IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 4, May 2023

Convertible Bridges and Advanced Technologies

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Abstract: *One of the most fascinating things about Civil engineering is a Bridge. There is never ending research about the bridges all over the world. India's first sea bridge, the 'Pamban' bridge, was also the country's longest sea bridge until the construction of the Bandra-Worli sea link. As India has got a great history in the topic of bridges. Our country has a great history in the field of bridges. It has about 173,000 bridges and about 36,470 of them were built under the British Raj. But if we see history or present of our country there are very few bridges which are movable/convertible. As construction of these types of bridges comes out to be costly as well as time consuming. So, we often see this topic to be ignored. As students of civil engineering, we would like to touch upon the topics which are niche and barely touched. As we must make India a developed nation as soon as possible we should bring advanced technologies in India. As we go into technicalities movable bridges are particularly required at some intersections by which we can to transportation quickly. Few drawbacks which come while using movable bridges is construction is costly and movement is slow. We will try to tackle that issue though our project. Bridge are the main connection provided between two access provided for transport in such way bridges are provided and hence are an obstacle of money transportation there are many movable bridges introduced like bascule bridge lift bridge, swing bridge.*

Keywords: Deep people analytics, employee attrition, retention, prediction, interpretation, policies recommendation

I. INTRODUCTION

Movable bridges, also known as drawbridges or bascule bridges, are a type of bridge that can be raised or lowered to allow for the passage of boats or ships. These bridges are typically found over navigable waterways or in areas where there is a need for both road and water traffic. Movable bridges have a long history dating back to ancient times, with some of the earliest examples dating back to the Roman Empire. However, it wasn't until the Industrial Revolution that movable bridges became more common and more sophisticated, with the introduction of steam and hydraulic power. Today, movable bridges are still an important part of many transportation systems, particularly in areas with heavy shipping traffic. These bridges can take on a variety of forms, including vertical lift bridges, bascule bridges, swing bridges, and retractable bridges. Each type of bridge has its own unique advantages and disadvantages, depending on the specific needs of the location and the type of traffic that it needs to accommodate. Overall, movable bridges have played an important role in the development of transportation systems throughout history, and they continue to be an essential component of modern infrastructure.

In traffic engineering, a movable bridge refers to a type of bridge that can be opened or moved to accommodate the passage of waterway traffic, such as boats or ships. These bridges are also commonly known as drawbridges or bascule bridges. The requirements for a movable bridge in traffic engineering include:

1. Clearance height: The movable bridge should provide sufficient clearance for the passage of tall vessels. The vertical distance between the highest point of the bridge deck and the water level must be designed to accommodate the height of the tallest anticipated vessels, considering factors such as tides and potential changes in water levels.
2. Opening mechanism: The bridge should have a reliable and efficient opening mechanism that allows for the movement of the bridge deck to create an opening or clearance for the passage of waterway traffic. This can be achieved through various mechanisms such as bascule (hinged), vertical lift, or swing mechanisms. A vertical lift bridge is a type of movable bridge that has a section of the bridge deck tha can be raised and lowered vertically. The section is usually called a "lift span," and it is raised using hydraulic or electric motors. The lift

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span is lifted to a height above the water level to create a gap for boats to pass through, and it is lowered back into place once the boat has passed through.

3. Structural integrity: The movable bridge must be structurally designed and constructed to support the weight of vehicular traffic when closed and maintain stability and safety during the opening and closing operations. It should meet the required load-bearing capacity standards and be able to withstand environmental factors like wind, waves, and seismic forces An uplift bridge, also known as a vertical- lift bridge or a lift bridge, is a type of movable bridge that has a lifting mechanism to allow for the passage of ships and boats. The lifting mechanism of an uplift bridge consists of a large counterweight attached to the lifting span that moves up and down vertically along guide rails or cables.
4. Operational controls and safety systems: The movable bridge should be equipped with appropriate operational controls and safety systems. These may include mechanisms to monitor and control the opening and closing operations, warning signals and barriers to alert road users and waterway traffic, and navigation lighting for visibility during night-time operations.

Convertible Bridge Complex Engineering Structure

A convertible bridge is a type of engineering structure that is designed to allow passage for boats or another watercraft. These bridges can also be used to provide passage for vehicles, pedestrians, or trains over waterways or other obstructions. Movable bridges are complex structures that require careful design and construction to ensure their safety and functionality.

There are several types of movable bridges, including bascule bridges, swing bridges, vertical lift bridges, and retractable bridges. Bascule bridges are designed to pivot at one end, allowing the bridge to be raised and lowered using counterweights. Swing bridges pivot horizontally, rotating around a central point to allow passage. Vertical lift bridges use a system of counterweights and pulleys to raise and lower the bridge deck. Retractable bridges are designed to be moved horizontally, sliding along tracks to allow passage.

The design and construction of a movable bridge requires careful consideration of many factors, including the type of traffic that will be using the bridge, the size and weight of the boats or vehicles that will pass through, the water depth and current, and the location of the bridge. Structural engineers must also consider the materials and construction techniques that will be used to build the bridge, as well as the environmental conditions that may affect its operation, such as wind, waves, and ice.

In addition to the engineering challenges of designing and constructing a movable bridge, there are also safety concerns that must be addressed. Movable bridges must be designed to withstand extreme forces, such as those caused by high winds or heavy traffic. They must also be equipped with safety features, such as warning lights and barriers, to prevent accidents and ensure the safety of pedestrians and vehicles.

Overall, the design and construction of a movable bridge is a complex undertaking that requires careful planning, coordination, and execution. When done properly, these structures can provide safe and efficient passage for boats, vehicles, and pedestrians, while also serving as iconic landmarks and symbols of engineering ingenuity.

Important Design Aspects:

The structural design of a movable bridge is critical to ensure that it can support the weight of the movable span, as well as any counterweights or other components that are used to balance the span. The structural design must also consider the effects of wind, water currents, and other external forces on the bridge. The mechanical design of a movable bridge involves the design of the machinery and components that are used to operate the bridge. This includes the motors, gears, and other components that are used to open and close the movable span. The design must be reliable and efficient, as well as easy to maintain and repair. The electrical design of a movable bridge involves the design of the electrical systems that control the bridge's operation. This includes the controls for the motors and other components, as well as safety systems to prevent accidents and protect personnel. Safety is a critical aspect of any movable bridge design, and the design must consider the safety of both personnel and the public. This includes safety features such as guardrails, warning lights, and safety interlocks to prevent accidents. Movable bridges must also consider their impact

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on the environment particularly on water quality and aquatic habitats. This includes the use of materials. that are resistant to corrosion and erosion, as well as measures to prevent pollution and protect wildlife.

Specific area of application

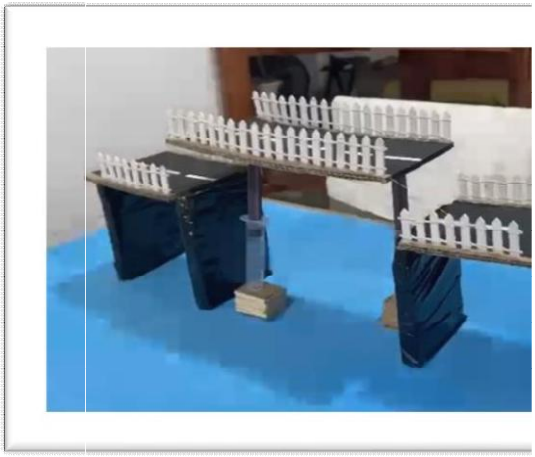
Movable bridges are often used in port and harbour areas to allow ships and other large vessels to pass through while maintaining access to land-based transportation infrastructure. Movable bridges are also commonly used in areas where rivers and canals intersect with roads, railways, or pedestrian walkways. Movable bridges are sometimes used in industrial facilities such as factories or refineries, where they are used to move heavy equipment or materials across waterways. Movable bridges are also used in recreational areas such as parks or nature reserves, where they provide access for pedestrians and cyclists across waterways. Military Movable bridges are sometimes used in military applications, such as in amphibious assault operations or for temporary crossings in conflict zones.

Parameters on which performance of the project is tested:

As the model is miniature version of the movable bridge, we can only test is on the durability side and the functioning and the working of the principle but on the larger scale we can test.

A) Load capacity: The load capacity of a movable bridge refers to its ability to support the weight of vehicles, pedestrians, and other loads that cross the bridge. Testing the load capacity typically involves applying a static or dynamic load to the bridge and measuring its deflection and stress levels.

B) Speed and efficiency: The speed and efficiency of a movable bridge refer to the time required to open and close the bridge and the energy required to operate it. Testing the speed and efficiency typically involves measuring the time required to open and close the bridge, the energy consumption of the motors, and the operating costs of the bridge. C) Durability and reliability: The durability and reliability of a movable bridge refer to its ability to withstand the effects of weather, corrosion, and wear and tear over time. Testing the durability and reliability typically involves subjecting the bridge to simulated weather and environmental conditions and measuring its resistance to corrosion, fatigue, and other forms of damage. D)Safety features: The safety features of a movable bridge refer to its ability to protect personnel and the public from accidents and other hazards. Testing the safety features typically involves checking that all safety systems are working correctly and conducting simulations of emergency scenarios to evaluate the response time and effectiveness of the safety systems. E) Environmental impact: The environmental impact of a movable bridge refers to its effects on the surrounding environment, particularly on water quality and aquatic habitats. Testing the environmental impact typically involves monitoring water quality and aquatic life around the bridge and evaluating the effectiveness of any measures taken to minimize the impact.



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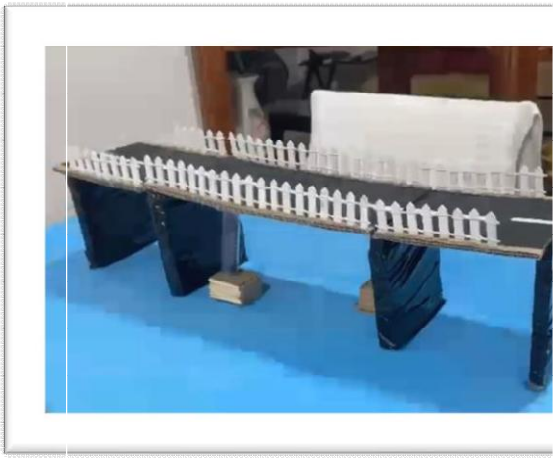

Fig.: Completed Model