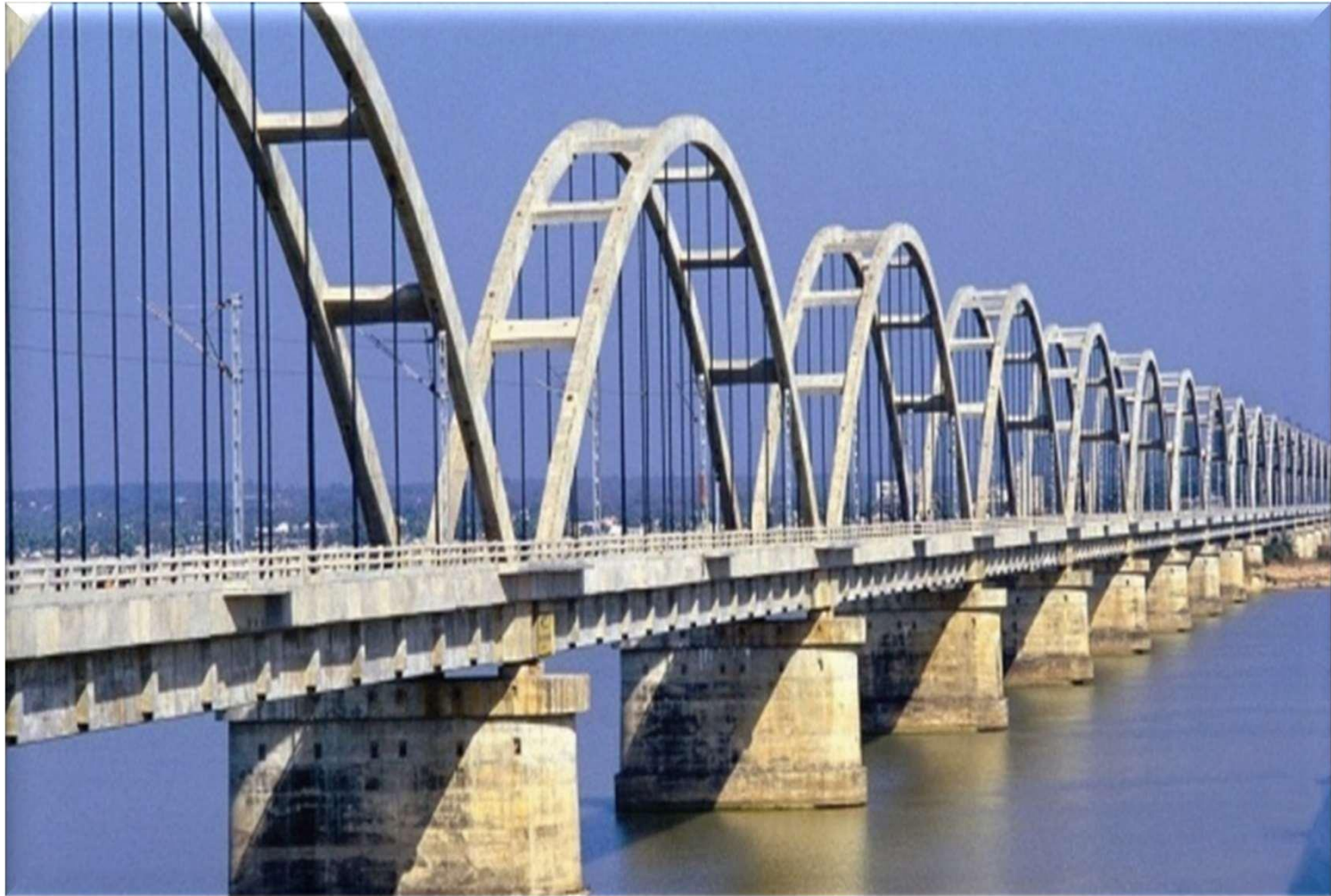
Normal

Bow-string

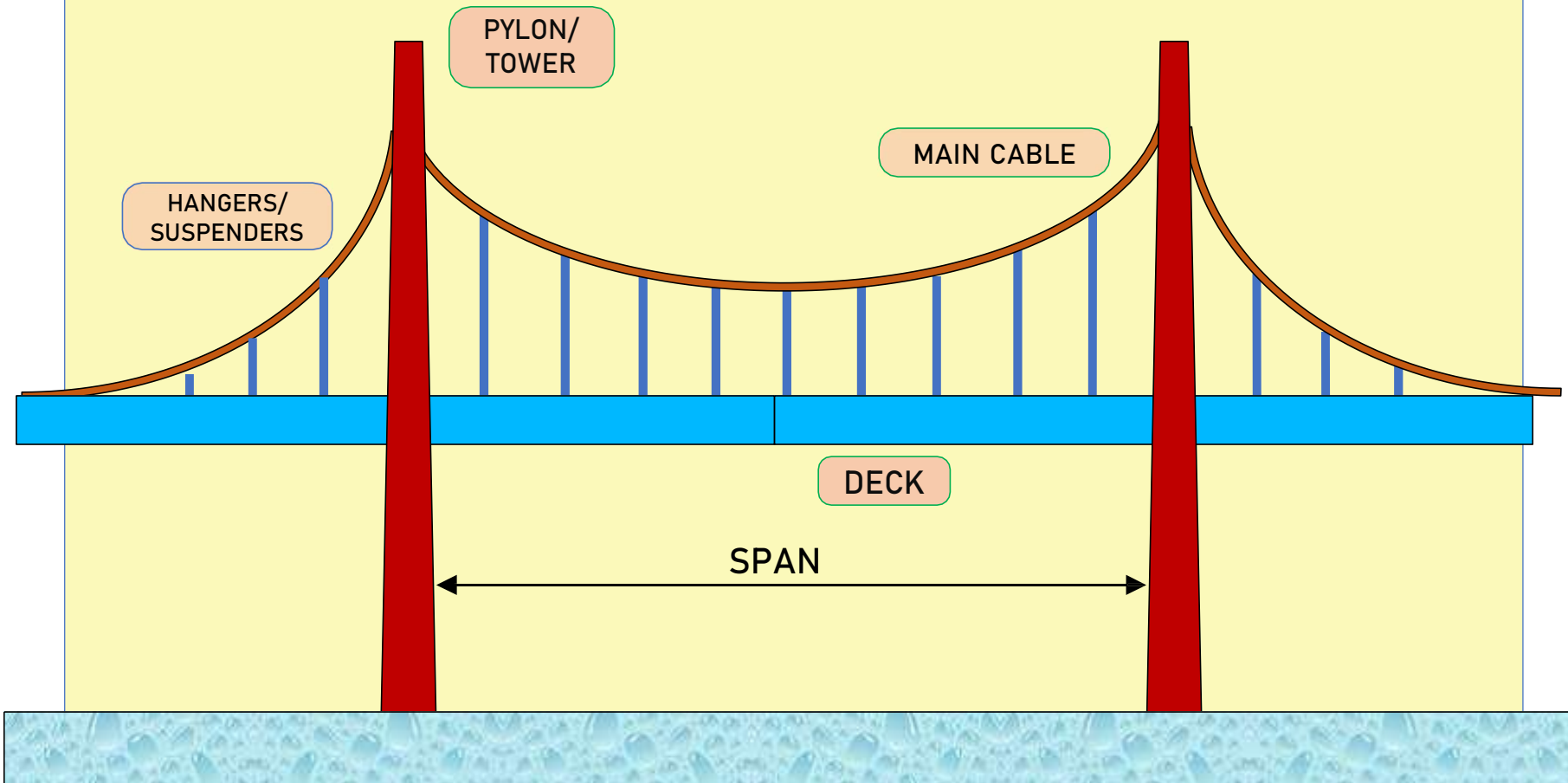
Normal

Extradosed

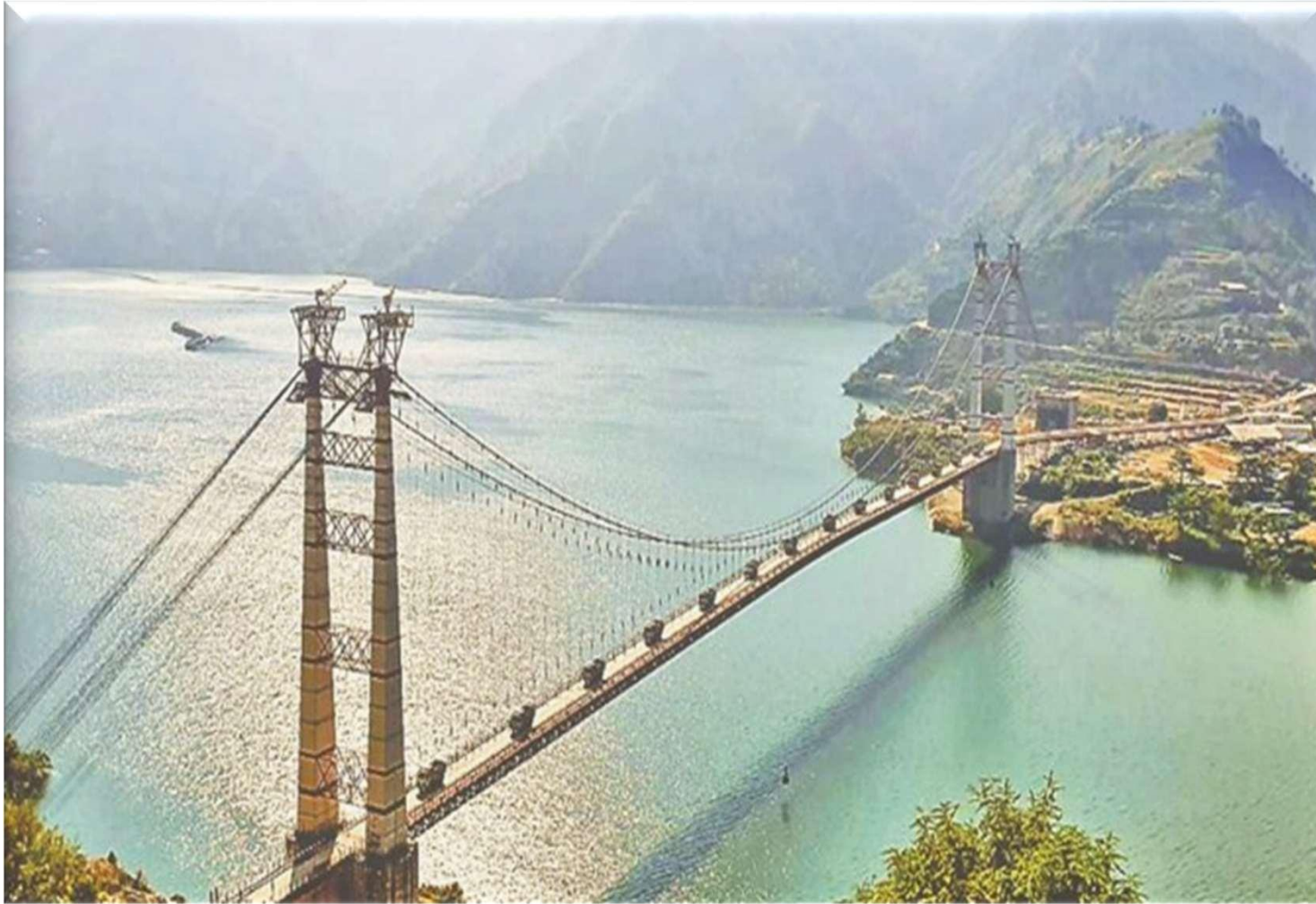




Suspension Bridge



**Suspension Bridge
(Uttarakhand)**



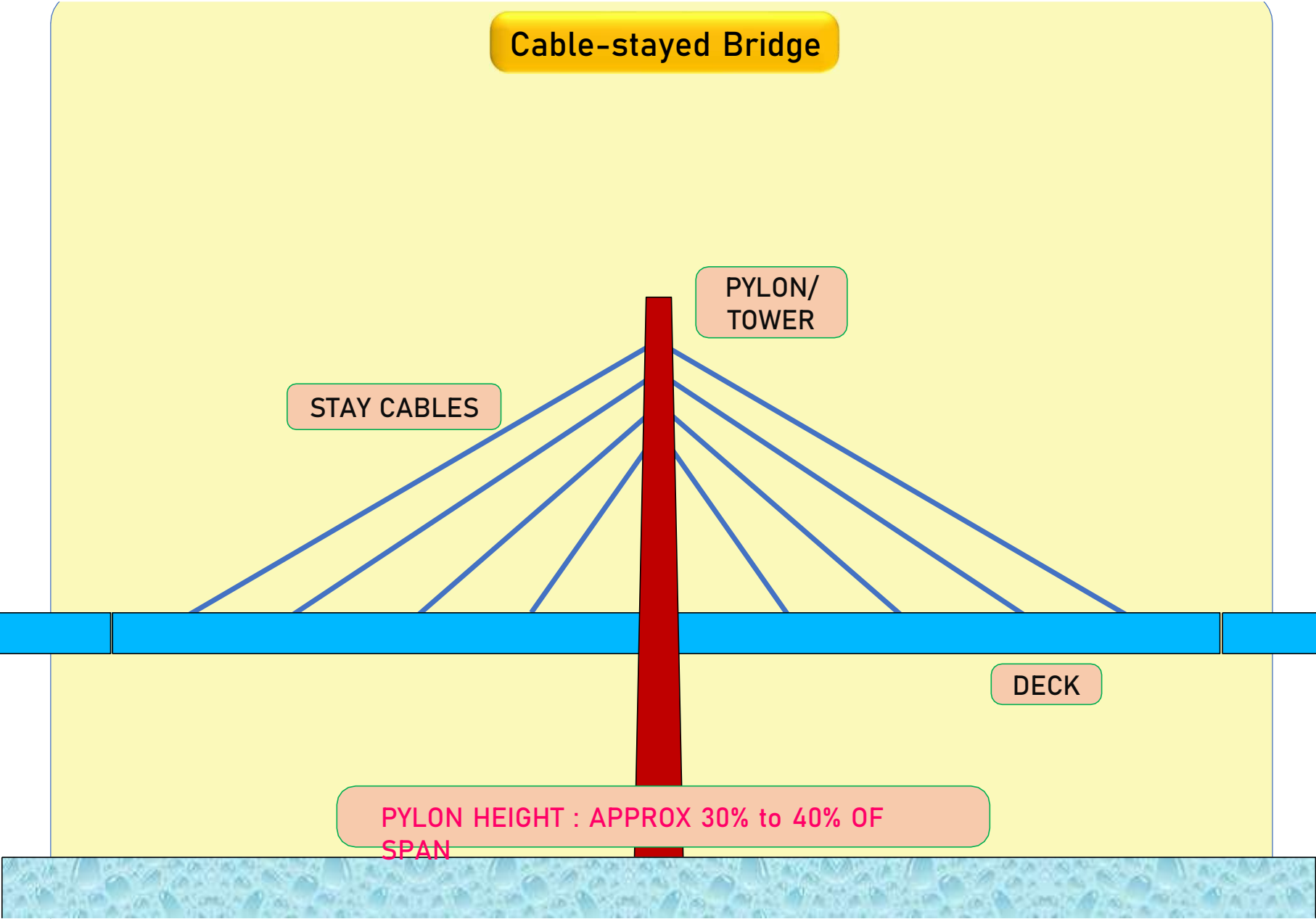
Cable-stayed Bridge

PYLON/
TOWER

STAY CABLES

DECK

PYLON HEIGHT : APPROX 30% to 40% OF SPAN



**Cable-stayed Bridge
(Yamuna, Delhi)**



**Extradosed Bridge
(Hoogly, Calcutta)**



CHARACTERISTICS of LONG SPAN BRIDGES

- **HARSH WORKING CONDITIONS**
- **REQUIREMENTS OF OTHER USERS**
- **SPECIAL LOADS - WL, EQL, SHIL**
- **NOVEL CONSTRUCTION
TECHNIQUES**
- **INSPECTION & MAINTENANCE**
- **AESTHITICS & SUSTAINABILITY**

Aspects of Bridge Construction

Planning

- Resources
- Construction drawings
- Encumbrance free
- Safety
- Off-site/on-site
- Access roads

Foundation & Sub-structure

- Pile founds
Driven/ Cast-in-situ
- Well founds
Sinking/ Jacking
- Survey & Monitoring

Super-structure

- Prefab/ precast
- In-situ/
Launching
- Sequencing of activities
- Precision
- LOAD TESTING

Finishing Works

- Bearings
- Expansion joints
- Wearing course
- Parapets
- Wings/ Returns
- Drainage
- SITE CLEARANCE

- Safety & Protection works
- Quality Control
- Environment & Health
- Documentation

LAUNCHING METHODS

Methods of construction

CRITERIA FOR DECIDING THE METHOD:

- Type of bridge
- Design requirements
- Site constraints
- Time constraints
- Equipment deployable at site

PSC

Cast-in-situ

Decfi slab
cast-in-situ

Precast

Launching

- Slab
- I - Girder
- Box section
- Trough

(Not preferred)

- Shuttering/ centering
- Concreting scheme
- Pre-stressing - individually

(Preferred)

- Precasting yard
- Single pour
- Short-line/ Long-line
- Logistics

Methods:

- Launching Girder/ Nose
- Mobile cranes
- Segmental/ full span

Precast Yard



Precast
Yard



Composite

Factory
(Steel
works)

- Shear connectors
- Logistics
- Launching
- Ty securing

- Steel Girder/
Box section
- Concrete Deck
- OWT girders

Cast-in-situ
(Concrete
deck)

- External centering
- Sacrificial sheets
- Concrete pour
sequence

Launching

- Road cranes
- Launching Nose
- Incremental method

Shear Connectors



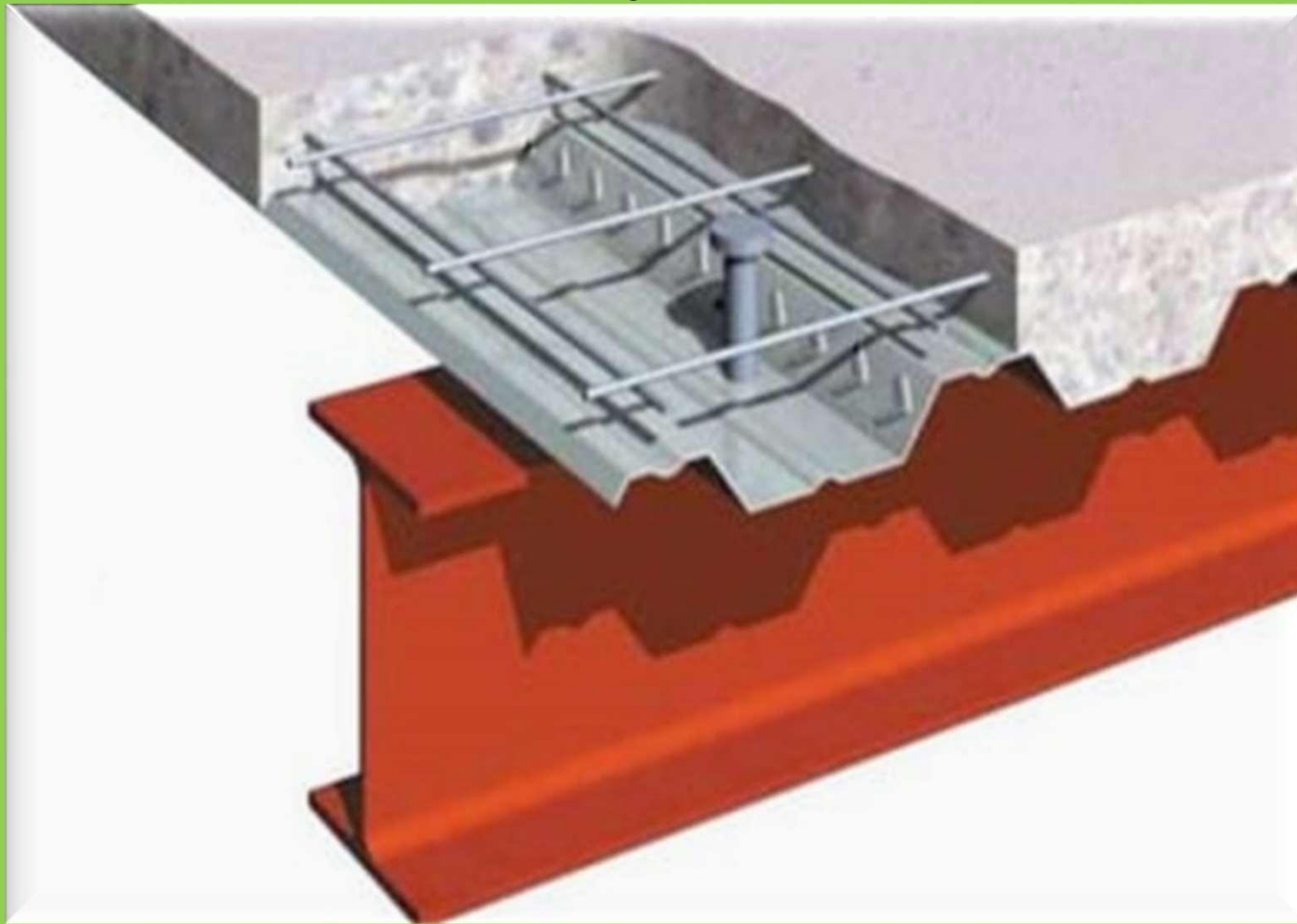
Launching by road cranes



Incremental Launching (Bogibeel bridge)



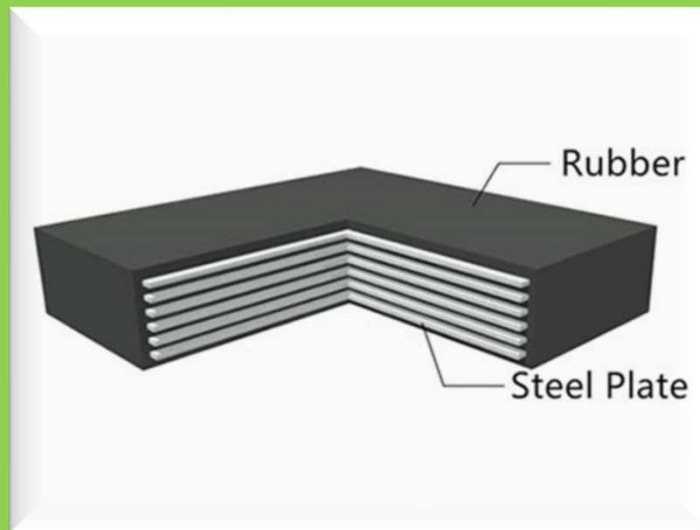
Deck slab concreting
(sacrificial
shuttering)



Common types of Bearings

Elastomeric

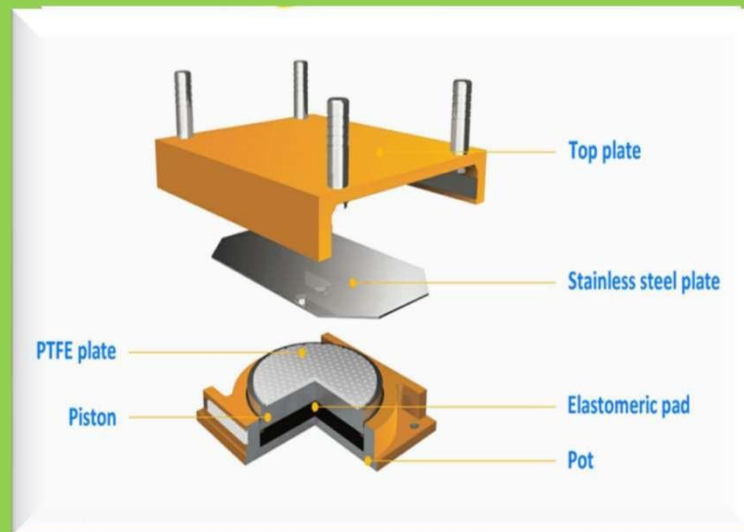
- Laminated steel & elastomer (rubber)
- Universal bearing
- For small spans upto 25m



Common types of Bearings

Pot/ PTFE

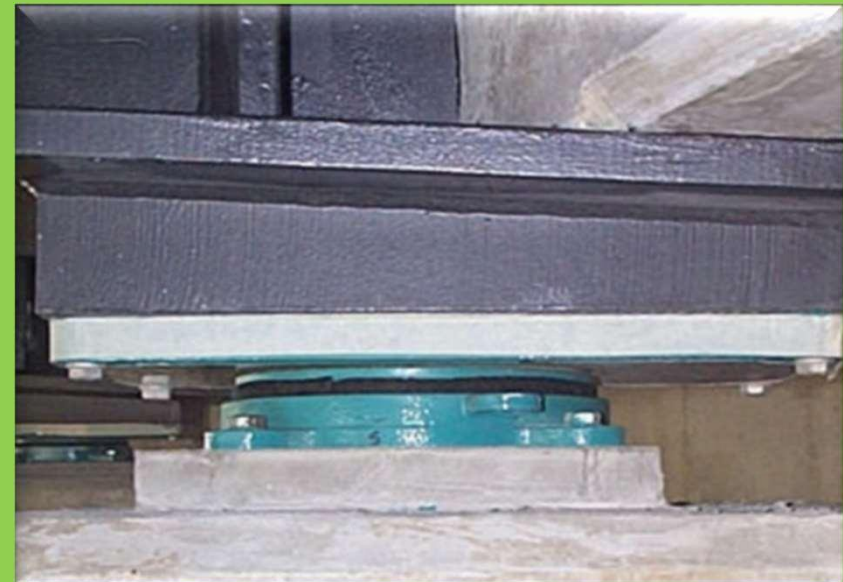
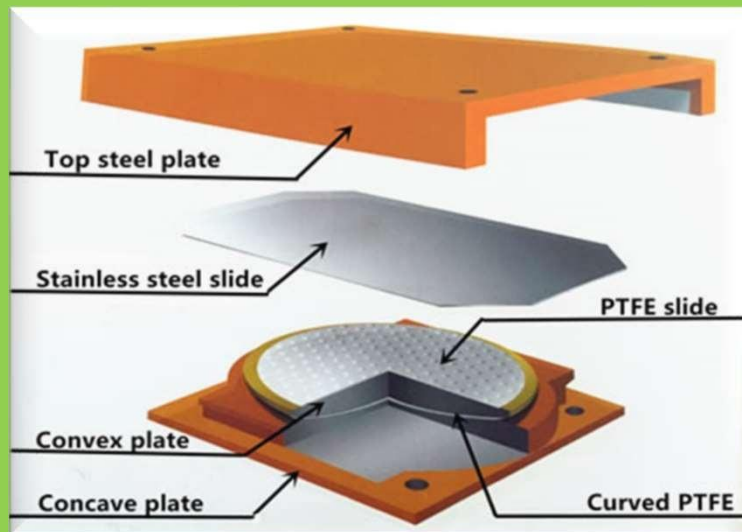
- Types: Free, Fixed, Lateral/ Longitudinal
- For spans of 25m to 60m
- PRESET – temperature correction
- Installation: Sleeves & grouting



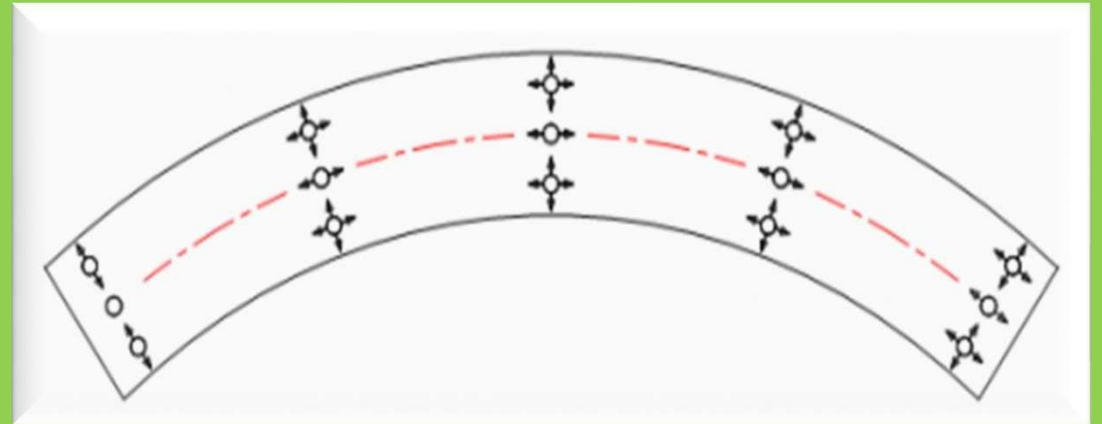
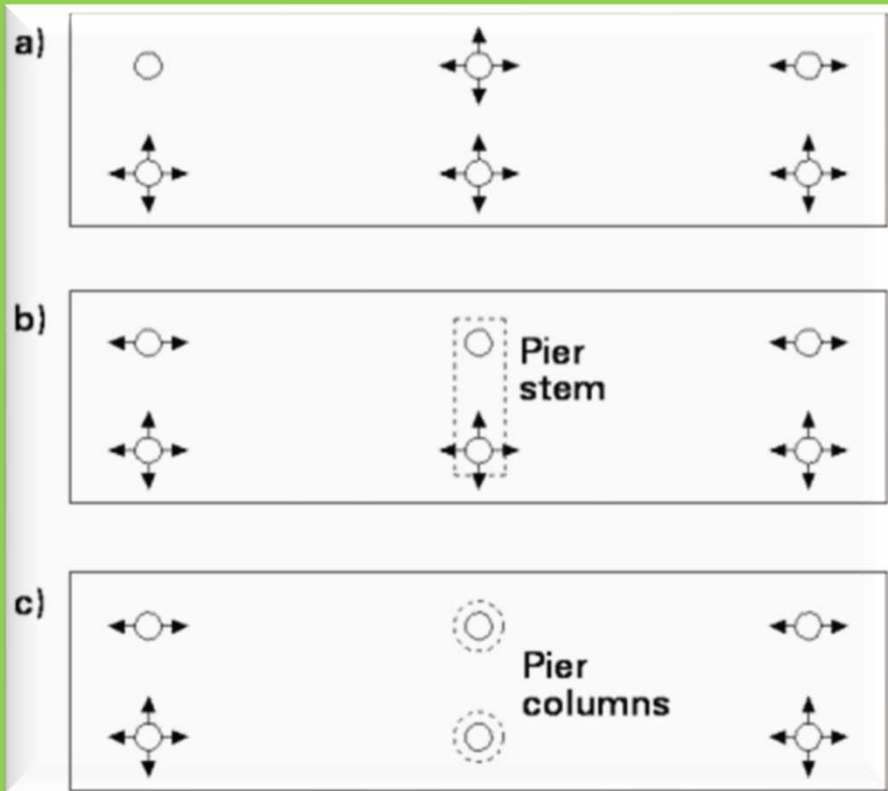
Common types of Bearings

Spherical

- Types: Free, Fixed, Lateral/Longitudinal
- For spans $> 60\text{m}$
- Installation: Sleeves & grouting

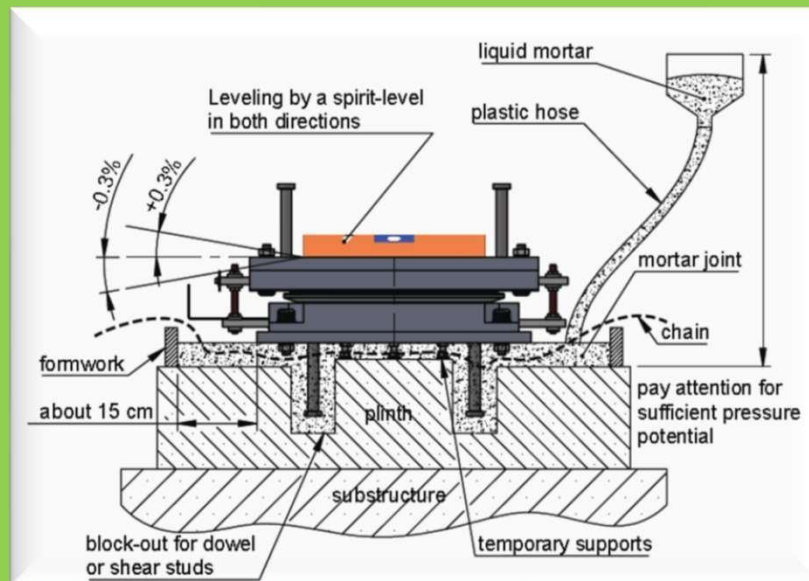


Bearing Layout drawing



Installation of Bearings

Pot/PTFE
&
Spherical



- Inspection/ certification of bearing manufacture
- Holes in piercap/pedestal during its casting
- Bearing with sleeves fixed to bottom of girder
- Installation of bearing with sleeves into holes during launching
- Grouting with non-shrink grout
- Remove clamps after curing

**CASE STUDIES
OF BRIDGE
CONSTRUCTION**



ZUARI RAIL
BRIDGE,
GOA

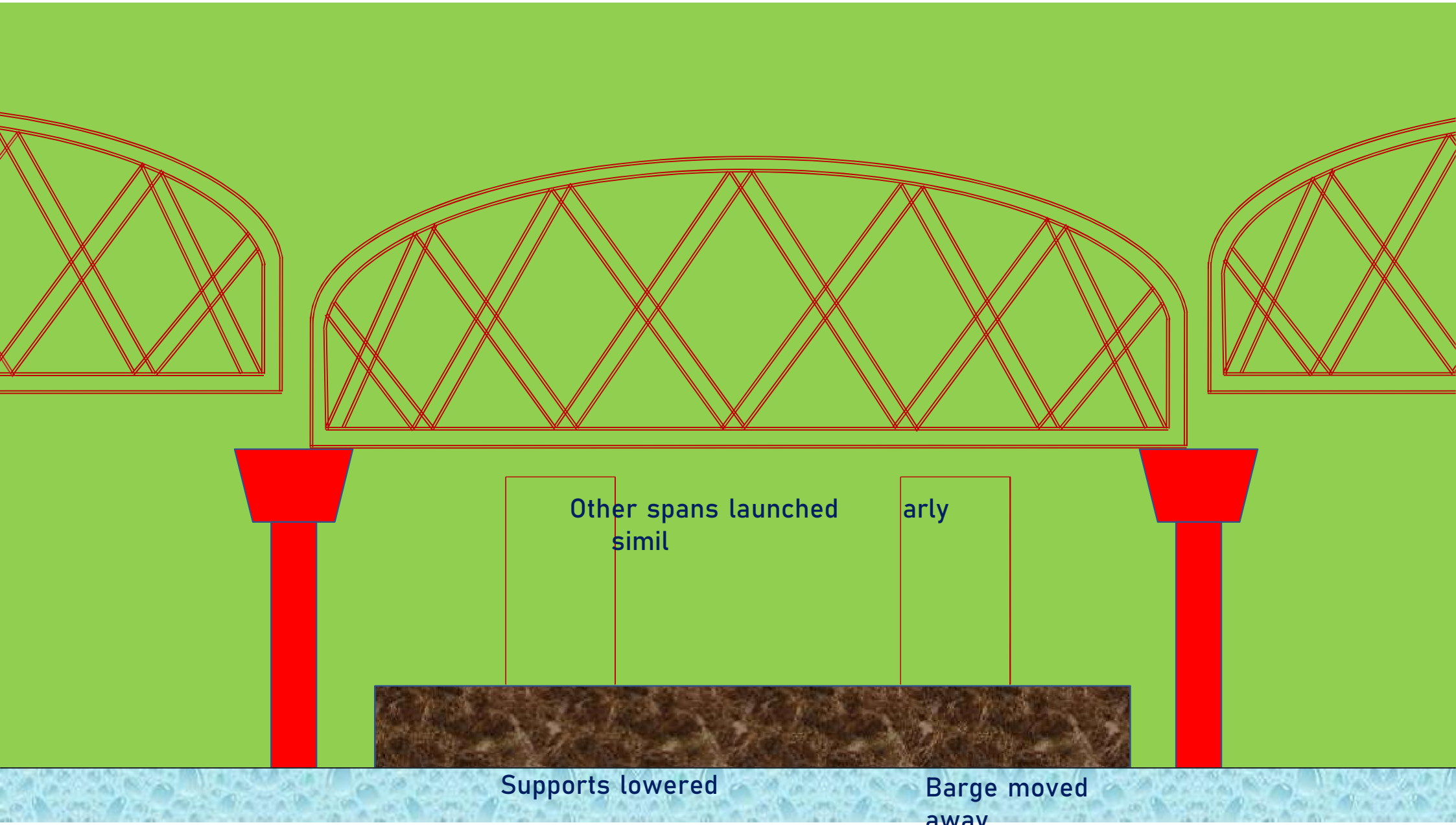
FEATURES

- TOTAL LENGTH: 950m
- CENTRAL SPAN:
125m (for navigation)
- STEEL TRUSS: 600 tons
- PERENNIAL FLOW
(Zuari river
Backwaters)



Innovative launching of 125m span

- TIDAL VARIATION - Used for launching
- TEMP BERTH - adjacent to river
- ON SHORE - fabrication of
- STEEL BARGES - for girder movement



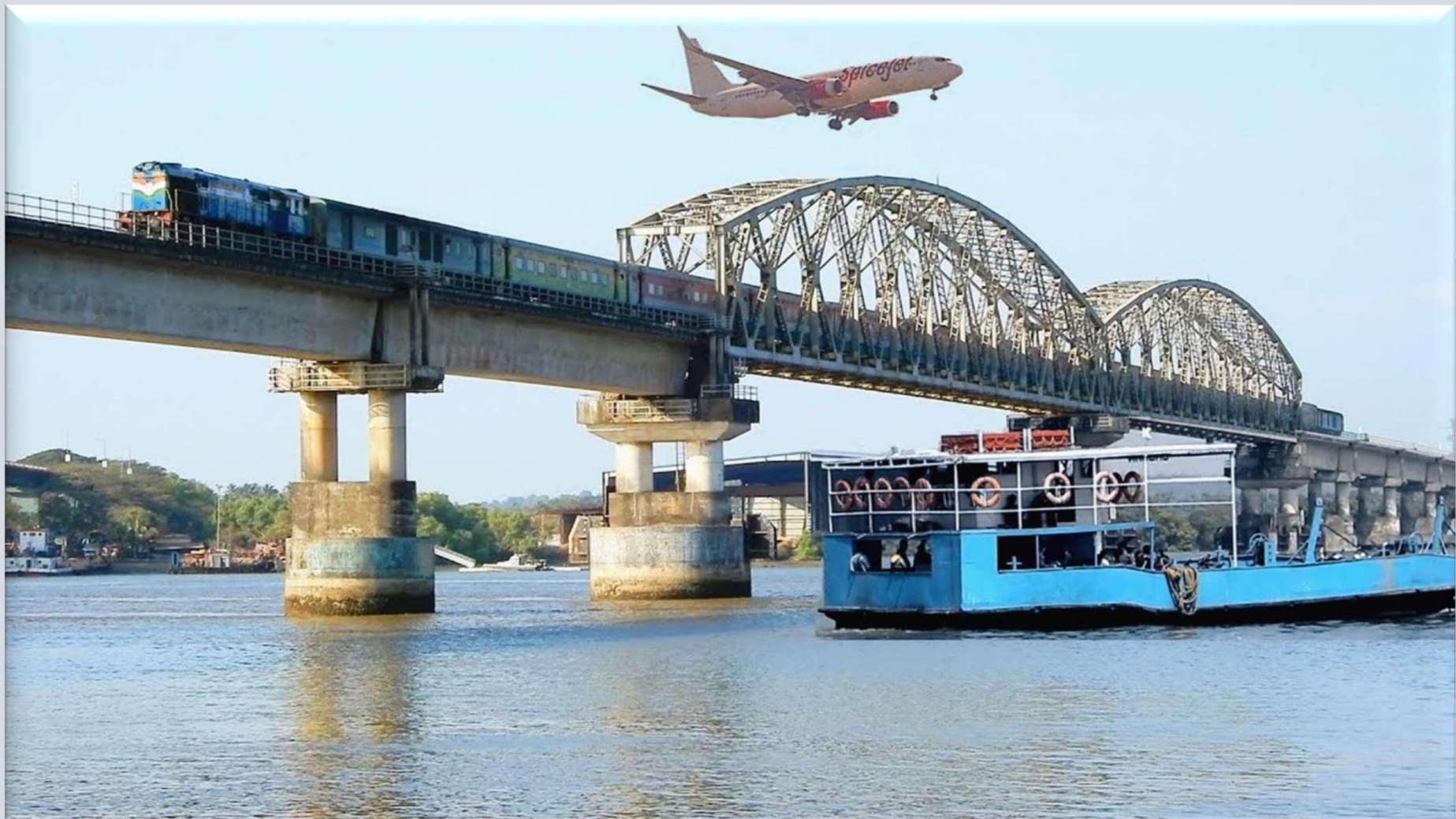
Other spans launched
similarly

early

Supports lowered

Barge moved
away

Completed Bridge

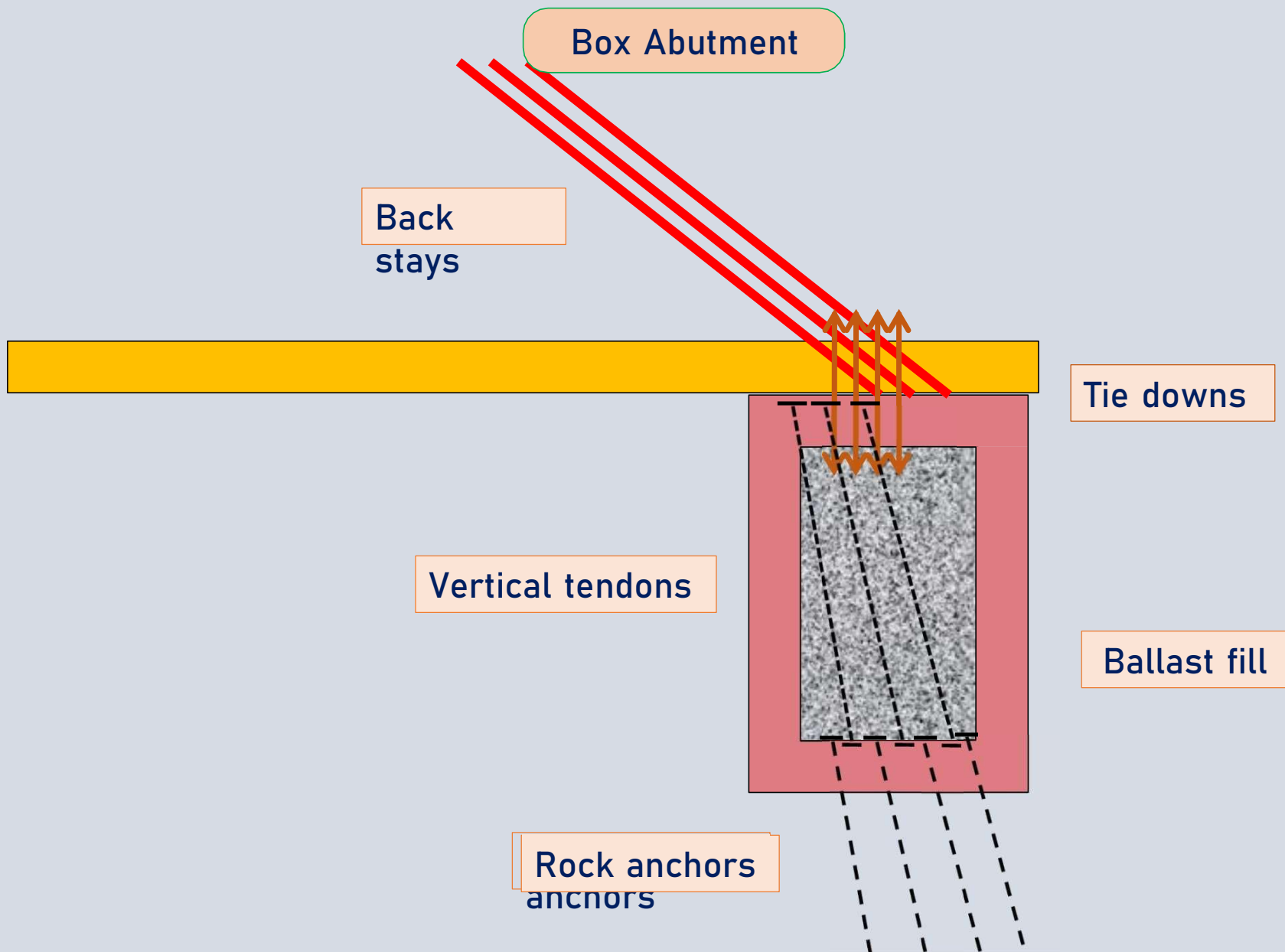




**CABLE-STAYED
ROAD-OVER-BRIDGE,
BANGALORE**

FEATURES

- SPAN : 180m -
SKEW (135m + 45m back
span)
- Deck : RCC I-girders
- Deck : 23.4m
width : H-frame- 54m
- Pylon height
Crossing 5 Railway
tracis



CFT in progress

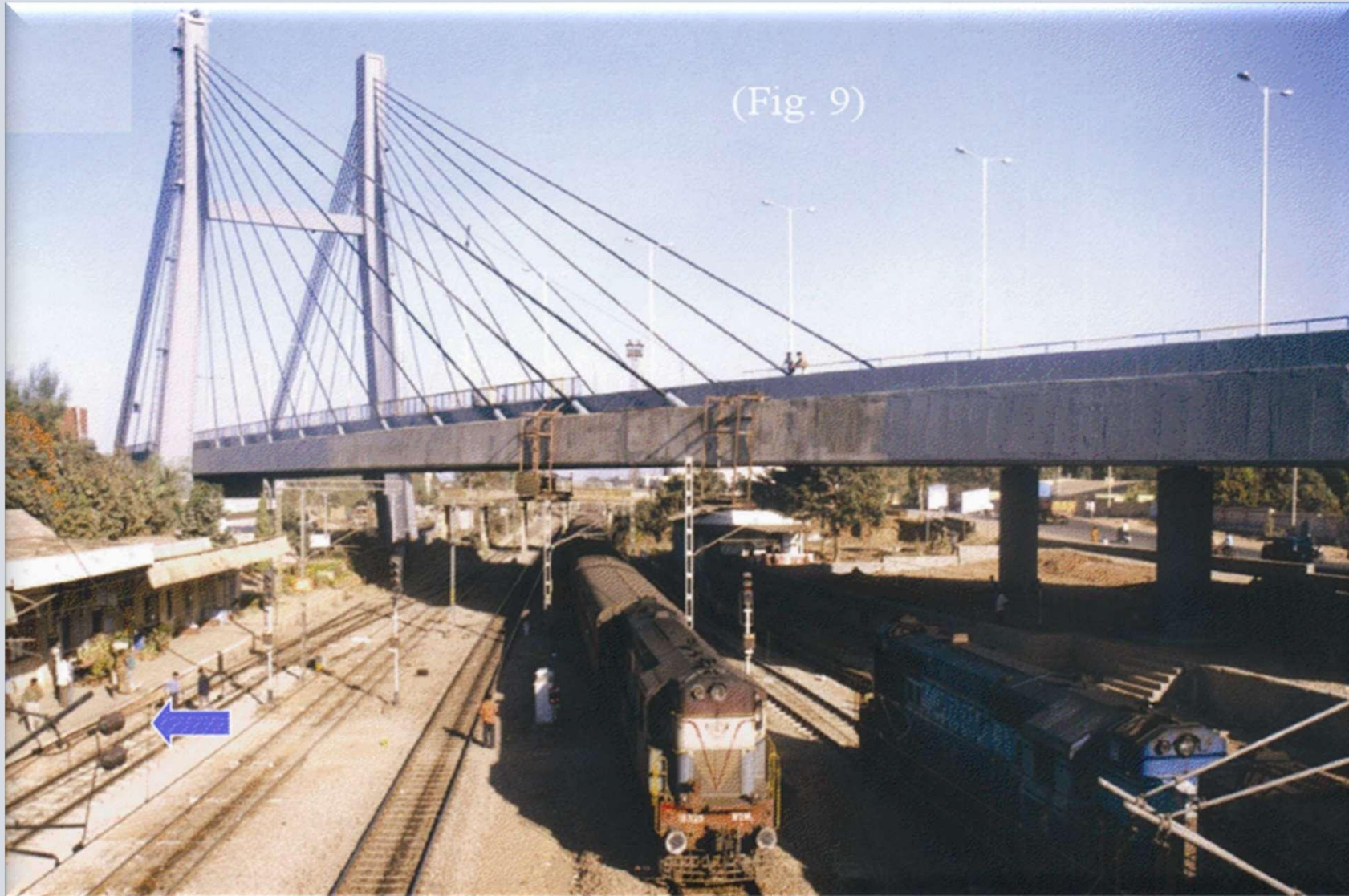
(c) 2002 Jay Balakrishna



Multi-level safety



Completed bridge



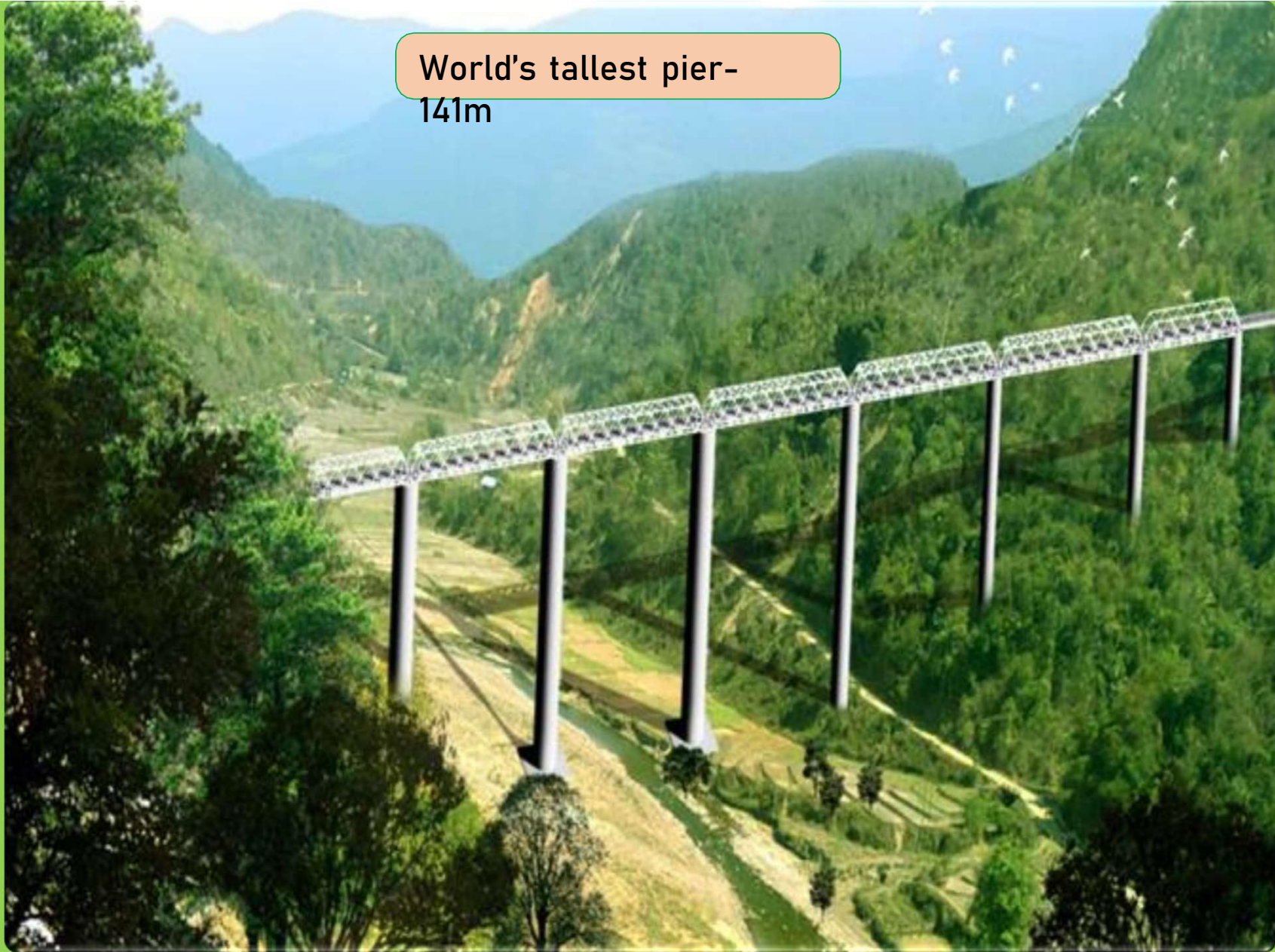


**OPEN-WEB THROUGH
STEEL GIRDER
BRIDGE, MANIPUR**

SPECIAL FEATURES

- Deep gorge in hilly terrain
- RCC bored cast-in-situ piles
- Hollow circular piers
- OWTG of 106m span
- Weight of each span: 900t

World's tallest pier-
141m

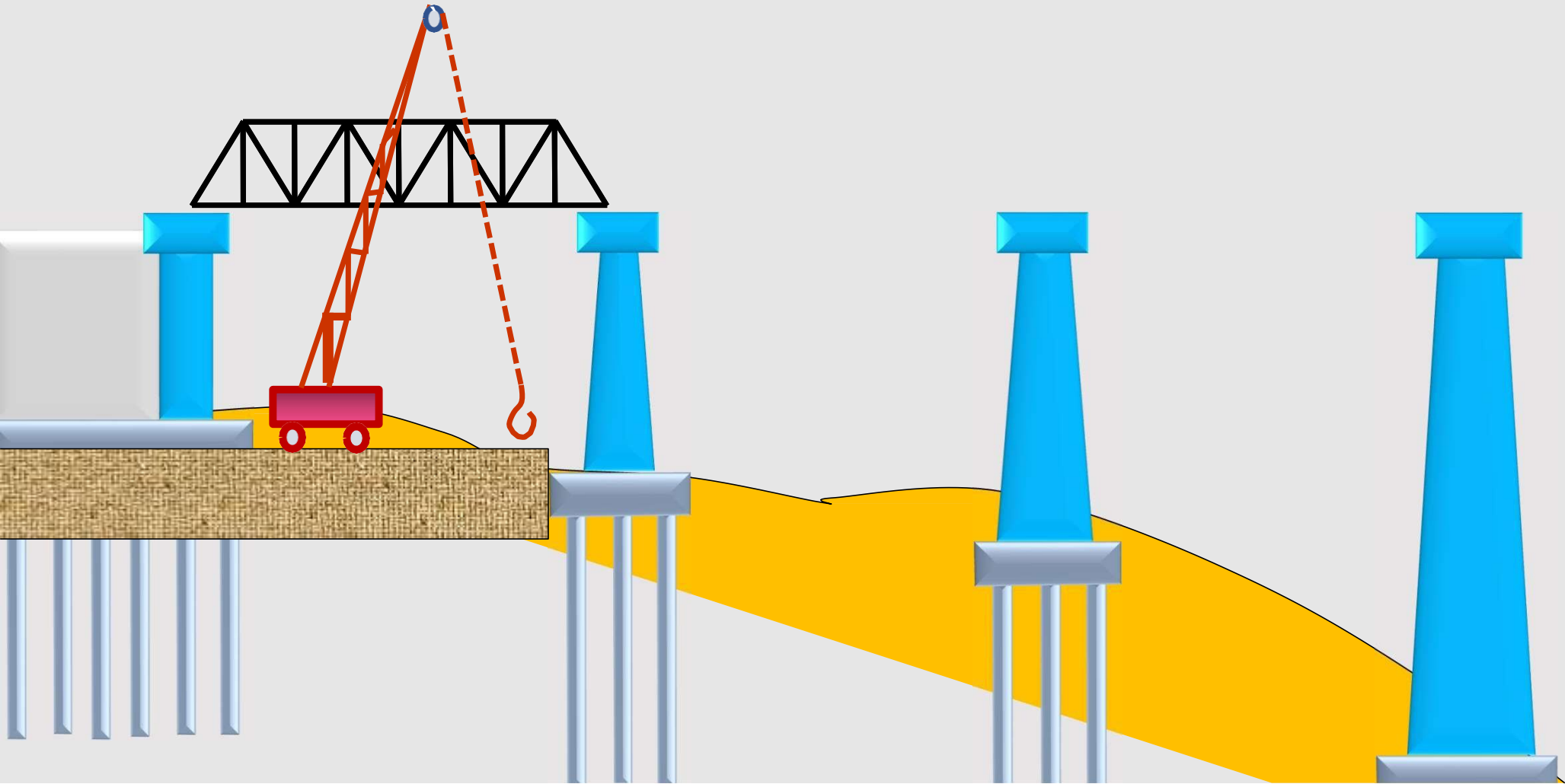


Qutab Minar

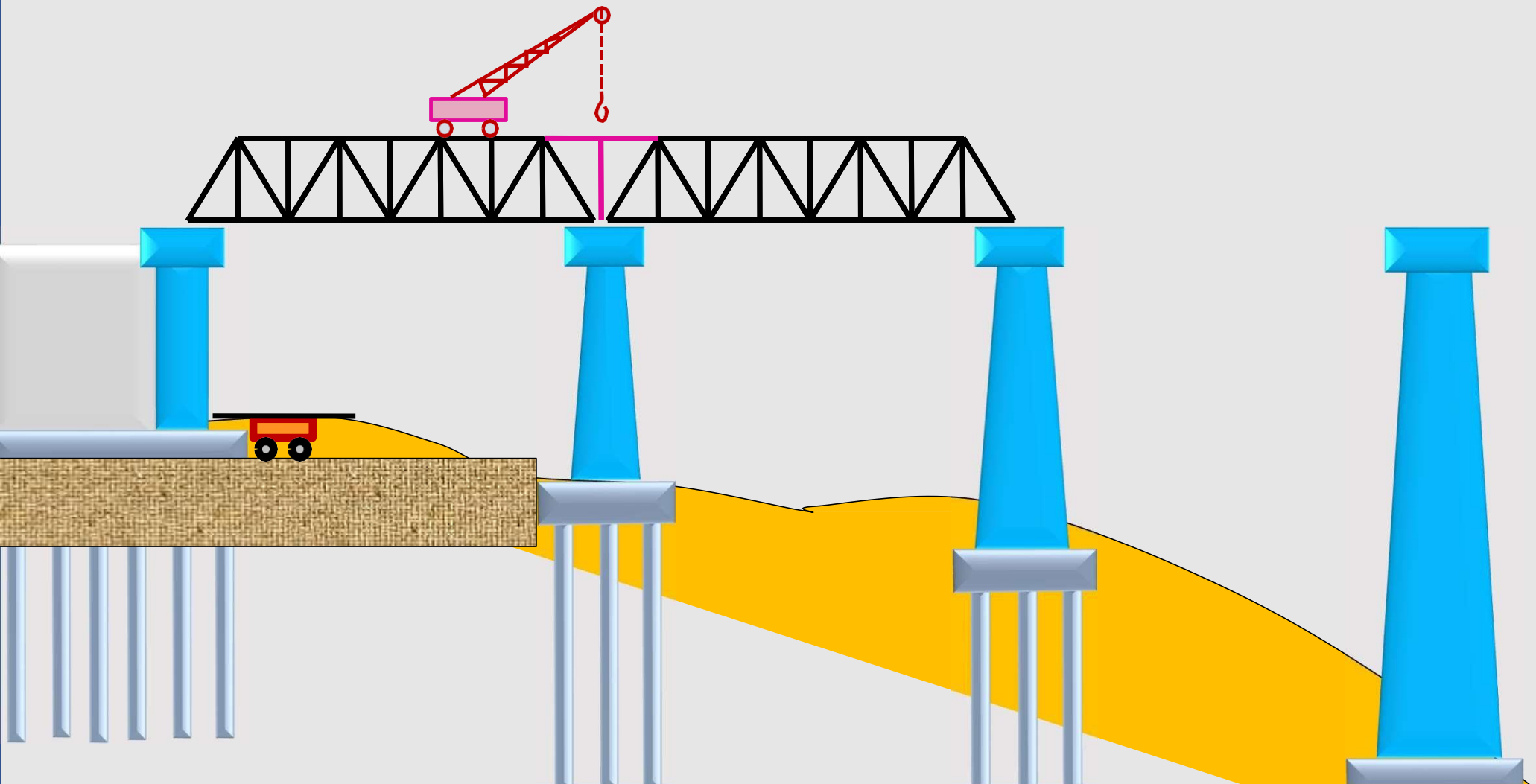
CHALLENGES

- Maintaining Camber (113mm at centre)
- Reversal of Stresses during erection
- Restricted space
- Safety of construction at heights
with sub-zero temperatures

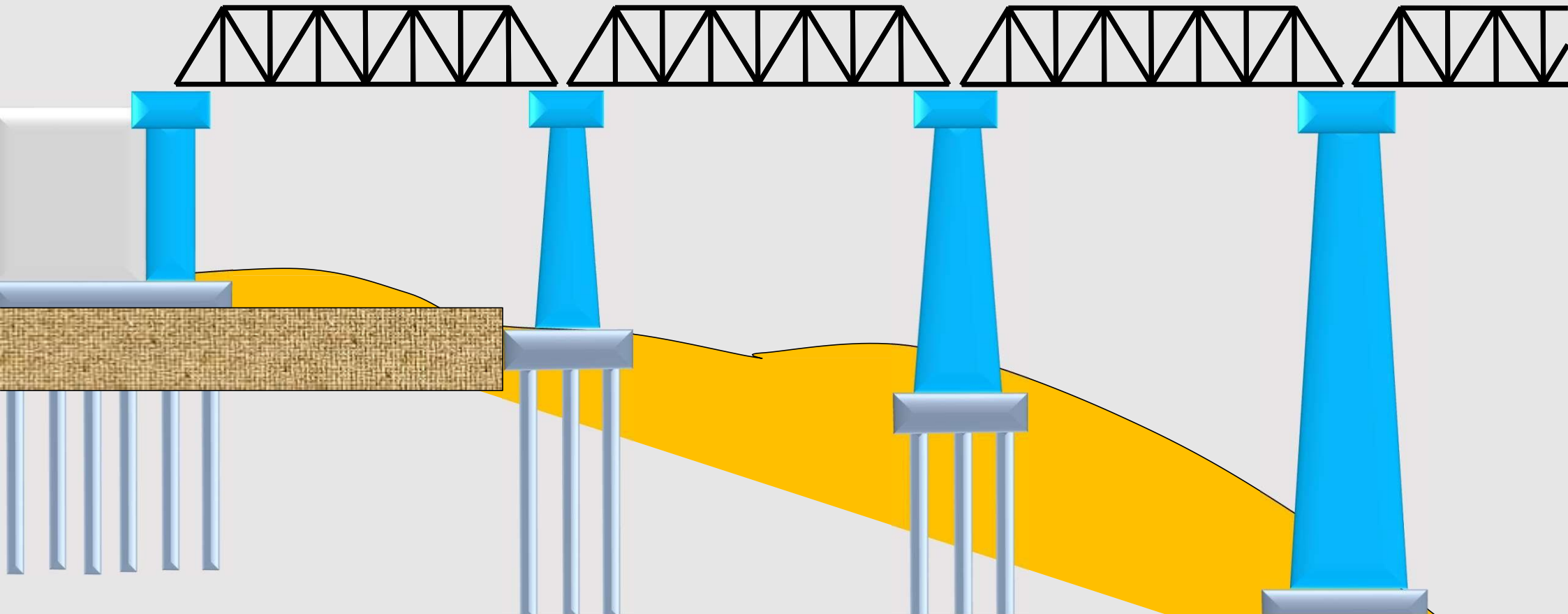
First span by road
crane



Launching 2nd span



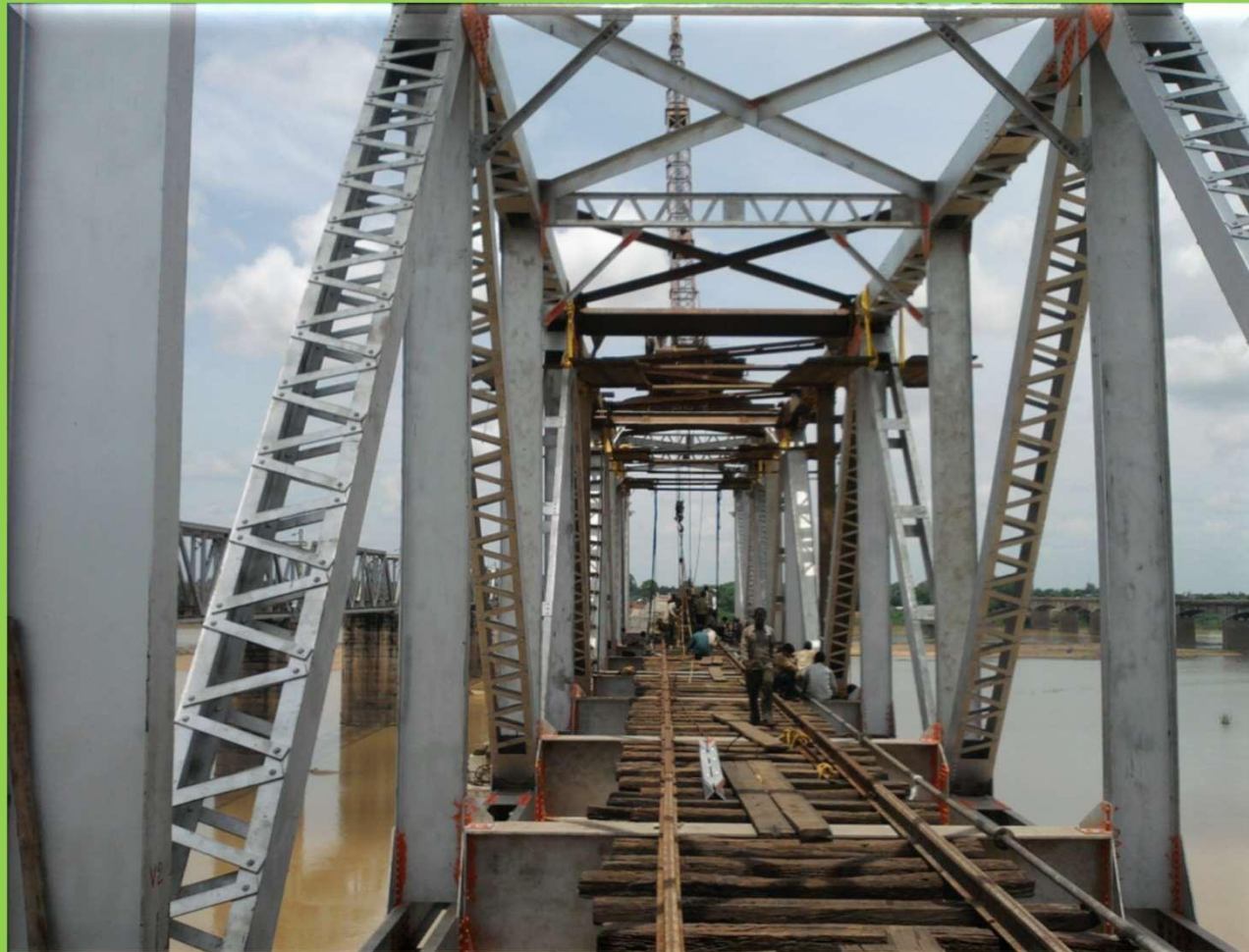
Launching of all spans
completed



Dip-lorry carrying member



Over-head crane

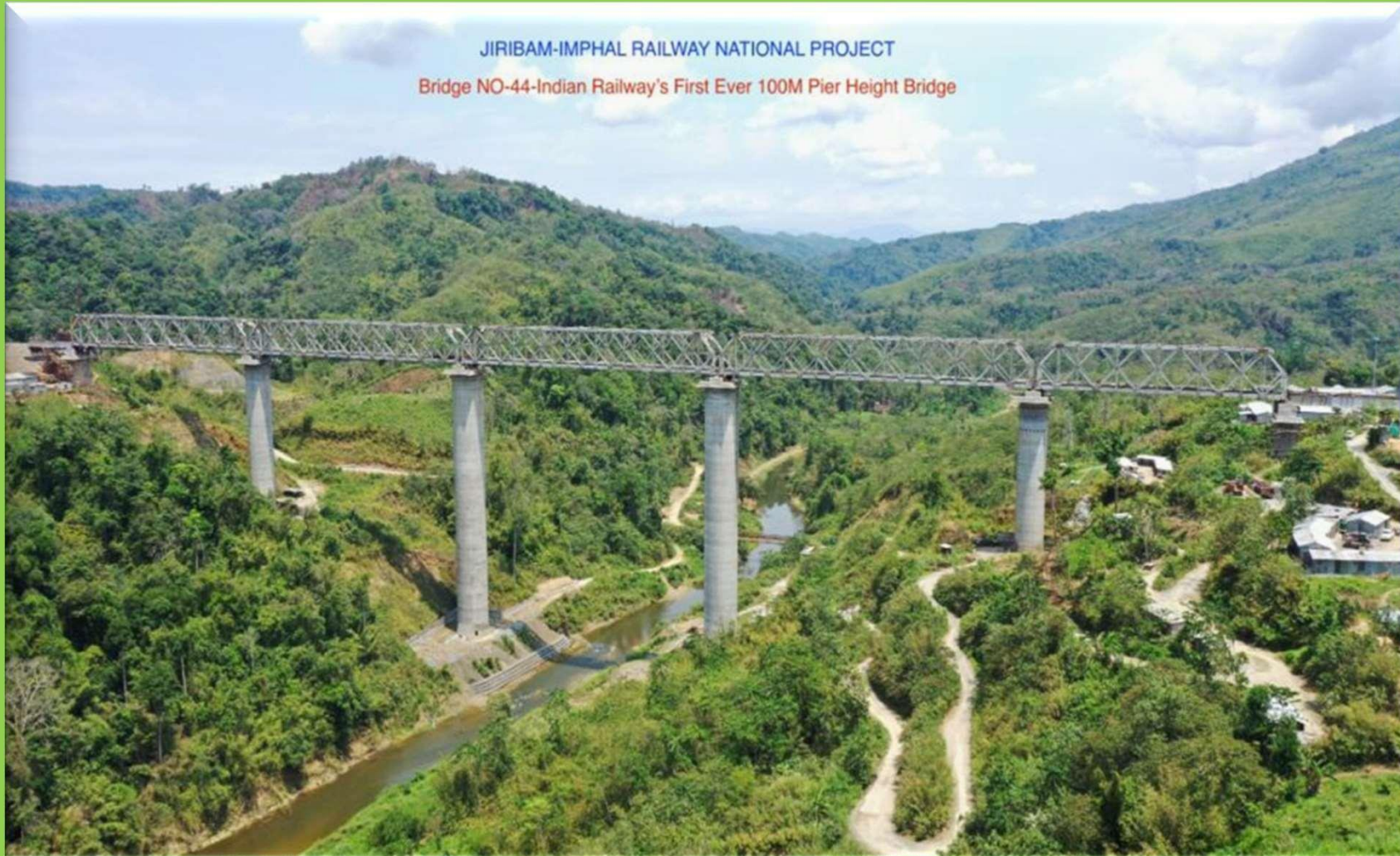


Over-head crane



JIRIBAM-IMPHAL RAILWAY NATIONAL PROJECT

Bridge NO-44-Indian Railway's First Ever 100M Pier Height Bridge

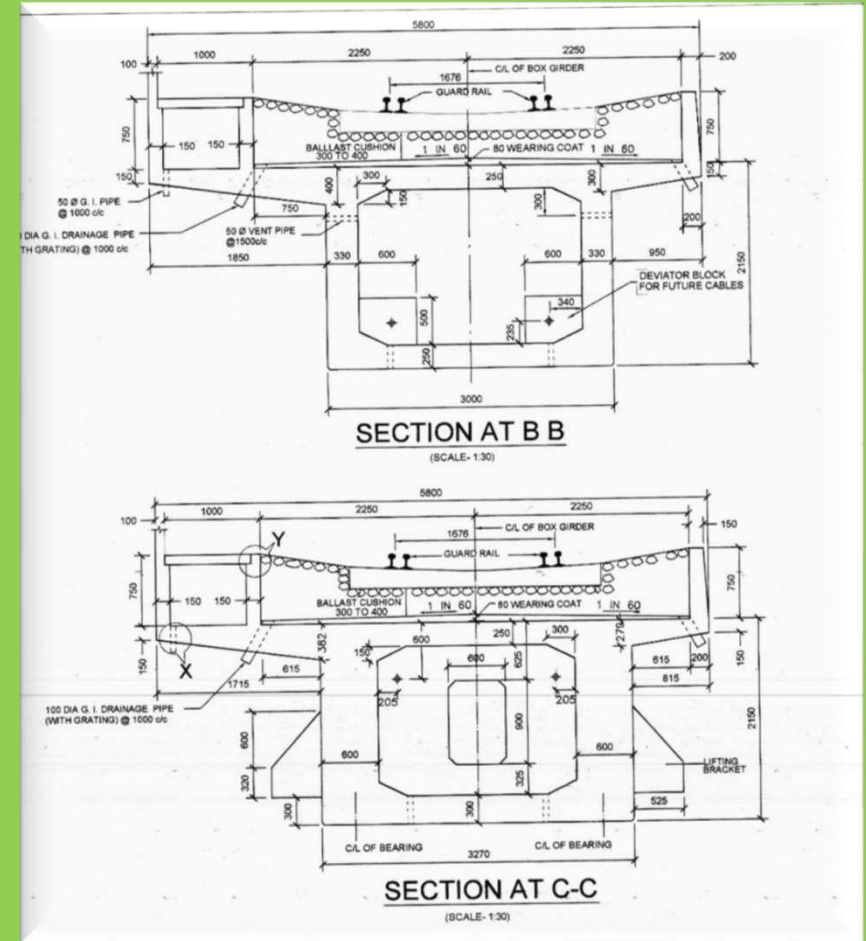




PSC Box Girder
Rail bridge,
Bijapur,
Karnataka

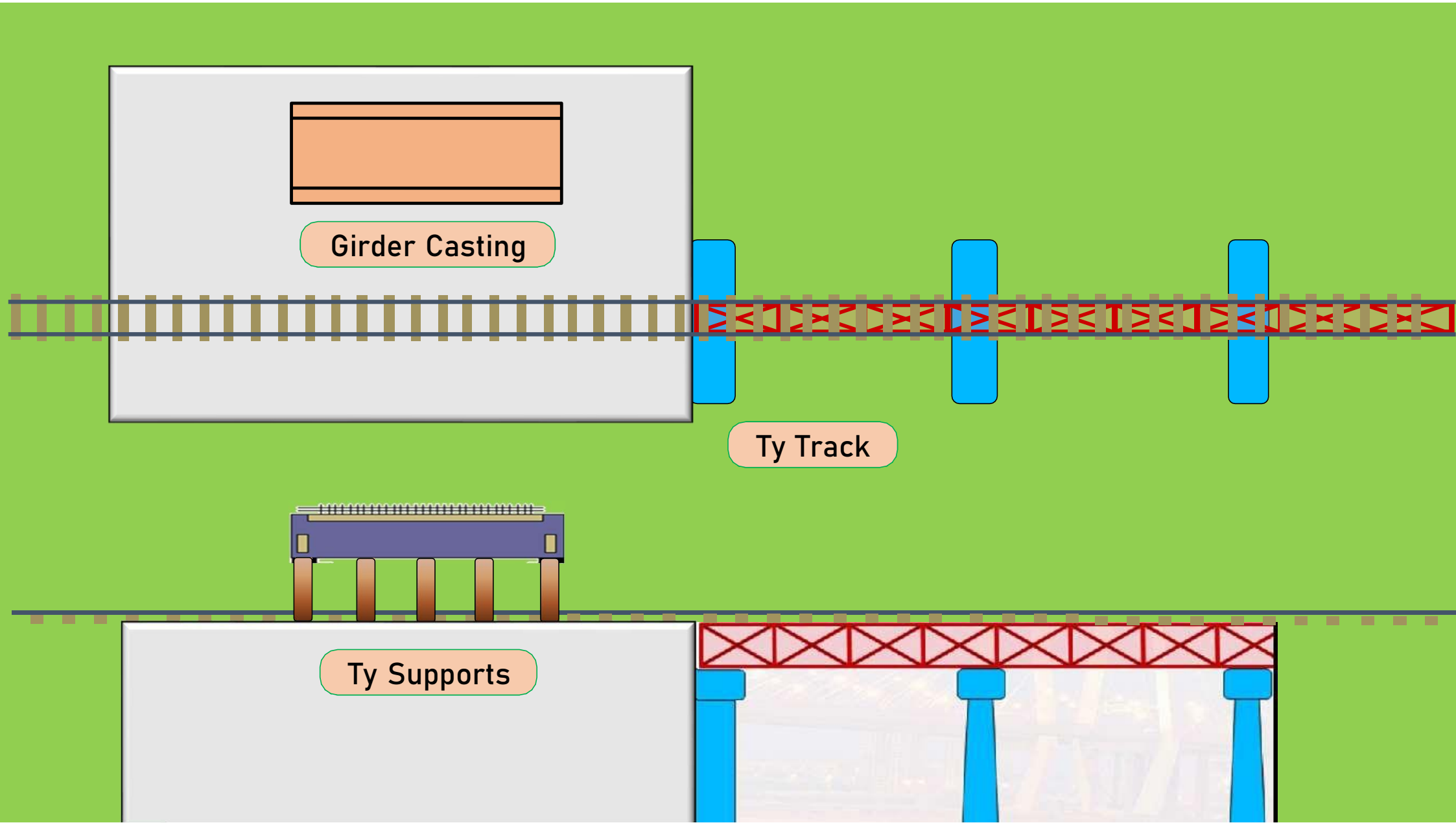
SPECIAL FEATURES

- TOTAL LENGTH: 460m
- 12 of 30.5m spans
- PSC BOX Girder: 450 tons
- PERENNIAL FLOW
(Tributary of Krishna river)



Launching of Girders

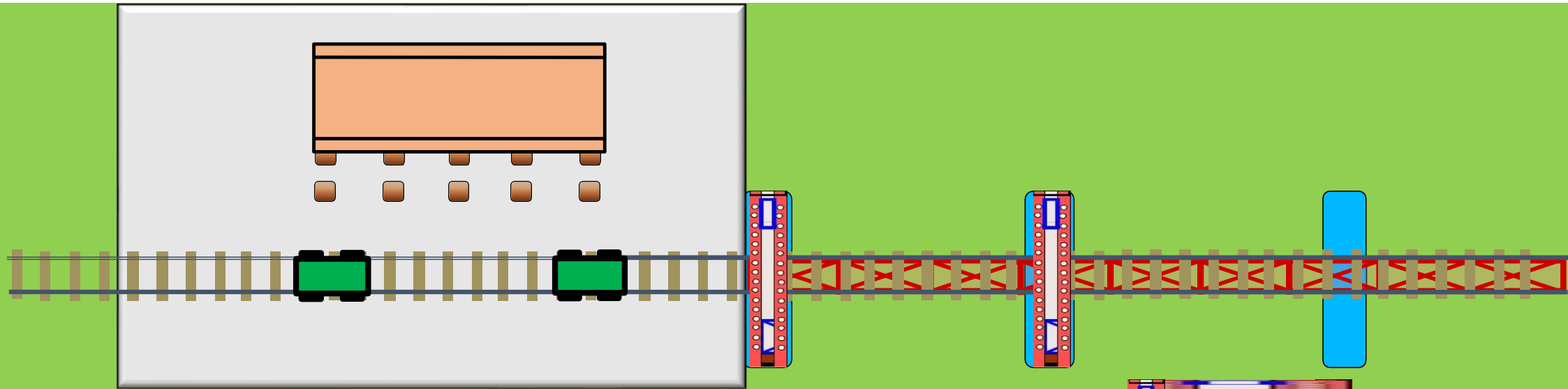
- PRECAST on approaches
- Launching Girder
- For 2 Spans Length - 125t
- No Support from bottom



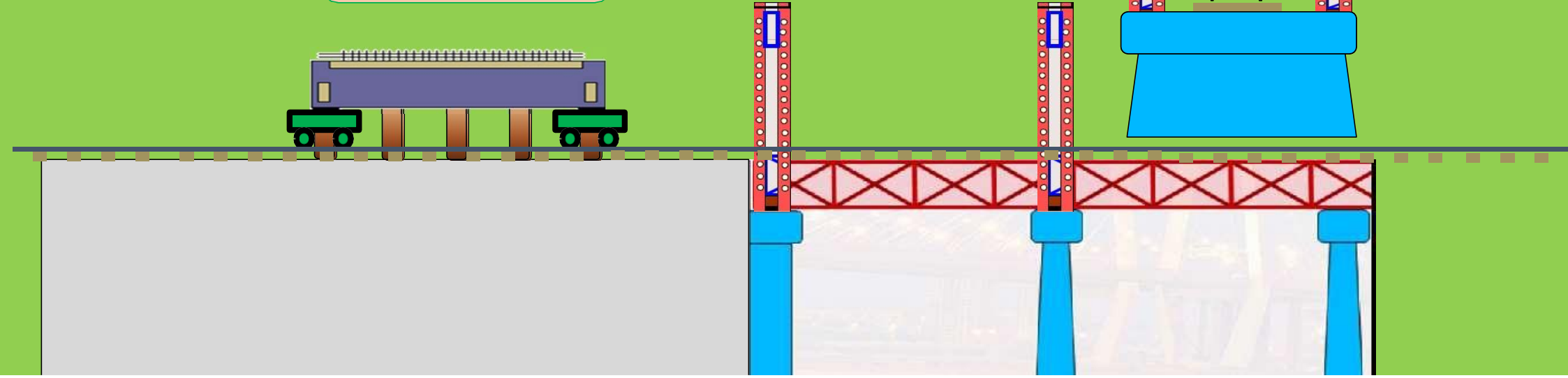
Girder Casting

Ty Track

Ty Supports

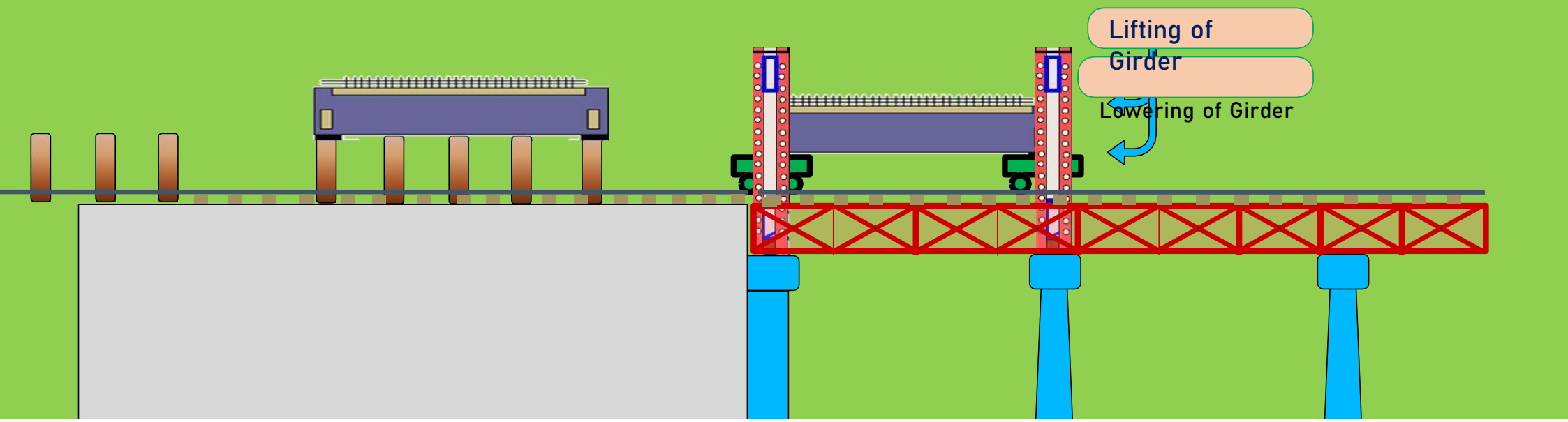
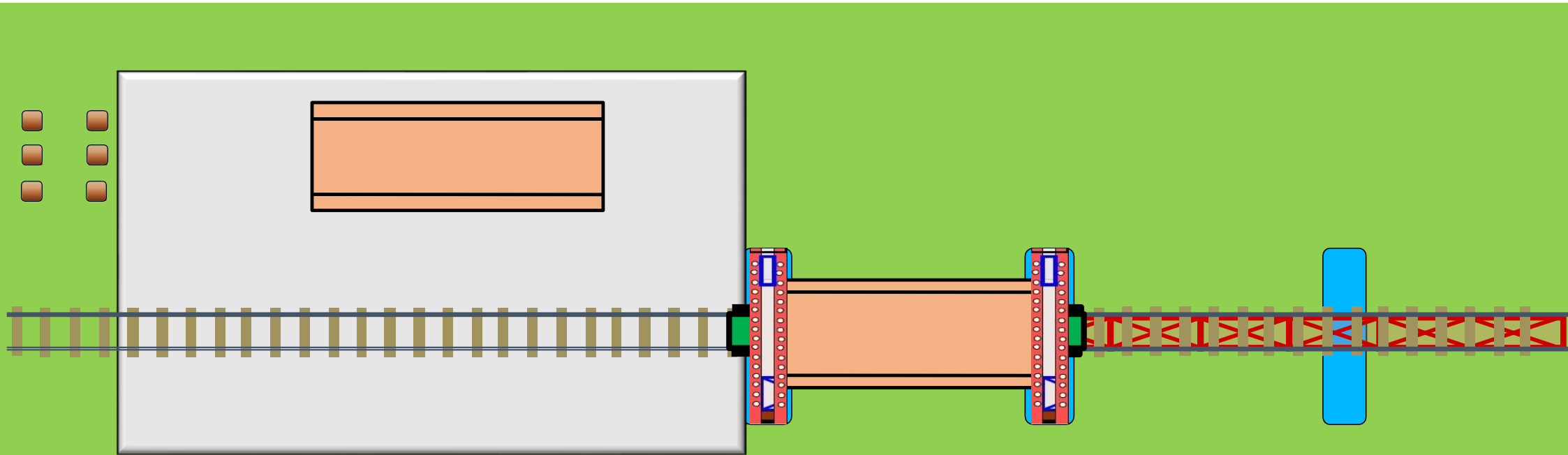


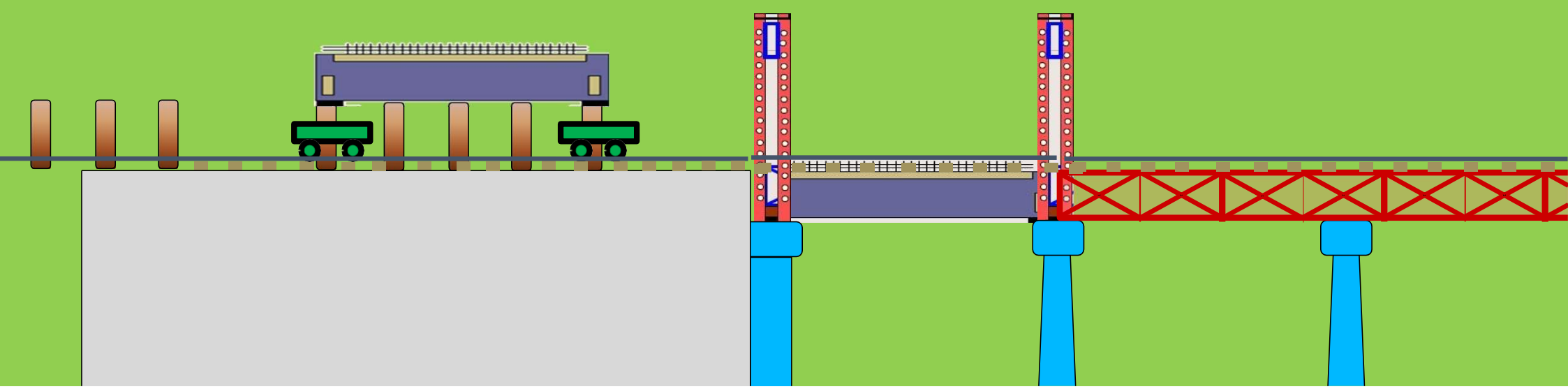
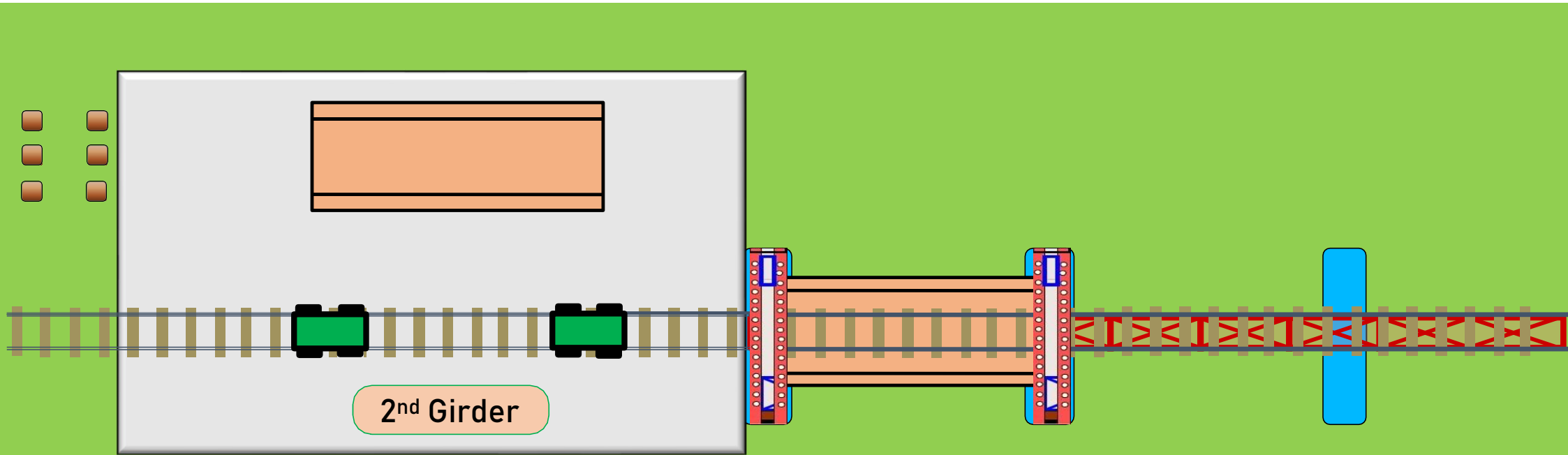
Special Trolleys

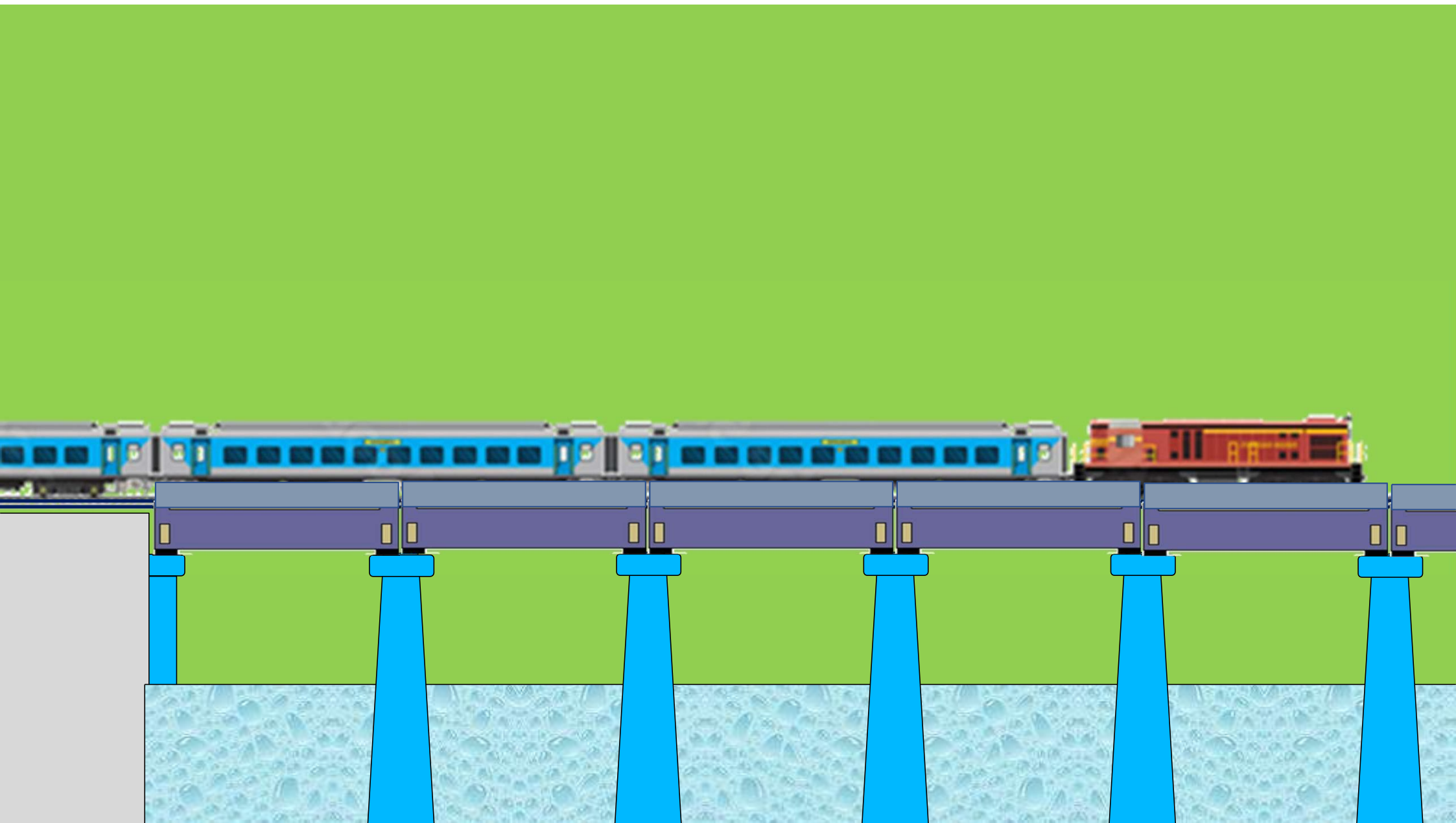


1st span with portal









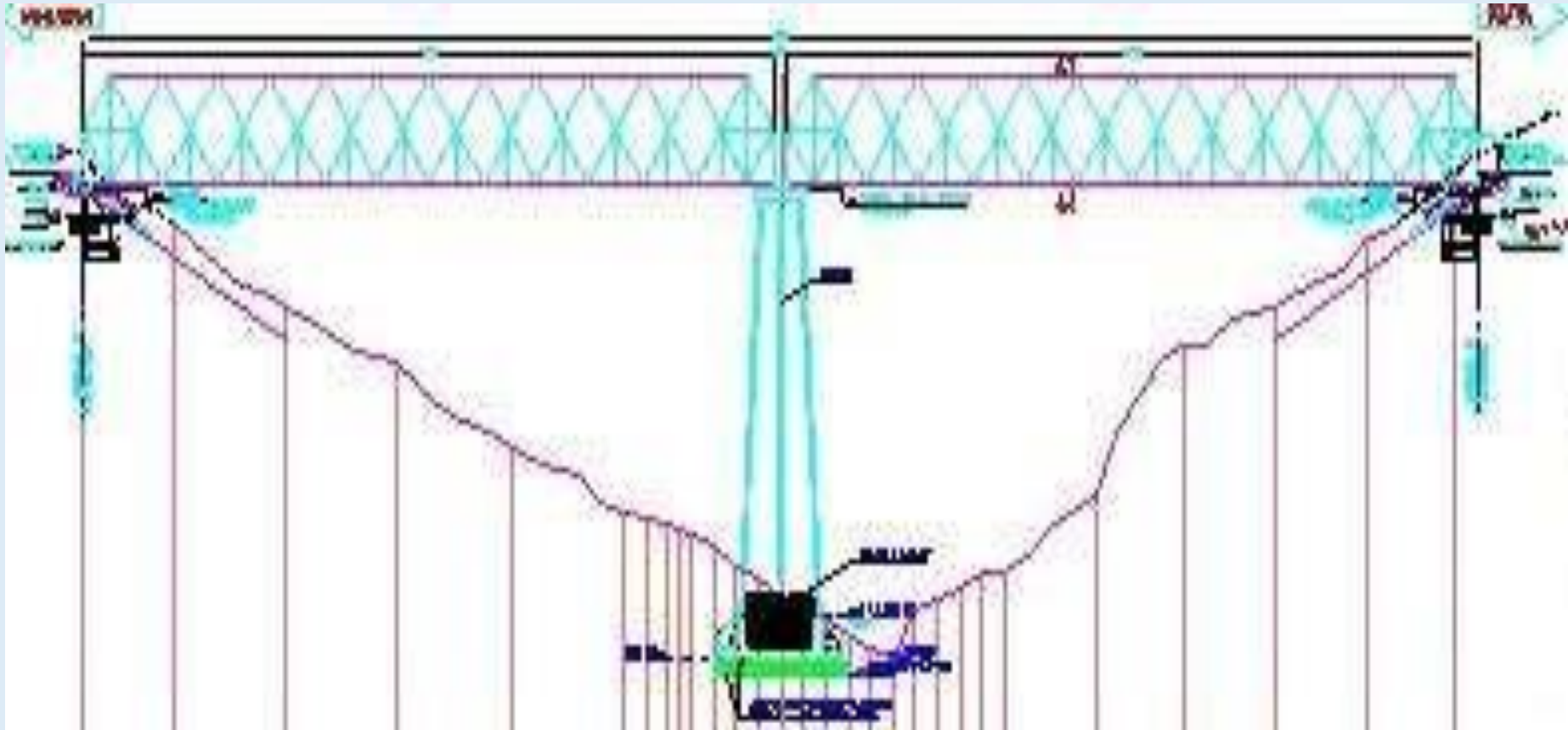
Completed bridge





Jhajjar
Khed
Bridge,
J&K

Two spans of 153.4m



Incremental Launching

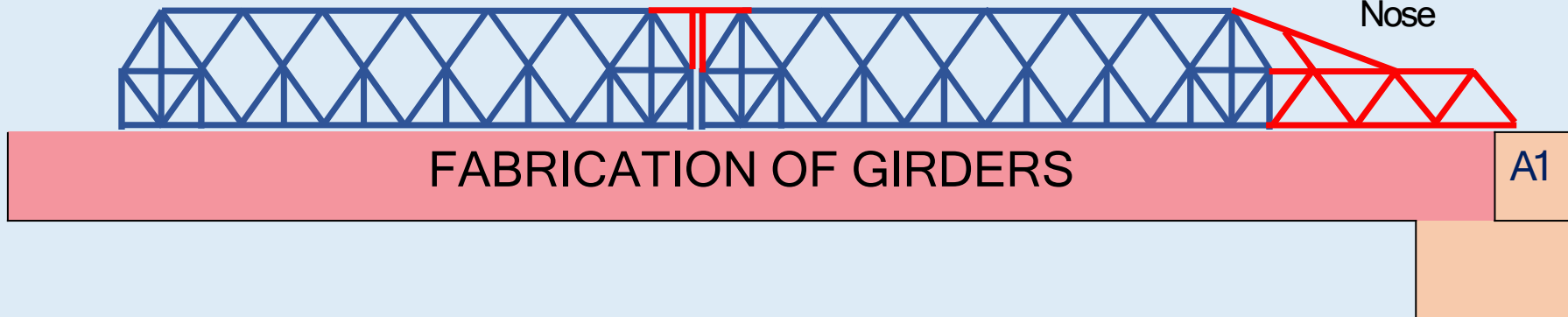
- Each girder around 1000 tons
- Stitch girder + Launching nose:
700tons
- Pulling by powerful multi-strand jacks
- Skid beams with stainless steel
bottom
- PTFE pads on supports

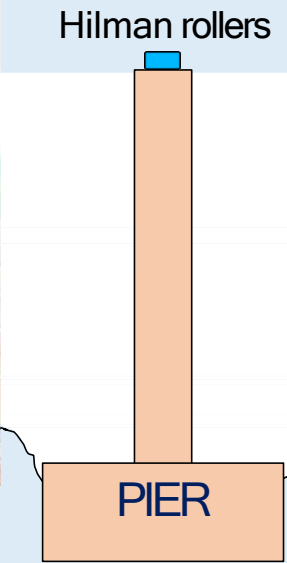
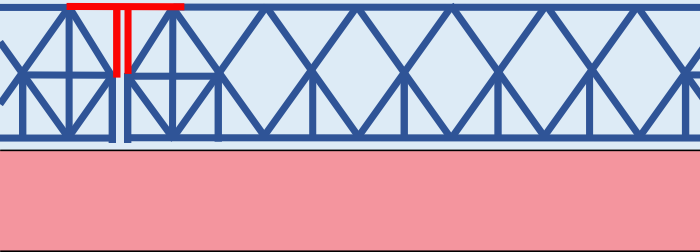
Temporary
Stitch

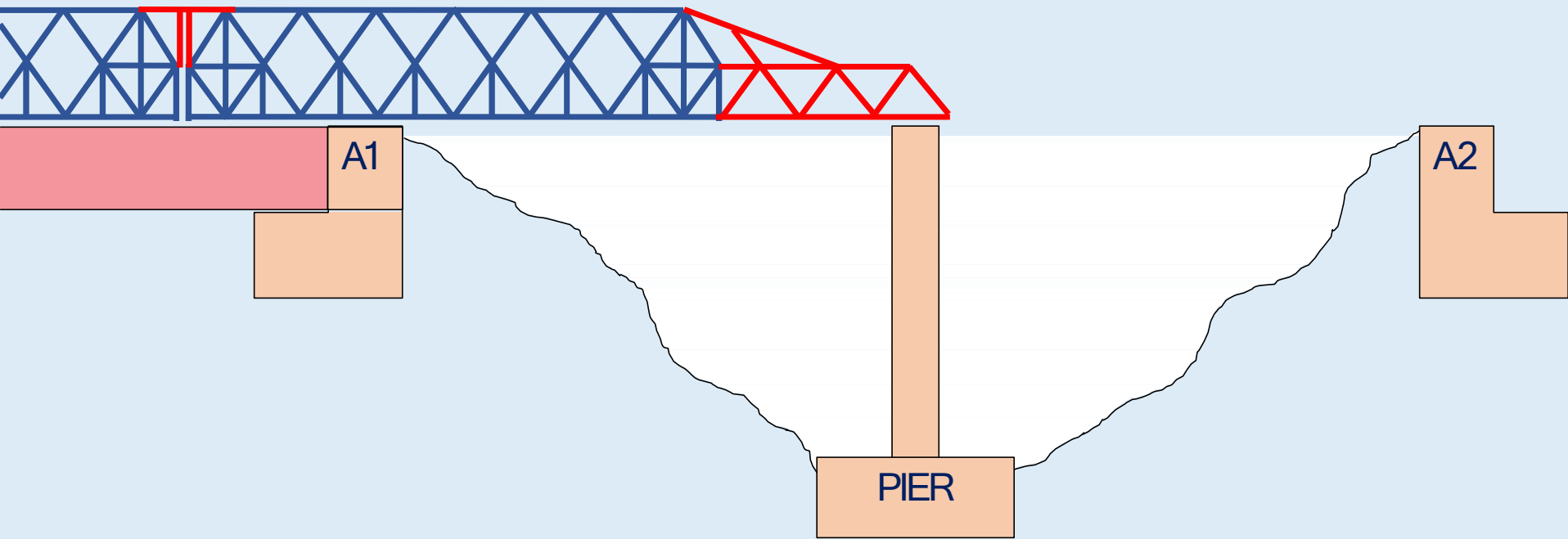
Launching
Nose

FABRICATION OF GIRDERS

A1









Stitching girder

Launching Nose

Completed Bridge





Segmental Viaduct,
Hyderabad Metro

Precast Yard



Short-Line Method



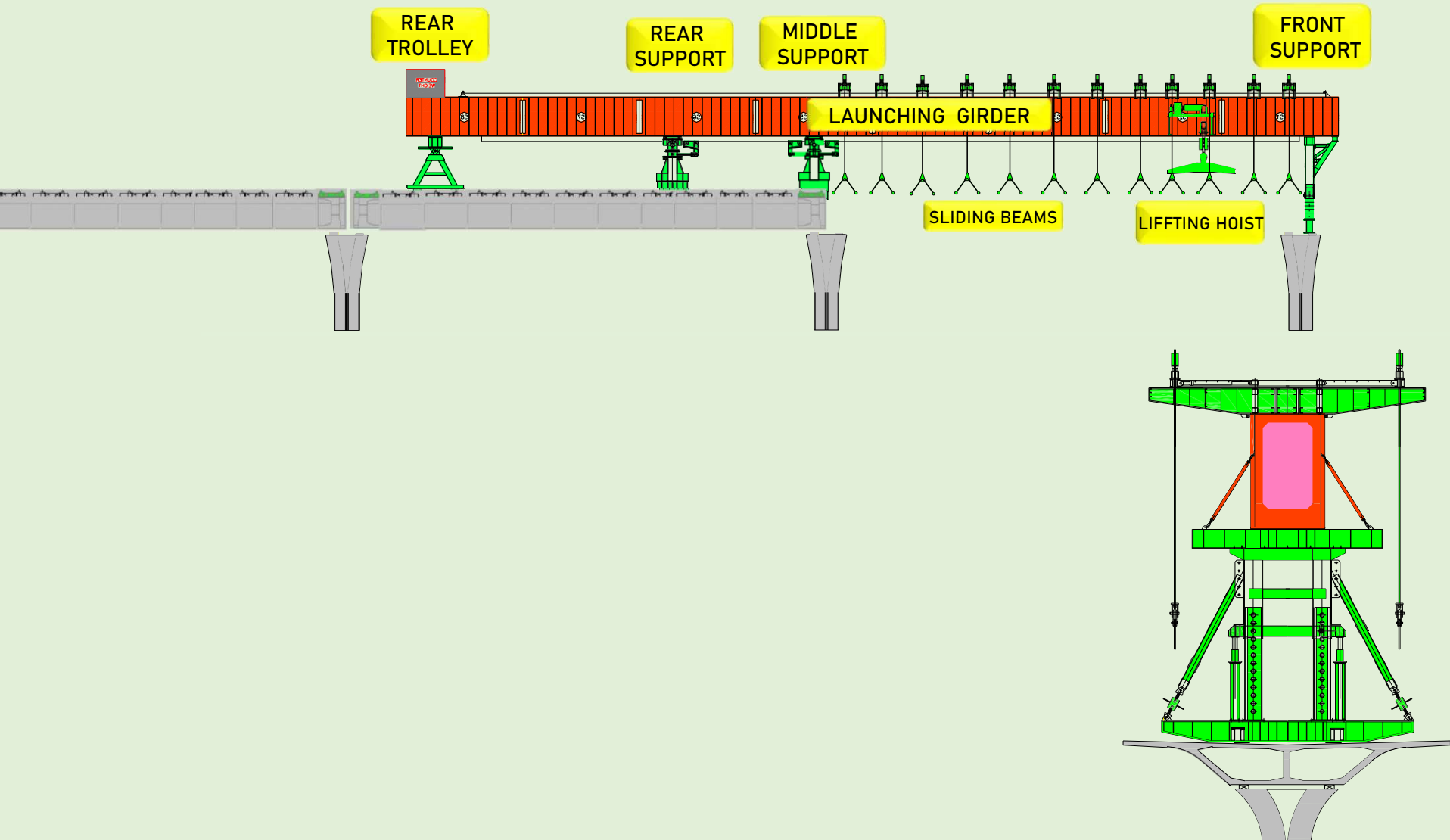
Next
segment

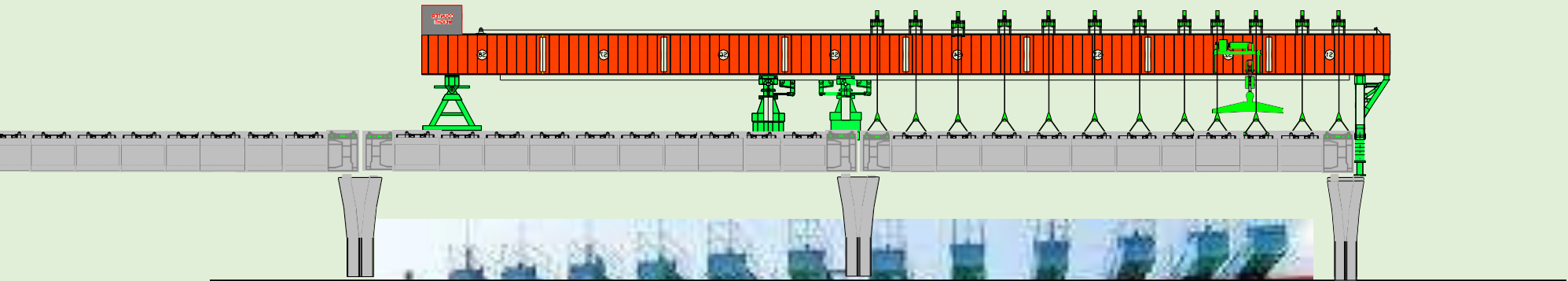


Curing



Launching Girder









JAI
HIND

QUESTIONS?

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