

Model Project on Construction of Naranarayan Setu over river Brahmaputra at Jogighopa.



A case History

Prepared by :-

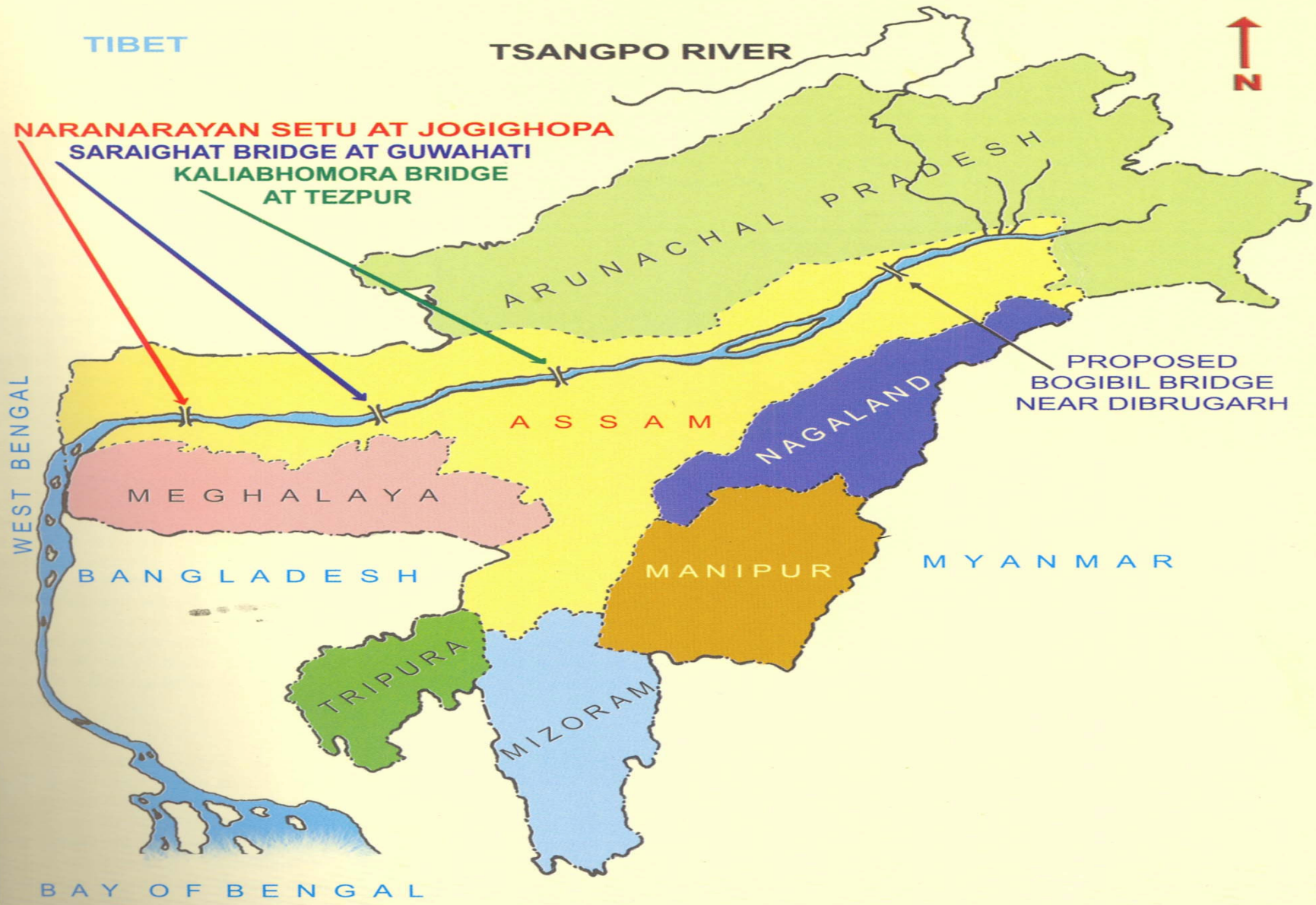
- » **S. K. Saha, AEN/BR/ASN/ER.**
- » **B. N. Das, AXEN/CON/Design/NFR.**
- » **J. Mandal, AXEN/Con/HGS/NFR.**

HISTORICAL BACKGROUND

- It was a dream of Assam to link Jogighopa with Pancharatna over Brahmaputra river since long back.
- Exploratory surveys and intensive studies made by the British Engineers in 1928 and 1940 to connect north bank to south bank.
- But it was abandoned due to serious problem of foundation near south bank.
- The proposal was again revived when the extension of BG line From New-Bongaigaon to Guwahati via Gowalpara was in question.
- Initially this bridge was meant for construction of cable stayed module in order to minimize the different foundations for 624m.
- But this idea had to be given up due to technical difficulties.
- Lastly the foundation stone of this bridge was laid in 1983 by the then Prime Minister Smt. Indira Gandhi.
- The name of Bridge has been kept by the name of great king of Koch of the 16th century as “Naranarayan Setu”.

LOCATION STUDY AND INVESTIGATION

- RITES was the consultant for investigations to make study for design.
- Geological investigations were carried out by the GSI, Shillong.
- Seismological field studies were carried out by the India Meteorological Department.
- Laboratory Studies for earthquake done by the University of Roorkee and submitted the recommendation for design criteria.
- Geo-Technical investigation for rocky strata in bore hole done by M/s AFCONS.
- Hydraulic data collected from Brahmaputra Flood Control Commission and Central Water Commission.
- Gauging data collected from Central Water Commission for 20 years.
- Central Water Power Research Station collected topographical data for 35 km U/S and 10KM D/S side.
- The Hydraulic Model Study and Investigation done by Central Water Power Research station, Pune in 1982-83.



MAP OF THE NORTH EASTERN REGION

**FIG. 1.1
BRIDGES ACROSS RIVER BRAHMAPUTRA**

Importance of Bridging (Rail- cum- Road Bridge)

- Speedy communication with Assam and Meghalaya.
- Railway track connecting the existing Jogighopa Rly. Stn. to the Kamakhya Stn, near Guwahati.
- It is an alternate route for passenger and goods traffic bothways and also to serve the requirement of national security.

Importance Of Bridging (Rail- cum- Road Bridge)

- Transportation of mineral rich Garo Hills endowed with natural resources into the main stream of National Economy.
- Two lane road component in the upper deck connecting NH-31/B on the North Bank with the NH-37 on South Bank.

Technical Features

- River :- Brahmaputra river in Bongaigaon district of Assam.
 - Length of bridge :- 2.284 km (Rail- cum- Road bridge.
- Span :- (1x32.6+ 14x125 + 1x94.6 + 3x125 + 1x32.6)m.
- Type of girders :- Steel open web girders of through type (Width = 11.50m, Depth = 18.50m)
- Type of foundation :- Well foundation of double-D type (11.00m x 17.00m for P1 to P16 & P19); Circular well (18.00m dia for P17 & P18; 6.00m dia for A1 & A2)
- Type of bearing :- Roller and rocker (Oil bath type).
- Commencement of project :- December 1987.
- Commissioning of the Bridge for road & Rly traffic :- 15th April 1998 by Sri Atal Behari Bajpayee (PM).
- Maximum depth of foundation :- 66.00m below LWL
- Grade of conc. :- M-30, M-25.

Technical Features Contd...

- Consumption of cement :- 80,000 MT.
- Volume of concrete :- 1,00,000 cubic mtr.
- Consumption of steel reinforcement :- 13,000 MT.
- Consumption of steel in Super-structure :- 35,500 MT.
- Total cost of the Project :-368 crs. (borne by Rly 101crs., by NEC 95 crs., by MOST 172 crs.)
- Preliminary Design done by :- RITES.
- Final Design of Super-structure approved by :- RDSO/
Lucknow
- Design of Foundation and Sub-structure approved by :-
Technical Advisory group appointed by Rly Bd.
- Max.Design Discharge :- 90,400 cumec.

Technical Features contd...

- Maximum Mean Velocity of Flood :- 5.00m/sec.
- Maximum Scour Depth considered :- 53.82m from HFL.
- Seismic force taken as per :-IRS bridge rule & IS: 1893.
- Span of viaduct :-7X17.86m RCC + 10X29.73m PSC (North) ; 7x17.86m RCC + 18x29.73m PSC(South)
- Clearance between HFL and bottom of girder :- 12.50m

Agency involved

- Fdn & Sub-Structure = Gammon India Ltd.
- Super-Structure = BBJ.
- Viaduct (north) = New India Construction.
- Viaduct (south) = Tantia Construction.
- Guide Bund & Br. App. = Tantia Construction.

Process of Execution for Foundation and Sub- Structure.

- Well caisson fabrication.
- Well caisson transportation and launching.
- Casting and sinking of caisson.
- Construction of sub-structure.



Gantry on barge for transporting caisson on river and placing it in position



Caisson being held in position with gantry



Construction of twin pier pedestal is going on



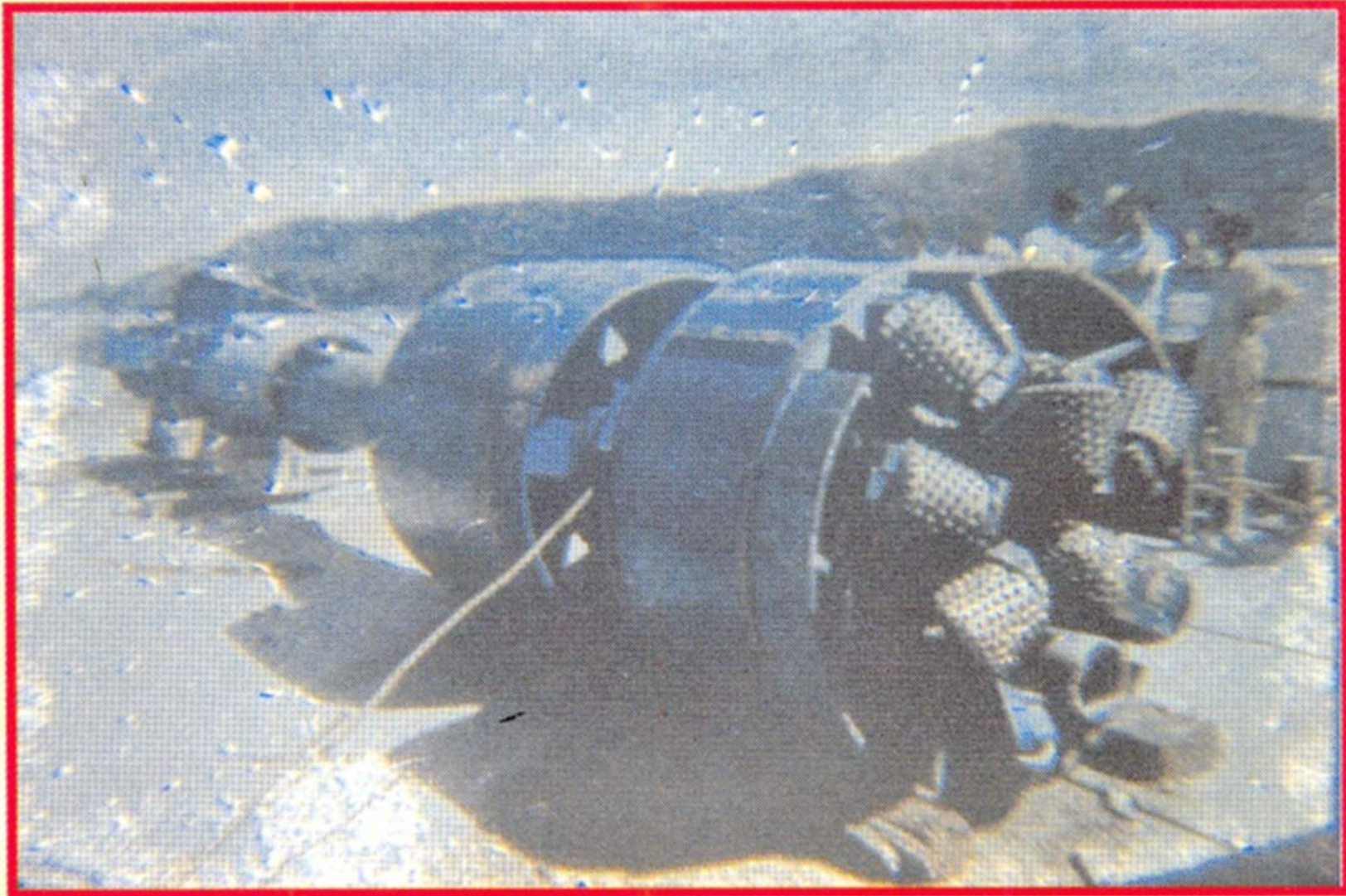
Tilted pier no.-13

SPECIAL FOUNDATION AT P-17 & 18

- Proposed by high technical advisory group.
- Well-pile combination.
- Well dia. = 18.0m.
- 12 nos. anchor piles of 1.5m dia through well steining of 3m thick.
- Piles are anchored into rock by 10m.
- 8nos external piles of 1.5m dia around circular well.
- Bottom plugging of well done by jet grouting technique.



Special foundation with well pile combination for pier no.-17



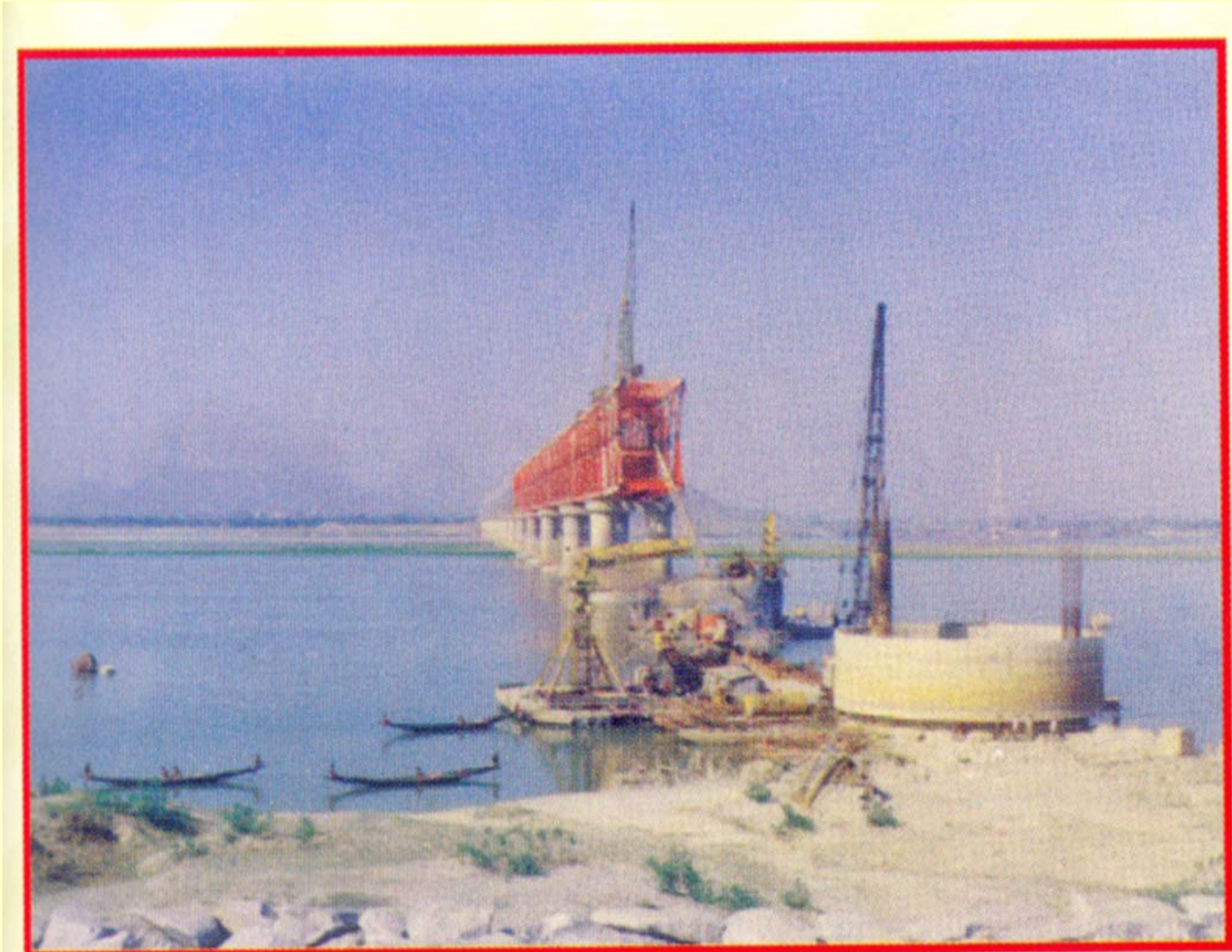
Rock drilling machine (diamond cutter) for driving pile into rock



Barges carrying jet grouting equipment, rock drilling machine



Jet grouting equipment used in construction of special Foundation (Pier-17 & 18)



Activities around spl fdn Of pier no. 17 & 18

Process of Execution for Super-Structure

- Fabrication of girder at Yard.
- Assembling and erection at site.



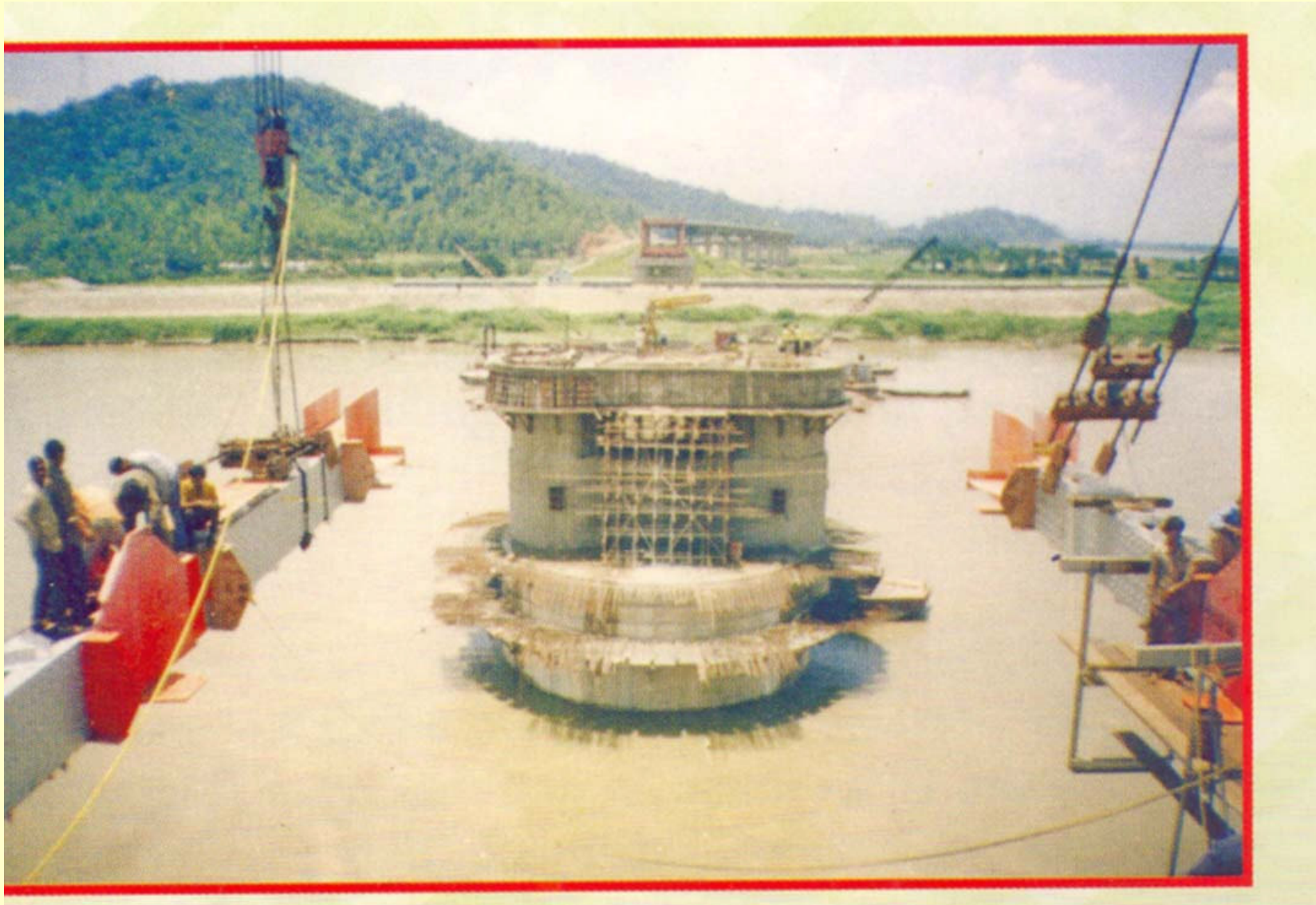
Fabrication and assembling yard



1st anchor span at JPZ end erected on trestle



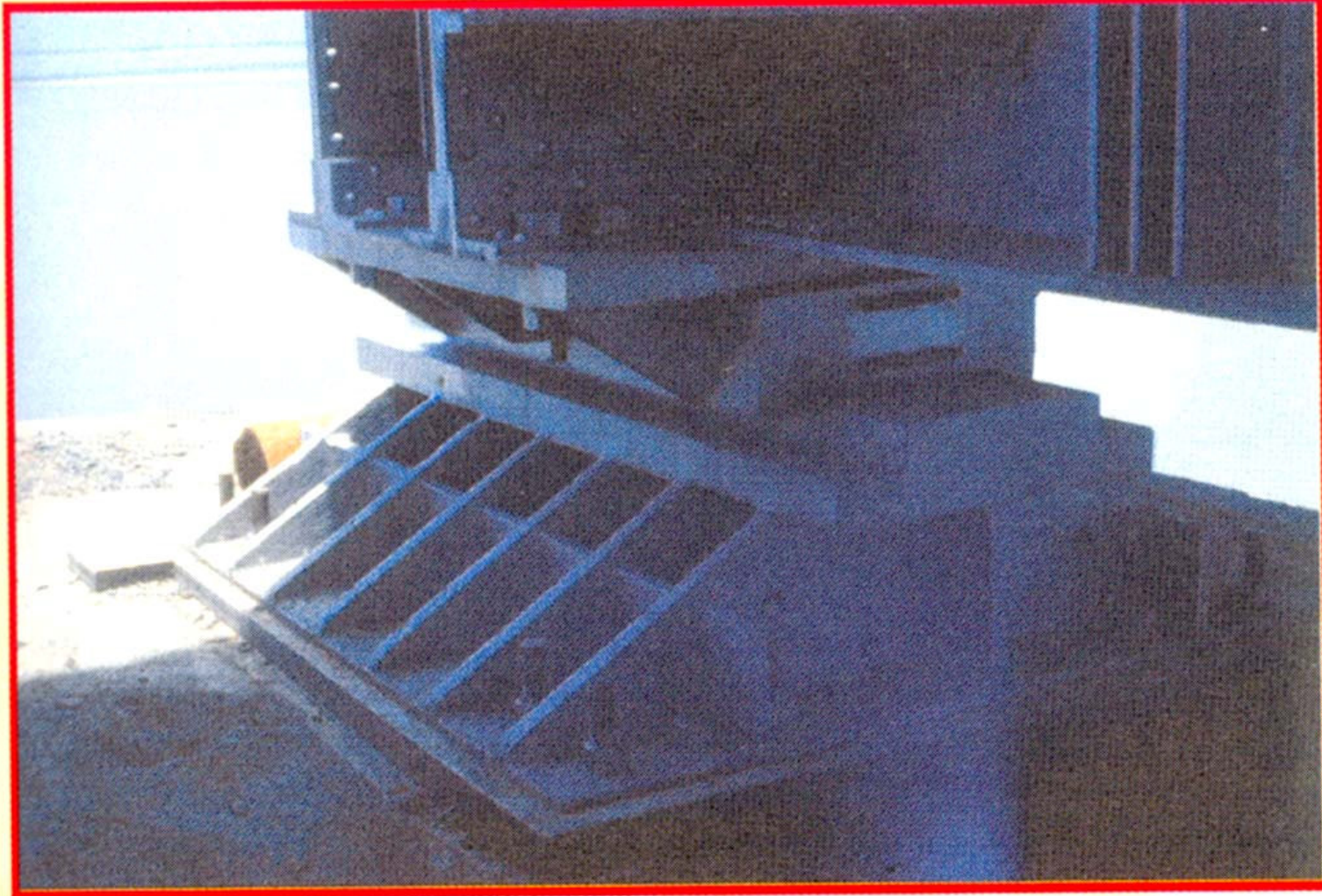
Full length cantilever span being held by temporary Receiving bracket to reach pier cap



Cantilever erection in progress with hanging device.



Almost full length cantilever can be seen behind the Team dancing Bihu, a traditional dance of Assam.



Rocker bearing for 125 m span



Completed railway deck



Strip seal type muorer expansion jt. At road deck Level.



Completed road deck

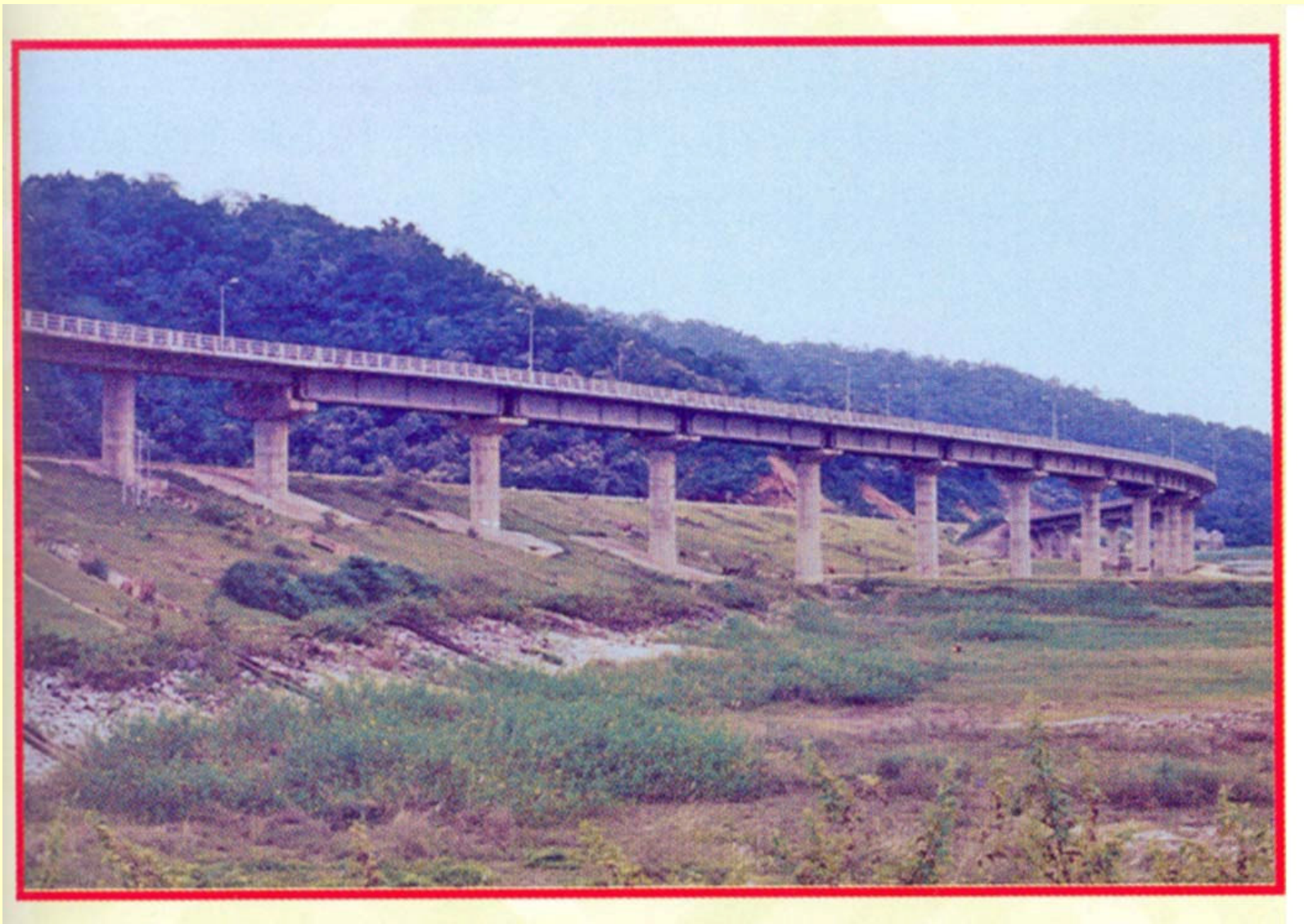
Construction of River Training Works.

- South side guide bund (length = 878m)
- North side guide bund.(length =850m)
- Top width = 9.00m, Side slope = 2.5 : 1

Construction of Viaduct , Bridge approach, Track linking & Road work.



Completed portion of north Guide bund



SOUTH BANK VIADUCT OF NARANARAYAN SETU

Conclusion

This was a big model Project in construction of important bridge by N.F.Rly and after opening to traffic it made us proud being a part in execution from Engg. Dept .Mighty river Brahmaputra had always posed a big challenge to Engineers. That is why it was an outstanding achievement of Railway Engineers.

When a dream of Engineers is converted into reality what a pleasure is felt that can not be explained in words.

Above all we are grateful to SP/W Sri Naresh Lalwani Sir, P/T-1 Sri Rajesh Kumar Sir and TA/C Sri Nizami Sir who has guided us all around to prepare this project.



Panoramic view of complete bridge NARANARAYAN SETU

“Success is never ending,
Failure is never final,
Change is the nature of life,
But challenge is the aim of life,
So, we have to challenge the change,
Not to change the challenges.”

Thank You.