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# SAM PRONATION BRIDGE for Fast Transportation and Ship Convenience

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**ABSTRACT:** The bridge is a structure which makes transportation easy and fast as per demand of day to day increasing traffic volume, which are made for saving time and provide ease in personal and professional lifestyle. The structural concept is developed from the existing bascule bridges. The bridge we are going to design is not been used before, it is not very different than existing bridges. It's kind of similar to the rotational bridges but they are suspended on pier at the centre which is constructed on the river, lake, etc. and it is also very difficult to construct such a piers for long span bridges, hence the "SAM PRONATION BRIDGE" is a solution for this. The mechanism that we are providing for rotation, need some power for making movement of bridge, so the connections of controls are from bank of river or lake, hence reduces the chances of failure. In this project we have consider all the cons of existing bridges and trying to make some improvement in them. The bridge is supported on the bank of river or lake and joining two or more routes. The bridge movement is horizontal and driven by mechanical means. The two or more destinations are designed as another bearing portion of the bridge. The vehicles coming are directed as per the direction they needed and then goes to their destination.

**KEYWORDS:** Bascule bridge, Traffic volume, Mechanical means.

### I. INTRODUCTION

A Bridge is a structure which is built on the water body so as to connect the two terminal stations and provides passage over the obstacles. The Bridge is a structure which makes transportation easy and fast as per demand of day to day increasing traffic volume, this are mainly made for saving time and to provide ease in personal and professional lifestyle.

A moveable bridge or movable bridge (common alternative spelling in American English), is a bridge that moves to allow passage (usually) for boats or barges. In American English, moveable bridge and drawbridge are synonymous, and the latter is the common term, but drawbridge can be limited to the narrower, historical definition used in some other forms of English, in which drawbridge refers only to a specific type of moveable bridge

Rotational span bridges are provided with a central pier and rotating machinery, the span of bridge rotates around the central pier. When normal road traffic has to cross the bridge, it is positioned on its close position and act like as a fixed bridge and allow them to pass over it and when a ship or any vessel has to pass the bridge is kept at 90 degree angle from its fixed position and hence allows the vessel to pass. Generally a clearance of 70m to 90m is required.

An advantage of making bridges moveable is the lower cost, due to the absence of high piers and long approaches. The principal disadvantage is that the traffic on the bridge must be halted when it is opened for passages. For seldom-used railroad bridges over busy channels, the bridge may be left open and then closed for train passages. For small bridges, bridge movement may be enabled without the need for an engine. Some bridges are operated by the users, especially

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those with a boat, others by a Bridgeman (or bridge tender); a few remotely using video-cameras and loudspeakers. Generally, the bridges are powered by electric motors, whether operating winches, gearing, or hydraulic pistons. While moveable bridges in their entirety may be quite long, the length of the moveable portion is restricted by engineering and cost considerations to a few hundred feet.

Movable bridges have proved to be an economical solution to the problem of how to carry highway and rail lines across an active waterway. Currently, approximately one thousand movable highway bridges provide critical links in the highway infrastructure system in United States. One of the most important types of movable bridge is bascule bridges.

Swing span bridges are provided with a central pier and rotating machinery, the span of bridge rotates around the central pier. When normal road traffic has to cross the bridge, it is positioned on its close position and act like as a fixed bridge and allow them to pass over it and when a ship or any vessel has to pass the bridge is kept at 90 degree angle from its fixed position and hence allows the vessel to pass. Generally a clearance of 70m to 90m is required

## II. LITERATURE REVIEW

[1] Akshay Bharadwaj Krishna & Shikhar Gupta

Design and Analysis of Bascule Bridge using Finite Element Method They has used the Trunnion Hub Girder to avoid failure and Light weight Epoxy Asphalt Mixture (LEAM) for the Damage reduction and they has taken the reference of Pamban Bridge [www.iaeme.com/ijmet](http://www.iaeme.com/ijmet) 18<sup>th</sup> of Dec 2016

[2] Berger William (March 2015)

The history of swing bridges in New South Wales most likely commenced in Sydney, with it being noted that the earliest swing bridges in the colony were those erected at Wentworth Park, Pyrmont and Glebe Island in 1850, 1857 and 1862 respectively (Dare 1896, *Main Roads* 1973). The Pyrmont design consisted of a lattice deck which pivoted about a central pier and the Glebe Island design consisted of a single opening swing span mounted on the bridge abutment.

[3] M. Tilley ( June 2016 )

In 1885 a different type of Swing Bridge was constructed on the Fig Tree Bridge over the Lane Cove River (Fig.7) The swing span was a bob-tailed design which consisted of a shortened rear span. This type of bridge is usually adopted due to limited land availability. In order to balance the resultant differential in span masses a counterweight is mounted on the shorter span. There are some minor consequences for this type of design, namely the asymmetric wind loads that are experienced, however these can be catered for by strengthening the bridge where necessary (Waddell, 1916). Dual plate web girders are the main components of the bridge superstructure and they taper from 6 ft. at the abutment to 2 ft. at the pier. It is noteworthy that this design was also manually operated by a handle on deck level which passed through a number of gears before transferring rotation to the structure.

[4] John MacDonald (March 1992)

He prepared a design for a swing bridge to be built on the North Coast, over Cold stream River a tributary of the Clarence River near Maclean. The intention was that it would provide access for the tugs and barges associated with the sugar industry between the farms and the mill at Harwood (Fraser 1985). Only a small line drawing survives in MacDonald's calculation books; the design is unusual in that it consists of a lattice trussed central pivoting span with what appear to be plate girder approaches. It would have been similar in some regards to the Sale Bridge in Victoria built in 1883. Possibly as a result of the considerable expense involved, or potentially due to a lowering of demand from river traffic, this bridge was never built; a single lane timber beam bridge was erected at the crossing instead.

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[5] D. Healy (November 2015)

The next development in swing bridge design was apparent on the Hay Bridge completed in 1873. The design consisted of lattice girder span supporting timber decking and the bridge was operated by hand. The drum was a composite of cast and wrought iron that was finally founded on a centre pier. It was noted by Mr G. S. Mullen, past Resident Engineer, that the Hay Bridge was operating satisfactorily with the frequency of openings being over times per annum in the 1880s (Main Roads, 1973). The swing span was locked shut in 1937 and the bridge was demolished in 1973 with the turntable relocated to Lions Park, Hay. This type of bridge design was also adopted for the swing span on the Gladesville Bridge over Parramatta River completed in 1881, with reports that the operation was also satisfactory. Figure 8.8 is an elevation of this type of swing bridge design.

### III. METHODOLOGY

- [1] As the bridge will work both Cantilever as well as both end supported hence both designs will be made by us.
- [2] For the swinging of bridge necessary to have all the required checks on the Model of the bridge and hence we are going to make a working model.
- [3] Design of various components of the Bridge by using IS-Code.
- [4] The working mechanism of the bearing is provided at the other end of the bridge.

### IV. EXPERIMENTAL RESULTS

#### Design of deck slab

As per IRC the total load on bridge for 30m span is 2727 KN.

As per the design the deck slab having total out to out width is 8.1 m the track width is 7.5m for two lane as per the IRC.

The depth of bridge deck is 500mm and cover is 25 mm.

The main longitudinal reinforcement i.e. main Bars 25mm diameter @ 290mm C/C.

Similarly the distribution bars are of 12 mm diameter @ 230 mm C/C.

#### Design of truss girder

The beam girder is designed as per the load coming from the Bridge deck is total load transferred from deck to top members of the truss girder is factored load 4090 KN.

After analysis of load on each member of truss the maximum load on the members are 4170.50 KN and 6561 KN so the design as per them so use ISMB 500 @ 243.9 Kg/m and ISWB 450 @ 240.2 Kg/m.

The top most member of truss girder is designed as Beam girder so Select Section ISMB 500 @ 243.9 kg/m is found safe against loading.

The connection between truss girders are also act as a beam members so the top girder beam section is also used as connecting member.

#### Design of connection members

The connections are welded connection so according to design the connection is double angle welded connection is provided in which 80mm wide and 5mm thick plates are used and 185 mm long should be provided the type of weld is fillet weld.

#### Design of Column

Load on column is 2845KN and the factored load is 4267KN so Design of column is according to load of 4900 kN

The column is 8 m high and after the design the diameter is found 5m

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The longitudinal reinforcement is 32mm diameter bars and provide 245 No of bars and the ties are connected should be of 8 mm diameter @ 300 mm C/C should be provided.

### Design of pile

The piles are precast piles used in foundation of column the diameter of column is 350mm and 6 m long circular compression member.

Number of piles used are 8 No's.

The reinforcement is 4 bars of 20 mm diameter connected by circular links of 8 mm diameter bars @ 170 mm c/c .

Spiral reinforcement near pile , head is 8 mm diameter @ 100 mm c/c .

The spacers are also provided at 1.5 m interval to support the bars to keep them in Position.

The cover of piles to the reinforcement is 50 mm also the holes are provided at 1.5 m interval to handle the pile.

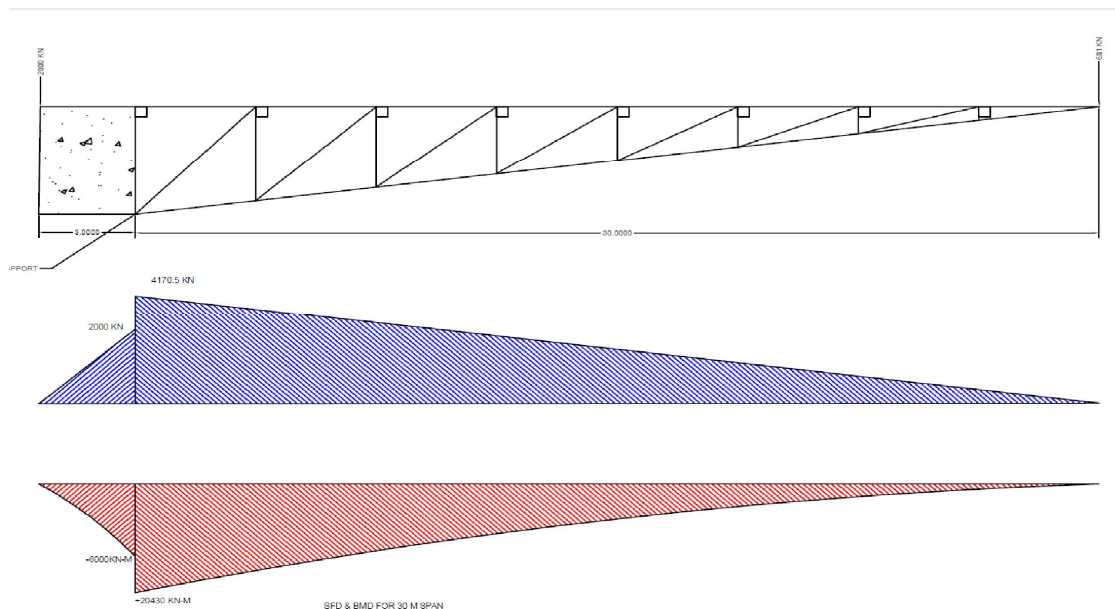
### Design of pile cap

Pile cap of rectangular plan & section is provided at top of 8 piles .

The depth of pile cap is 800 mm the reinforcement in x – x & y – y direction 40 nos

Of 25 mm diameter bar .

The cover to the reinforcement in pile cap design is 80 mm.



(a)

Fig.(a) shows the SFD and BMD of SAM PRONATION BRIDGE

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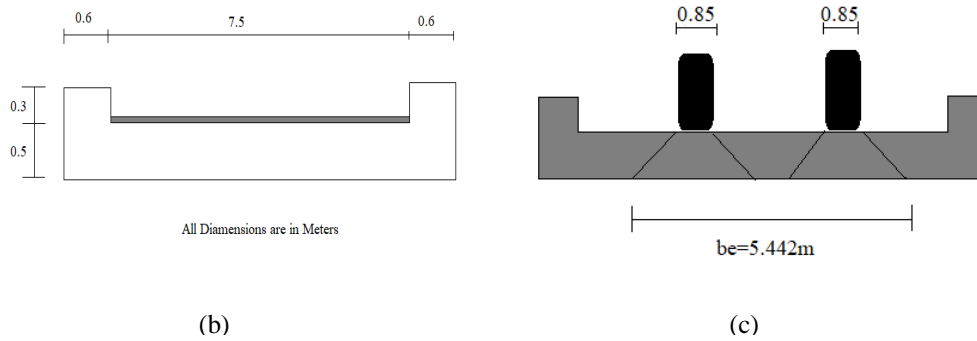
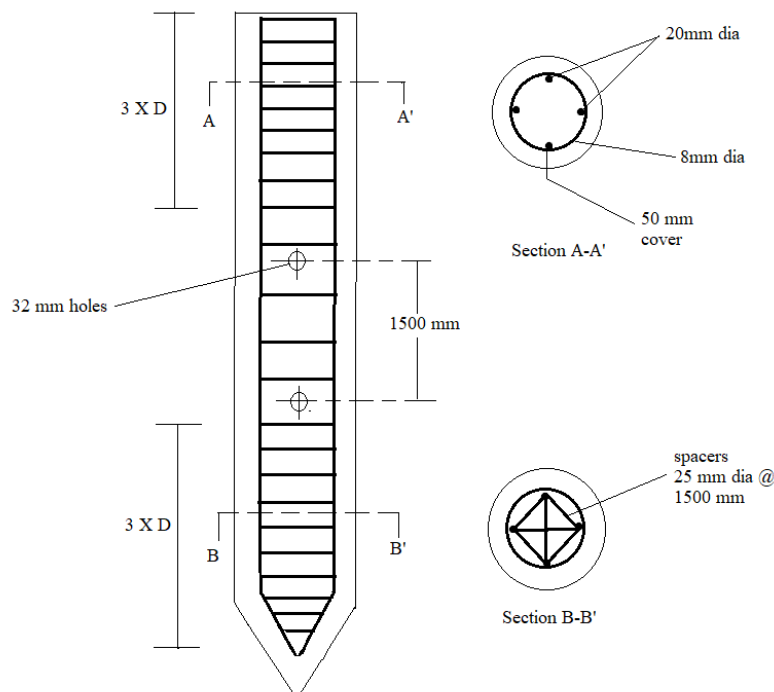


Fig (b) shows the sectional dimensions of Bridge deck and Fig (c) shows the dispersion width



## Reinforcement in precast Piles

(d)

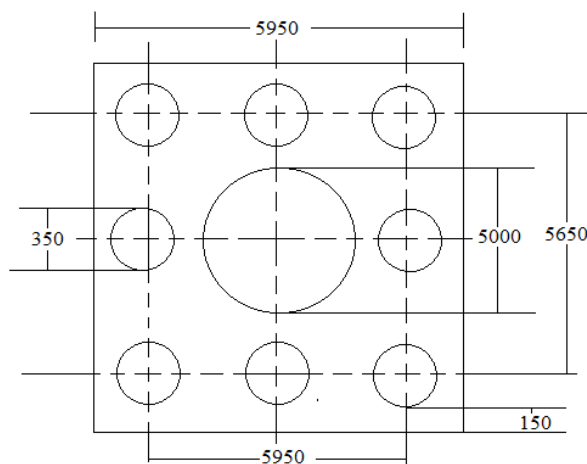
Fig (d) shows the precast reinforced pile

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(e)

Fig. (e) shows Pile cap and its dimensions with position of piles

### V. CONCLUSION

The Design made by us is found safe as per Guidelines of IS code 800-2007, IRC:6 – 1996 – Section II, IS code 456-2007 and Sp.16 Code and Hence there is no need to construct two bridges for connecting two different routes.

### REFERENCES

- [1] Berger William "THE HISTORY OF SWING BRIDGES" International Journal of Science and Engineering Applications, ISSN-2319-7560, Volume 5, March 2015.
- [2] M. Tilley "A DESIGN OF EXPERIMENTS STUDY OF PROCEDURE FOR ASSEMBLING BASCULE BRIDGE FULCRUM", ANSYS Modeling, USBN etd/2645, Vol 3.6 June 2016.
- [3] John MacDonald "HILLSBOROUGH RIVER BASCULE BRIDGE VIBRATION AND REHABILITATIO" Design For a Swing Bridge, USBN 3989, March 2015
- [4] Healy "MOVABLE HIGHWAY BRIDGE DESIGN SPECIFICATION" Movable Bridge Design Specifications ISBN \_, Vol 4 November 2015.
- [5] Waagner Biro, Access Bridge and CranewayFreudenau, volume no.1, 2016.
- [6] AkshayBharadwaj Krishna &Shikhar Gupta "DESIGN & ANALYSIS OF BASCULE BRIDGE USING FEM" International Journal of Science and Engineering Applications, ISSN-2319-7560, Volume 6, 18<sup>th</sup> of Dec 2016 [www.iaeme.com/ijmet](http://www.iaeme.com/ijmet).
- [7] Robert Arthur Miller for "Design of a swing bridge". Technical report. University of Illinois. June 1911.
- [8] Parsons Brinckerhoff and Engineering and Industrial Heritage "A context for common historic bridge types" National Cooperative Highway Research Program, October 2005.
- [9] I. Berger, D. Healy and M. Tilley, "Movable Span Bridge Study volume-2: Bascule and Swing Span Bridges" March 2015.
- [10] By James Scott Groenier and Robert Guibernick "Transportation Research Record Journal of the Transportation Research Board" January 2007.
- [11] Newlon, Howard, Jr. "Bacsights: Build Us a Bridge." Virginia Department of Highways and Transportation Bulletin, November 1973.
- [12] Anon. Selection panel review workbook: Woodrow Wilson Bridge Design Competition, 1998. Courtesy of the Princeton University Maillart Archive.
- [13] Websites :
  - [www.google.com](http://www.google.com)
  - [www.wikipedia.com](http://www.wikipedia.com)
  - [www.core77.com](http://www.core77.com)