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AUTOMATED FOOT BRIDGE FOR RAILWAY STATION (SMART WAY OF CROSSING TRACKS)

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ABSTRACT

This Paper will explain use of Automated Foot Bridge in Railway station to overcome the problem of passing tracks (from one platform to another) in less time period with less efforts, Automated Foot bridge is designed to overcome the accidental problems occurring on the railway stations during passengers crossing the railway tracks and also it will help to transport the goods from one platform to another.

Keywords—Automated Foot Bridge,Railway Station, Accidental Problems

I. INTRODUCTION

As India is fast growing country we are trying to develop our transportation system to fulfill the need of population and as we knows train is one of the best mode of transportation to travel from one place to another, but when time comes to use this mode of transportation people are being irritated due to the crowd and the systems adopted at railway stations to reach on platforms from one to another. And to avoid the time consumption and efforts many of the people choose to reach the platform by crossing the track directly and due to this many of the time accidents occur and many of the people lose their life.

According to http://wonderfulmumbai.com website 10 people die every day in railway accidents in Mumbai. 36,152 people have died and 36,688 injured on Mumbai's Suburban (Local) Trains, from 2002 to 2012. Of the 36,152 deaths, 15,053 occurred on Mumbai's Western Railway line and 21,099 occurred on Mumbai's Central Railway. And 2/3rd of these accidents are occurred while crossing Tracks one platform to another platform. And hence it is very important to design or adopt such a technology which will reduce this method of crossing the track.

For this condition we are trying to give a solution to overcome this problem by providing automated foot bridge in between two tracks, so that people can pass the tracks easily without climbing and getting down, as this foot bridge is provided on same level of platform, passengers will use this foot bridge for sure and result of which will be less or no death due to accidents occurring due to crossing of tracks.

A. Conventioanal Methods of Crossssing the tracks

- **Foot over Bridge: -** A foot over bridge is designed for pedestrians or in some cases cyclist to cross the road, Rail tacks (*fig. no.1*) or rivers, Foot over bridge is becoming very popular in urban India as it help to cross the road for pedestrians without worrying about high speed traffic, as well as its very safe option without interrupt vehicles, railways etc.

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Figure no. 01Foot over bridge for railway tracks

- **Escalators: -** escalator is nothing but the continuously moving stairway which provides movement of passengers up or down.

Figure no. 02 Escalators for railway tracks

B. Some Movable Bridges Used In Different Cases

Automated Bridge

A movable bridge is a bridge that has dynamic moving parts used to change the form of the bridge, usually to allow passage for boats. There are many types of movable bridges, and they differ in the way they transform.

The most popular types would be a drawbridge or a bascule bridge (tail bridge), but you can also find a retractable bridge, a swing bridge, a tilt bridge, vertical-lift bridge, a transporter bridge and several other types

II. CASE STUDY

Different Types of Automated / Swinging Bridge

a) Drawbridge is another name for movable bridge in American English bit in British English it is name for a bridge that has hinges only on one end and is lifted with chains. It was usually used at the entrances of the castles.

b) Bascule Bridge can have one or both spans which have counterweights that balance them and make lifting easier. Rolling Bascule Bridge has no counterweights but it is lifted by the rolling of a large gear segment along a horizontal rack.

c) Folding bridge has more sections that are connected to each other by hinges and collapse together horizontally.

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d) Curling Bridge has many segments and when it is lifted it curls into a cylinder. There is, for now, only one such bridge: "The Rolling Bridge" at Grand Union Canal office & retail development project at Paddington Basin, London. It has hydraulics in the posts of a handrail which lift and curl the bridge.

e) Vertical-lift Bridge has a span that rises vertically while remaining parallel with the deck and allows river traffic to pass below. It uses counterweights or hydraulics which are placed in towers on bothe end of the span to lift the span.

f) Table Bridge works similarly to vertical-lift bridge but its span is lifted by hydraulics which are placed under the bridge and not in towers above.

g) Retractable Bridge (or a thrust bridge) has a deck that can be retracted to one side. They are not too common because they require a large dedicated area. They allow very high boats to pass without any limitation.

h) Submersible bridge (or a ducking bridge) does what it says on the tin – it is submerged into water to clear way for boats. It allows high boats to pass but it limits their draft.

i) Tilt Bridge is a bridge that rotates about hinges at its ends and is lifted at the angle. It can be curved like Gateshead Millennium Bridge or straight like Sint-Annabrug over the river Dender in Aalst.

j) Swing Bridge has a deck that rotates horizontally around fixed point (at center or at one of the ends if they are smaller) and is placed parallel with the river when it is open.

k) Transporter Bridge (other names are "Ferry Bridge" or "aerial transfer bridge") have a construction that carries a segment of roadway across a river. There are no more than twelve bridges of this type in operation today.

III. HISTORY OF AUTOMATED BRIDGE

3.1 Tower Bridge, London, England

Built from 1886 till 1894, this symbol of London is a combined bascule and suspension bridge in London, over the River Thames. It is close to the Tower of London, from which it takes its name. Tower Bridge is one of the most famous bridges in the world and the most famous movable bridge. The lower deck which is the bascule deck can open to an angle of 86 degrees in just 5 minutes. The two parts of the deck are counterbalanced by two bascules weighing over 1,000 tons each

3.2 Slauerhoff Bridge (the Flying Drawbridge), Leeuwarden, the Netherlands

Slauerhoff Bridge, Slauerhoffbrug or the Flying Drawbridge is a fully automated bascule bridge in which a section of the road is impressively swung in the air to allow boats to pass. The section of the road that is raised is 15 meters (49 ft) by 15 meters, and it is raised to 90 degrees

3.3 Gateshead Millennium Bridge, Newcastle, England

An award winning pedestrian tilt bridge spanning the River Tyne in New castle. The bridge opened to the public in 2001,and is sometimes referred to as the Blinking Eye Bridge or the Winking Eye Bridge

3.4 Pont Jacques Chaban-Delmas, Bordeaux, France

A vertical-lift bridge over the Garonne River in Bordeaux. Opened in 2013, the bridge has a total length of 670 m (2,200 ft) and a longest span of 100 m (330 ft), which makes it the longest **vertical-lift bridge** in Europe

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3.5 Puente de la Mujer, Buenos Aires, Argentina

The Puente de la Mujer, or Woman´s Bridge, is a beautiful pedestrians bridge that opened in 2001, which according to some locals resembles a woman dancing tango. The bridge is located in Puerto Madero neighborhood, a waterfront area which is considered to be one of the city's top attractions. The bridge is a **swing bridge** that part of it rotates 90 degrees in order to allow water traffic to pass

3.6 Vizcaya Bridge, Biscay, Spain

A transporter bridge that links the towns of Portugalete and Las Arenas in Biscay province. A **transporter bridge** is a type of movable bridge that acts like an horizontal elevator: a section of the road runs from side to side carrying cars. Built in 1893, this is the world's oldest transporter bridge as well as a UNESCO world heritage site. The bridge is 164 meters (538 ft) long and can carry 6 cars and several dozen passengers from one side to the other in 90 second

3.7 The Dragon Bridge at Foryd Harbour, Rhyl, Wales

Opened in 2013, the Pont y Ddraig or The Dragon Bridge is a bascule pedestrian and bicycle bridge in Wales

3.8 Scale Lane footbridge, Hull, England

The Scale Lane footbridge is a beautiful **swing bridge** that links Scale Lane with Tower Street in the city of Hull. The bridge spans River Hull, a river that most of the bridges that span it are movable: 6 swing bridges, 4 bascule bridges and 3 lift bridges

Hörn Bridge, Kiel, Germany – It may not be the largest bridge in this list, but the Hörn Bridge is a rather unique type of movable bridge: a folding bridge. Built in 1997, it has a main span of 25.5 meters (84 ft) and spans the Hörn river, connecting the city center with the Gaarden quarter. The bridge folds once an hour to allow ships to pass

3.9 22 Drawbridges In Saint Petersburg, Russia

There are 22 drawbridges spanning the Neva River in Saint Petersburg, Russia. Every night during the navigation period from April to November, these 22 bridges are drawn to let ships pass in and out of the Baltic Sea into the Volga-Baltic waterway system, cutting almost completely the connection between the two parts of the city. Almost and not entirely since at every moment at least one bridge stays connected to allow passage for emergency vehicles. In the picture: the Palace Bridge, a **bascule bridge** in Saint Petersburg

IV. ABOUT AUTOMATED FOOT BRIDGE

Automated foot bridge is the bridge designed particularly for railway station to pass from one platform to another, as this system of bridge will be installed and fitted on the floor level of platform itself it will be very helpful to the passengers to pass / reach any of the platform within a very short period of time.

Also this automated bridge can be helpful for the coolies to transport luggage from one platform to another, as now a days this transportation of luggage is done by taking a long turn (i.e. going up to the last point of platform then use ramp to get down, again cross the track and again climb the ramp) which is very time consuming and manpower consuming work.

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If we provide this automated type of bridge we can save their time as well in very less energy or less manpower they can shift the luggage from one platform to another platform.

Figure No. 03 Coolies Crossing Track to Transport Luggage from One Platform to Another

4.1 Concept of Automated footbridge

Automated footbridge will be located in between every two platform which can be operated by means of motor or hydraulically. Only the thing is that while designing this bridge following criteria's to be kept in mind so we can provide efficient footbridge.

4.2 Criteria have to be considered

1. Span of movable / folding footbridge
2. Location where to install movable footbridge
3. Time required for opening and closing the platform of movable footbridge.
4. Obstructions due to water line and electric wire line

V. SPAN OF MOVABLE / FOLDING BRIDGE

As we are supposed to provide this bridge in between two platforms the span of the bridge depends upon the type of gauge of the track and hence while fixing dimension the criteria of the span available to be considered

VI. LOCATION WHERE TO INSTALL MOVABLE FOOTBRIDGE

While finalizing the location of installment we should take care that the location should be such that the passengers can reach to Exit gate by less time period and it should be nearer to the luggage room too.

As this bridge is going to provide platform to pass tracks on same level of platform floor one must take care that the standing position of Train too.

VII. TIME REQUIRED FOR OPENING AND CLOSING THE PLATFORM OF MOVABLE FOOTBRIDGE

As this is automatically operated (mechanically) we are suppose to study and finalize the capacity of motor and system of folding and opening of the platform.

As the frequency of railways are depends on the type / class of station we must take this into consideration the time laps between departure and arrival of trains at both the track and according we must plan the opening & closing time period.

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VIII. OBSTRUCTION DUE TO WATER LINE AND ELECTRIC LINE

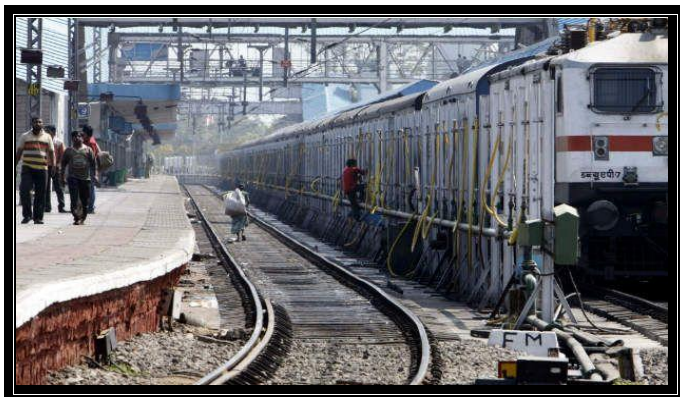

Figure No. 04 Water Line and Electric Line at Railway Track at Station

As shown in figure the water pipe lines run along the track at railway station to feed the water in coach and hence while placing the bridge we are suppose to take care that this line hould not get affected due to installation of bridge. Also the stations where electrical line is installed for running electric train the height is getting restricted and so while designing these bridge height criteria to be considered.

Procedure for Design

1) Fixing of diamension of Footbridge.
2) Fixing of location of footbridge
3) Finalising operational timing of bridge.
4) Finalising structure of the Bridge.

Study of dimensional measurements of all the members for finalizing the dimension of the automated footbridge is essential, as we are supposed to install this bridge at the location of intermediate portion of two railway tracks it should be designed to very high precisely as small change in dimension may cause very serious effect.

IX. CONCLUSION

1) This kind of bridge is not adopted anywhere in the India and abroad too.
2) This bridge will provide comfort to the passengers to pass one platform to another.
3) The people will not cross tracks directly and thereby accidents will reduce.
4) Train can be arriving on last platform to as passenger can pass tracks easily.

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