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Rotating Bridge Highway to Railway

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Abstract:- With the construction evolution and consequent roads and railways progressive development, emerged the need for the population to make crossings, not only to overcome geographical obstacles, but also to reduce the necessary travel time. However, one of the major problems until today has been the crossing of navigable waters. As one of the keys means of global transport, server navigation could not be less important than the construction of bridges, which would affect its course. It was then necessary to find a solution that would enable navigation of rivers and at the same time their crossing. Since building bridges with adequate clearance for the passage of ships required a more elaborate work in terms of very high inclination, movable bridges became the most viable solution to this dilemma, despite all all the challenges on their design. Nevertheless, movable bridges have not always had this purpose. In the Middle Age, these were used for protection against enemy's armies. The design of movable bridges, have primary explored over the last century the typical three types of movable bridges, bascule; swing; and vertical lift. Regardless of this, innovative solutions are increasingly taking form.

Keywords: *Swing Bridge, Bearing, Types, Advantage, Disadvantage, Maintenance, Construction, Material.*

I. INTRODUCTION

The movable span of a swing bridge, also termed the draw, rotates about a vertical axis (pivot axis). The draw is said to be symmetrical or to have equal length arms if the pivot axis is located at the middle of the draw. On sometimes, the arms are not equal. Unsymmetrical or bobtailed draws are defined by their length and draw. A swing span's dead load (self-weight) is typically evenly distributed around the pivot. Therefore, counterweights are needed at the ends of the shorter arms of bobtailed spans. Some bobtail draws are only nominally balanced about the pivot, with a definite excess of counterweight. The reason for the tail-heavy condition is to tilt the structure and raise the toe of the channel arm above its rest pier. This condition aids in closing the span. This tilting is sometimes referred to as secondary motion. Swing bridges are also categorized according to type of pivot bearing. If all the dead load is supported at the center, the swing span is said to be center bearing. The swing span is referred to the center bearing if all of the dead load is sustained there. The bridge is referred to as rim bearing if all or the majority of the dead load is supported by a large-diameter ring of rollers that is centered on the pivot axis.A swing bridge, also known as a swing span bridge, is a mobile bridge with a vertical locating pin and support ring serving as its primary structural support. These elements are typically located at or close to the bridge's center of gravity, allowing the swing span to pivot horizontally as seen in the animated illustration to the right. Small swing bridges over canals may only have one pivot point and open like a gate, but this requires a significant underground structure.

There can be two types of swing bridge on the basis of its Working mechanism:

- *Centre Bearing Swing Bridge*
- *Rim Bearing Bridge*

- *Centre Bearing Swing Bridge*

Center-bearing swing bridge. The trailing or balancing wheels, which roll on a track towards the outside edge of the pier, are adjusted with a little amount of clearance so that their sole purpose is to ensure lateral stability. This form of swing bridge swings solely on the centre pivot. When the bridge is closed, the ends are raised, and without lifting, separate supports are put on the pivot pier to support only the live load. The centre supports and end lifts should operate in tandem and be set up such that the ends are raised to the right height when the centre supports have just come to a bearing (without resistance from the dead load).

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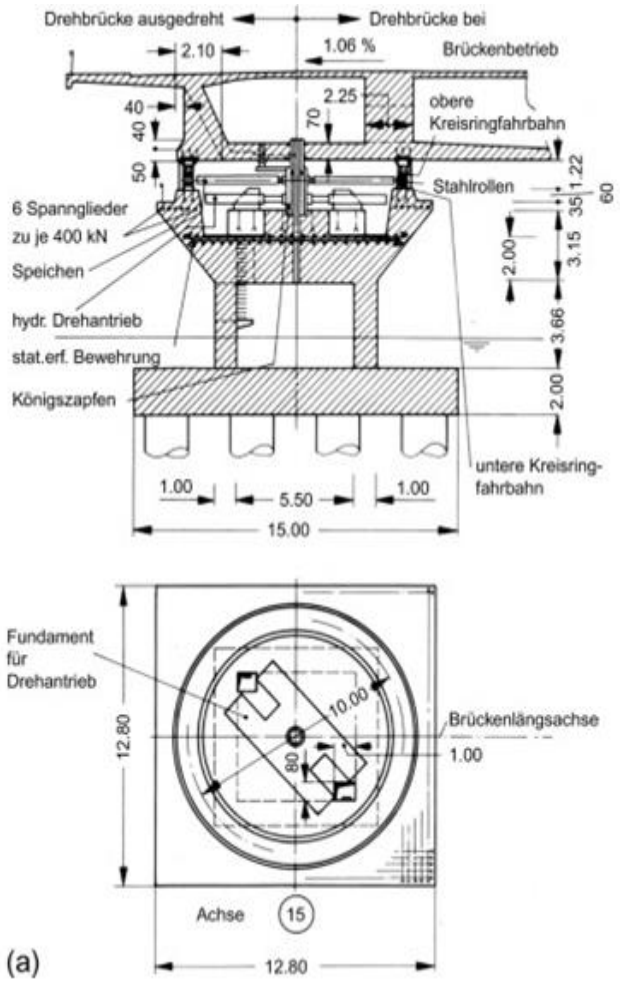

Fig 1 Centre Bearing Swing Bridge

➢ *Rim Bearing Swing Bridge*

Rim bearing swing bridge in rim bearing swing bridges, a minimum of two longitudinal spanning members are required to support the super structure. Tapered rollers are also provided because the distance travelled by the outer end is longer than that travelled by the inner end of the roller, for the provided angle of bridge rotation. In case of rim bearing mechanism when the bridge is fixed or in its closed position, it supports both dead load and live load. Rim bearings are quite handful for wide and heavily-loaded swing bridges. The drum girder transmits weight to a tapered tread plate that is held up by tapered rollers. Rotation of the span is achieved in the same manner as it was for the center-bearing swing bridge.

- *Scope*

The bridge is a structure which makes transportation easy and fast as per demand of day to day increasing traffic volume, which is made for saving time and provides 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 center which is constructed on the river, lake, etc. and it is also very difficult to construct such a pier for long span bridges.

- *Advantages*

✓ Compared to other type of movable bridge, wind load on swing bridge is minimum
✓ When compared to other types of movable bridges (bascule and suspension), the moment produced by wind force is smaller for swing span because it moves horizontally during bridge opening bridge that lifts vertically).
✓ A symmetrical swing bridge allows for the movement of two movable spans within a single moving structure. In order to effectively manage a busy waterway, this would be quite useful.
✓ Sizable piers are not required to support Swing Bridge because it neither lifts during Neither opening nor need counterweight as it is the case in bascule and vertical lift bridge.
✓ Due to the fact that the double deck swing bridge does not lift into the air to open, it is feasible to build.

- *Disadvantages*

✓ Because there are so many moving parts, it needs a lot of maintenance.
✓ It takes more time to operate than other types of movable bridges since a lot of key mechanical processes are involved in its opening and closing..
✓ Swing Bridge needs more machinery to open and close to waterway compare to bascule and vertical lifting bridge.
✓ Tool or devices used to detach swing railroad bridges is considerably expensive and fragile.
✓ Collision protection is needed along the full length of the superstructure - a serious disadvantage in this location where ship impact loads are potentially very large.

II. LITERATURE REVIEW

➢ *Berger found that (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.

➢ *According to D. Healy (March 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

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River completed in 1881, with reports that the operation was also satisfactory.

➢ *M. Tilley found that*

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

III. METHODOLOGY

➢ *Raw Material Used While Making the Model*

- Cardboard
- PVC Pipe
- Syringe Chart
- Paper
- Artificial Trees
- Acrylic Colors

Fig 2 Model

IV. CONCLUSION

At last, it is concluded that Swing Bridge is the best alternative for the short span rivers and canals and also suitable for large spans if carefully designed. It is more preferable than that of Bascule Bridge. Accidents and many failures caused in these types of bridges are because of the improper operation and functioning and also improper designing. If during the time of construction and designing proper designing is done also if material chosen for the bridge serves all properties there is no chance of failure for a long duration.

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