Rectification in the operating system of non-functional stoplogs on an inclined track

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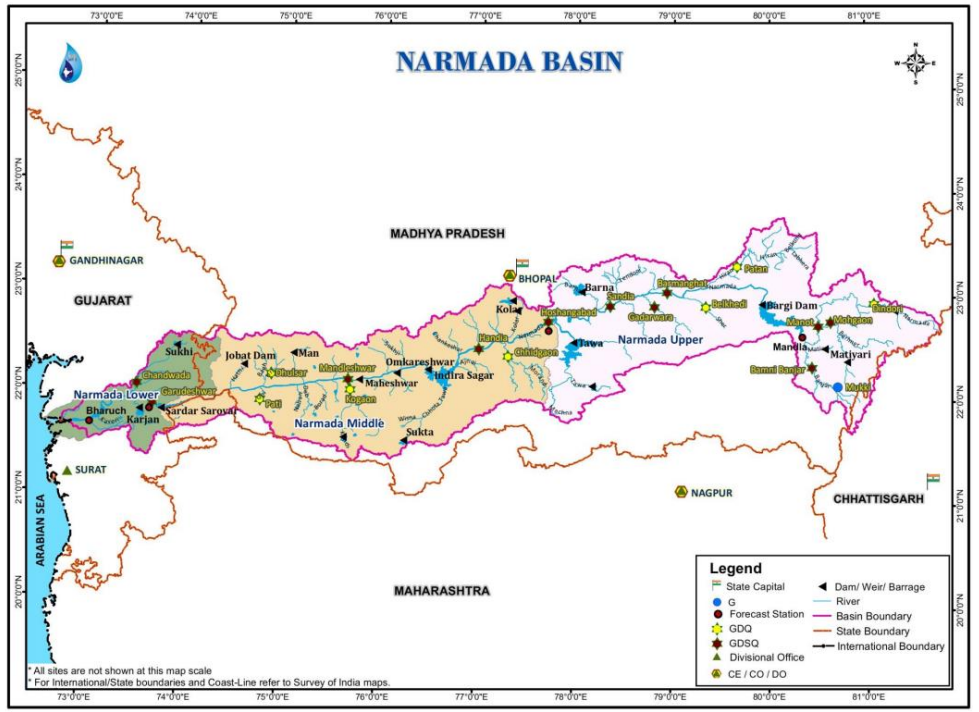
Narmada River

Sardar Sarovar Dam

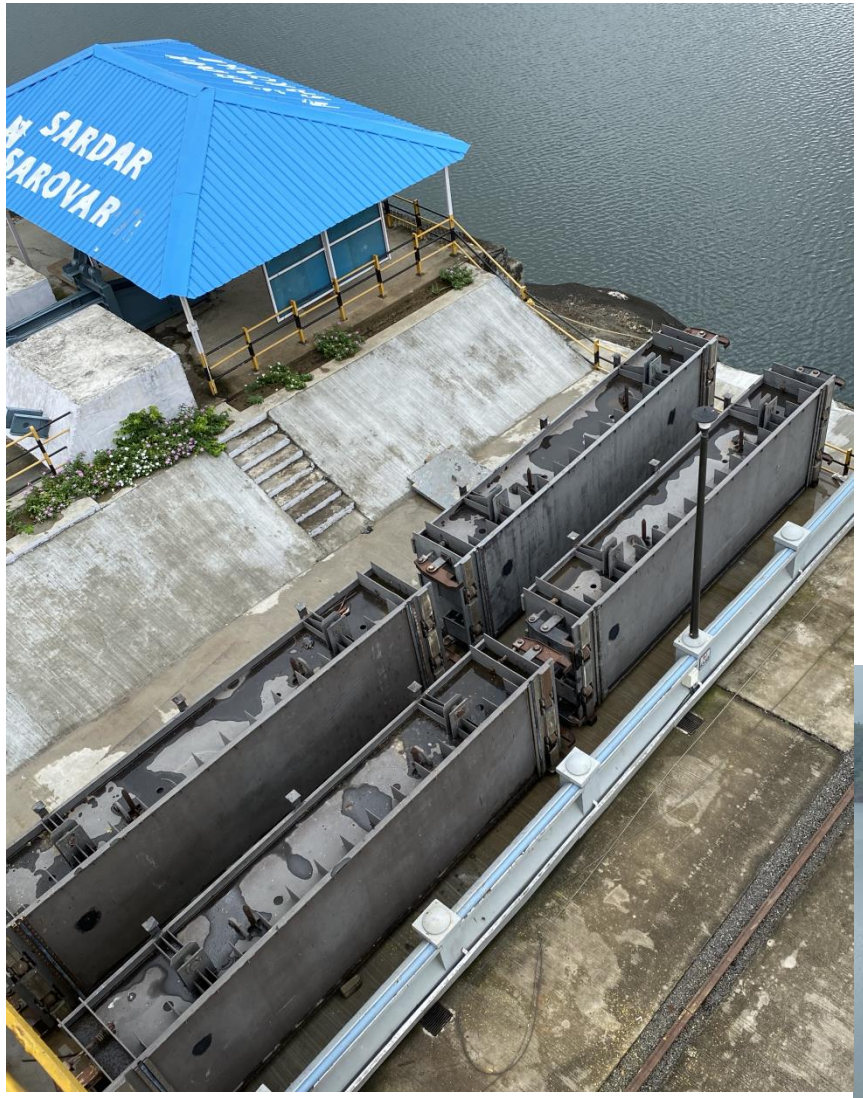


- Narmada, the largest west flowing river
- Length of river 1312 Km

Sardar Sarovar Project

Multipurpose dam built on the Narmada River Navagam near Kevadia, Gujarat

- Largest water resources project in India in terms of concrete volume
- Third highest concrete dam (163 m)
- Length of dam – 1210 m
- Two Power Houses
  - Main Power House – 1200 MW
  - Canal Power House – 250 MW
- Largest Irrigation Canal
  - Length 468 km
  - carrying capacity 1133 m^3/s
  - 35 branches

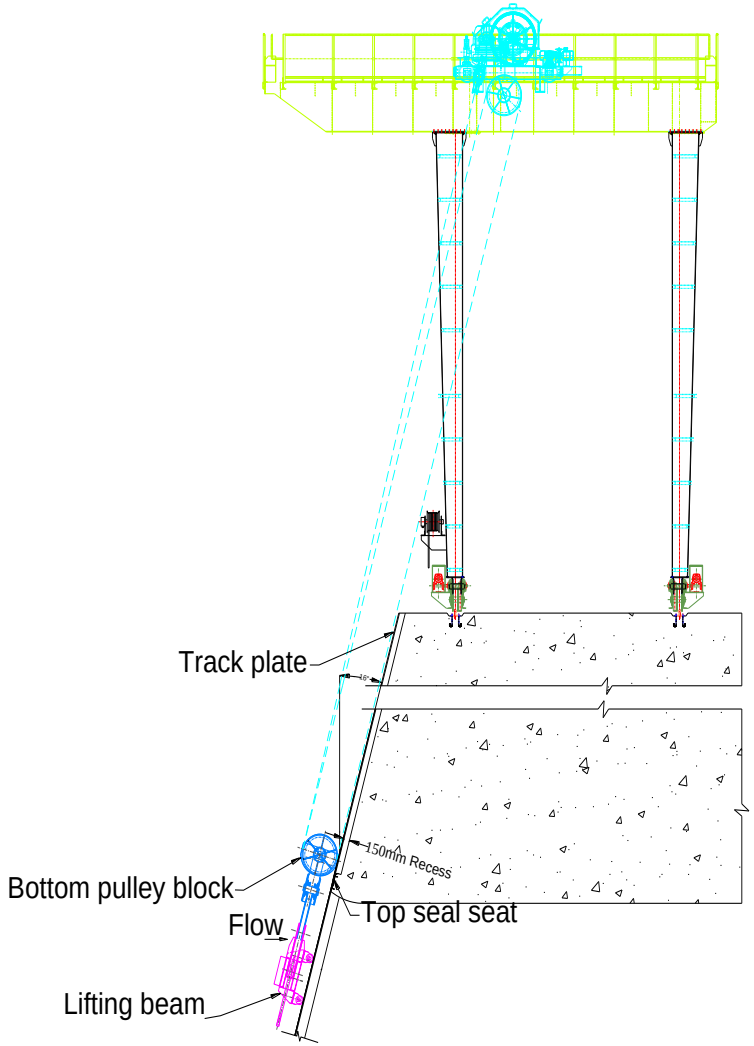


River Bed Power House Intake

- Six Penstokes Service Gates operated by Hydraulic Hoist
- Stoplogs at face of bell mouth Intake for maintenance of Service Gates

Stoplogs

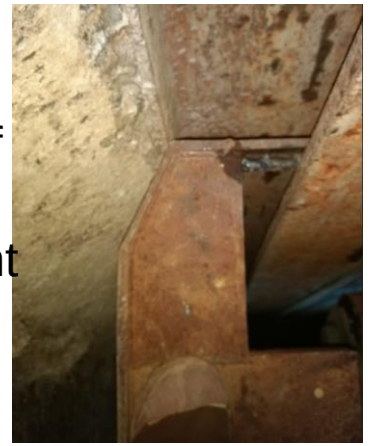
- One set of stoplogs having six units of size 6200mm X 2250 mm (each) provided for maintenance of these gates.
- Weight of each stoplog unit = about 15T
- Positioned at bell mouth entry on an inclined track at an angle of 16 degrees to the vertical
- Operated by 100T gantry crane.



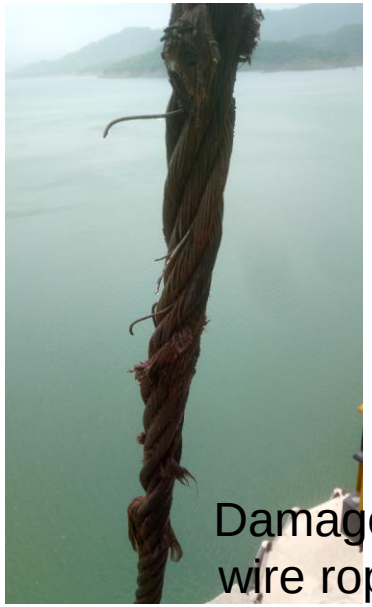
Trouble in Operation of Stoplogs

- Problem of non-working of stoplogs identified in 2008.
- Testing of the bottom unit carried out.
- During raising cycle, after disengaging the stoplog, the lifting beam got stuck in the groove.
- After raising, the lifting beam roller assembly and guide found damaged.

Stuck up of guide arrangement



Damaged pulley cover



Damaged wire rope

Single piece Bulkhead

Proposal

- Six bulkhead gates of size 6.3 m X 13.5 m weighing about 90t.
- Operated by an individual rope drum hoist of 110T capacity.
- The proposed bulkhead designed to suit the existing embedded parts.

Pros

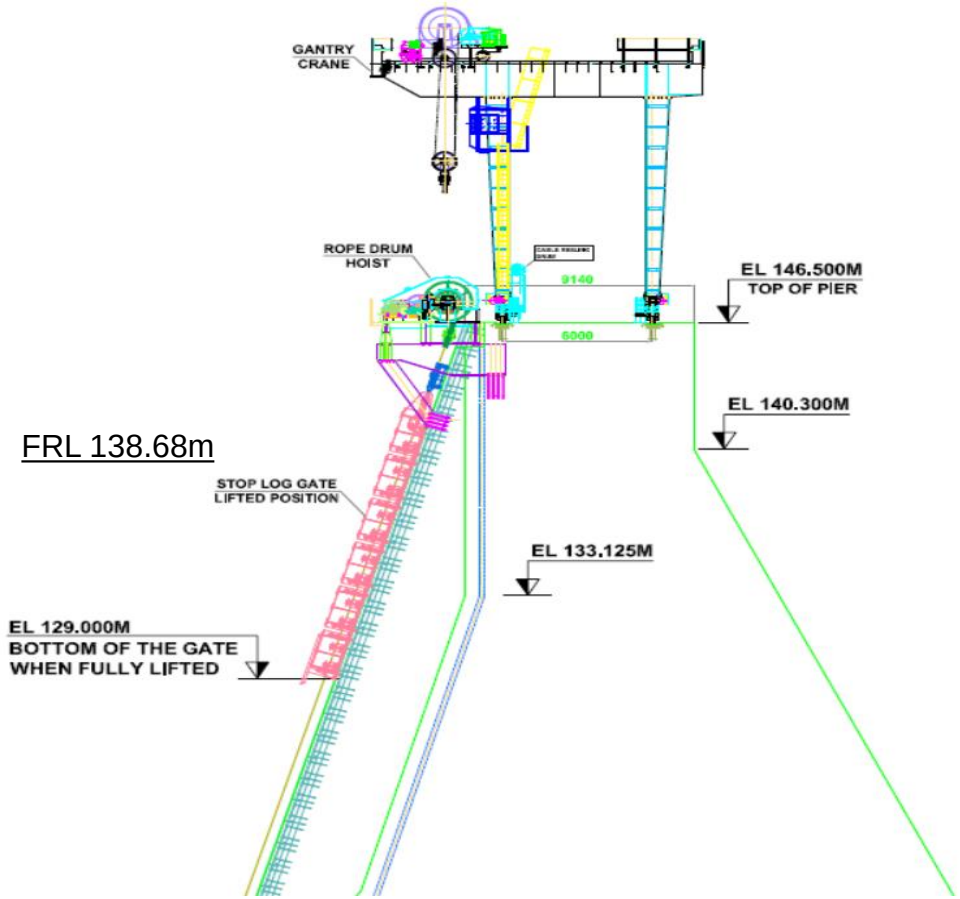
- This option simplify the operation of the bulkhead as it eliminates the need of engaging and disengaging the lifting beam with stoplogs units.

Cons

- Would require approximately 834 metric tones of steelwork.
- Dismantling the existing concrete and accommodating the required counter weight

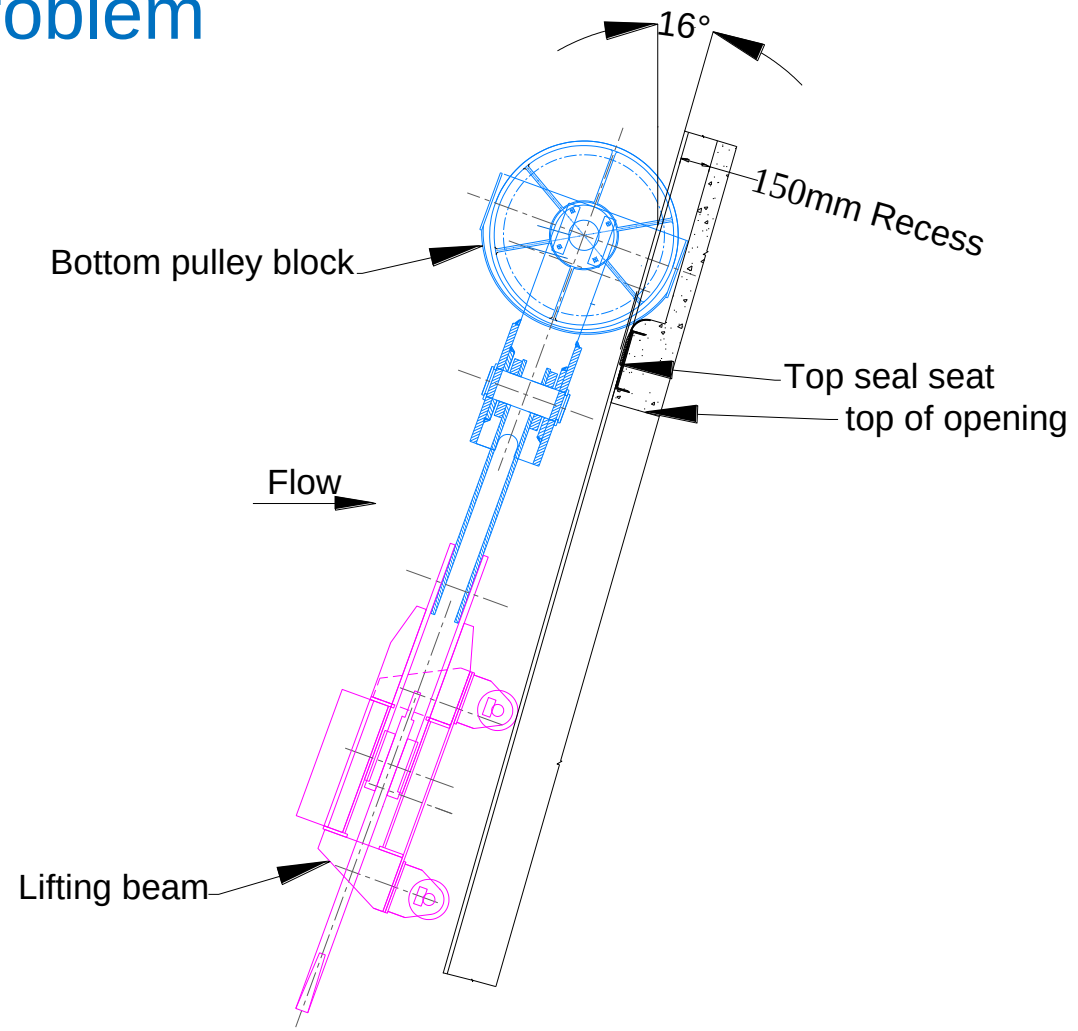
Challenges

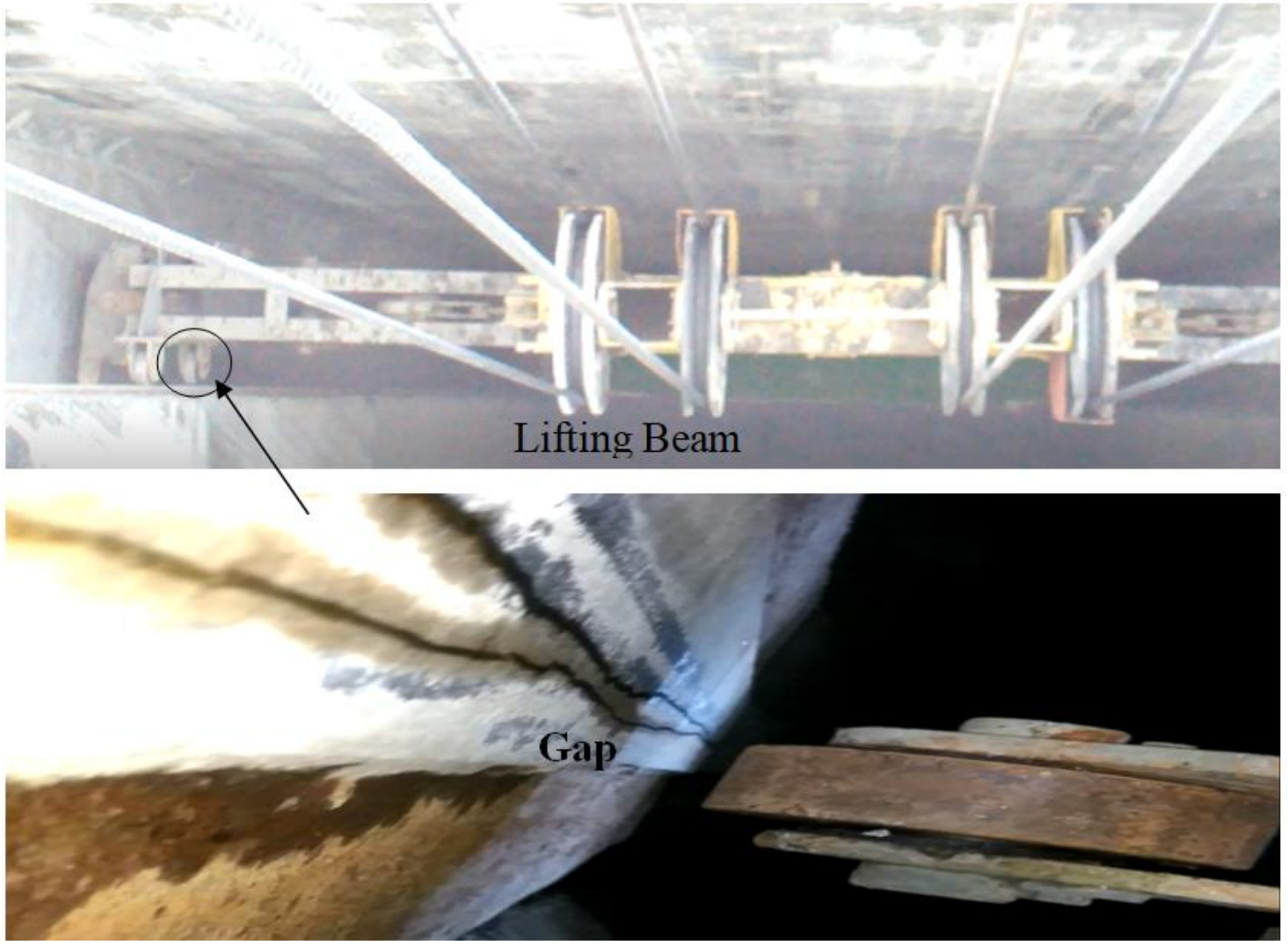
- Bonding of new concrete with existing old concrete.
- Space limitation for counterweight/ hoist bridge anchorages.
- Maintenance issue of the proposed bulkhead.
- Limited capacity of the upstream wall of penstock gate hoist chamber to support the cantilever hoist.
- High cost.



Proposed single piece stoplog/ bulkhead

Pin Point the problem




Lifting Beam
Gap

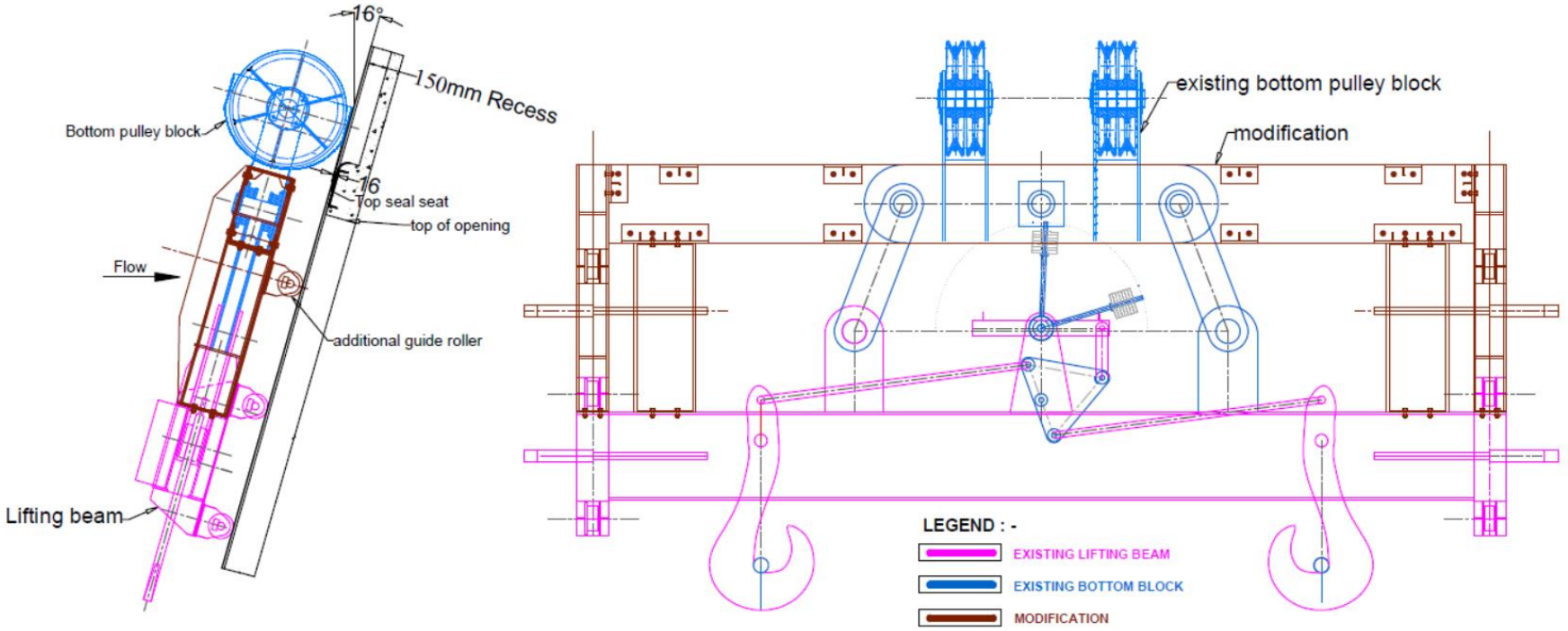
Rectification in Operating System of Existing Stoplogs

A. Provision of additional pair of guide roller in the bottom pulley block.

B. Alter the connection between lifting beam and bottom pulley block.

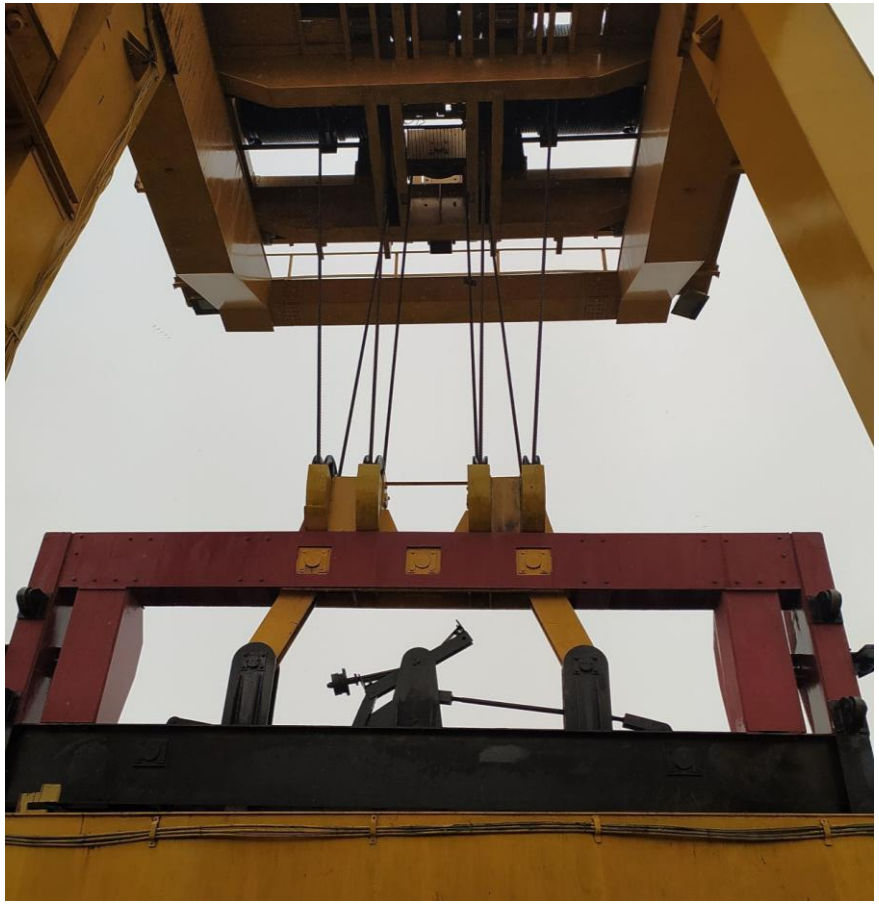
C. Redesign the Lifting beam arrangement.

Selection and Implementation of Final Solution



Modified operating arrangement

Additional weight 2.7T



Modified operating arrangement

Modified Lifting Bean during trial in the groove

Conclusions

- Focus on sizing of structural members.
- Critical detail often overlooked.
- Different Components designed at different times by different engineers.
- Overlooking the verification of workability.
- Lead to malfunction or even non-functioning.
- Coordination at each stage important.