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Appraisal and Design of Foot Over Bridge

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Abstract - *This project deals with the appraisal and design of foot over bridge. Where traffic occurs which opens the door of conflicts between pedestrian and moving vehicles. In our study area which includes stretch between Surat Railway station and Surat Central Bus Station with high average hourly traffic volume, Crossing by foot can not only be challenging but dangerous too. Due to these major problems this project aims to analyse and design a Foot Over Bridge between this stretch. Which will eliminates traffic congestion delay conflicts between pedestrian and moving vehicles and accident*.

Key Words: **Foot Over Bridge, Steel Truss, Light Weight Structure, Easy Construction, Strength**

1. INTRODUCTION

A foot over bridge is the bridge designed for pedestrians, Foot over bridges can be used decoratively to visually link two distinct areas or signal a transaction. Bridges providing for pedestrians and cyclist both are often referred to as green bridges and form an important part of sustainable transport movement towards more sustainability's. Footbridges are situated to allow pedestrians to cross water. They are located across roads to let pedestrians cross safely without slowing down the traffic. Footbridges are small, but important, because they are usually presented in the townscape.

Footbridges are also be built in the same ways as road and rail bridges. Most footbridges are equipped with a guard rails to reduce the risk of pedestrians falling. Footbridges, in fact, can elegant or beautiful, and are built on a more human scale than large road and railway bridges. Apart from that in stations and in towns, they are generally not much seen, even by the passengers who go under them.
Different types of design footbridges include following:

- Timber footbridges:
- Steel footbridges:
- Concrete footbridge:

Some road bridges have had their traffic diverted to alternative crossings and have become pedestrian bridges; examples in the UK include The Iron Bridge at Ironbridge, Shropshire, the Old Bridge at Pontypridd and Windsor Bridge at Windsor, Berkshire

Most footbridges are equipped with guard rails to decrease the risk of pedestrians falling. Where they pass over busy roads or railways, they may also include a fence or other such barrier to prevent pedestrians from jumping, or throwing projectiles onto the traffic below.

Steel truss:

Steel truss is widely used around the world for the construction of foot over bridges of different size. It is a effective material that provides sustainable solutions. Steel has long been recognized as the economic option for a range of foot bridges.

It dominates the markets for long span bridges, railway bridges, footbridges, and medium span highway bridges etc. It is now mostly the choice for shorter span highway structures

2. LITERATURE REVIEW

A level-of-service methodology for pedestrians crossing streets at midblock locations was developed. The methodology can provide a measure of effectiveness that indicates pedestrians' perceived quality of service in crossing roads at midblock locations. An objective was to determine what variables are correlated with pedestrians' perceived quality of service for midblock crossings. A statistical calibration and validation process involved the collection of actual site characteristics and stated levels of quality of service by a sample of persons at a selection of midblock crossing locations. The variables included those that are most important to the Florida Department of Transportation and local governments for the purpose of improving pedestrian mobility, safety, and livability. Results showed that the levels of crossing difficulty tend to increase with the width of painted medians, signal spacing, and turning movements. They also showed that both the presence of pedestrian signals and cycle length are statistically significant, although they were hypothesized to be indeterminate.

Pelican, puffin and toucan crossings are three types of independent signal-controlled pedestrian crossings, which are used throughout the UK. There are also formal pedestrian crossing facilities at many signal-controlled junctions. The City of Edinburgh Council has been proactive in implementing an action plan to reduce the vehicle green time at all its independent signal-controlled pedestrian crossings, to ensure a minimal delay to the pedestrians using them. This paper presents the simple mathematical analysis conducted to assess the average pedestrian delays and the total delay to pedestrians at specific examples of pedestrian crossings of all three types

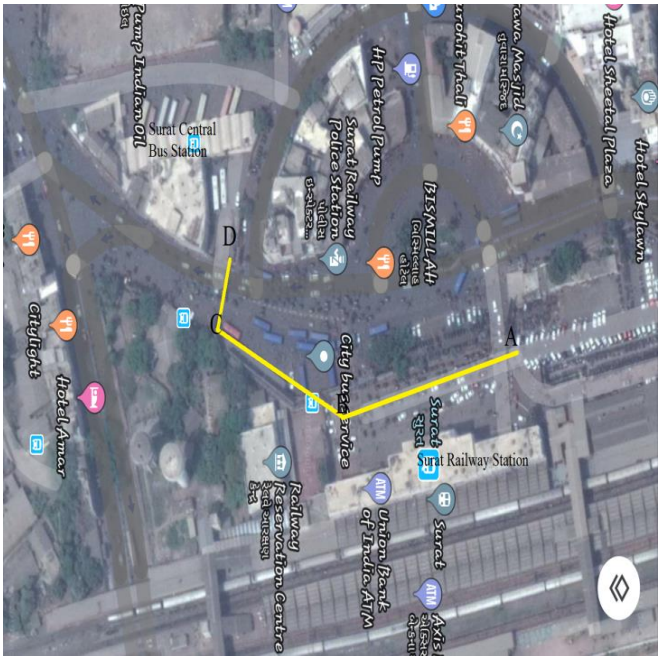
and signal-controlled junctions. It was found that pelican, puffin, and toucan crossings can be set to reduce pedestrian delays considerably, compared with the delays at exclusive signalled junction crossings, during peak periods. Short cycle times play a significant part in these settings. Such provision is useful for local authorities that give a higher priority to pedestrians and cyclists, and a lower priority to motorised traffic, in an urban environment. The best peak performer is the 'walk with traffic' pedestrian crossing arrangement at a two-stage T junction.

3. NECESSITY OF FOOT OVER BRIDGE

There are approximately 100000 to 150000 passengers were daily arrived at Surat Railway Station by IRCTC, Surat and approximately 35000 passengers were departure from Surat Central Bus Station as given data by Deputy Engineer, S. T. Sub Divn, Surat.

There are many places at which people could not travel there by bus so they choose to travel by bus from Surat Central Bus Station and there are also some places in which S.T. bus could not travel directly to that place.

So there are buses which travelled to that places in which S.T. bus can not travelled so people are travelled in this buses.



(Fig: Stretch of Foot Over Bridge)

3.1 STRETCH OF FOOT OVER BRIDGE

We have to provide foot over fridge from point A to D. The length of point A to B is 90 m, , The length of point B to C is 55 m, The length of point C to D is 26 m.

Foot over Bridge started from the entry to the railway station and continue through exit of railway station to city bus stand and over from the road crossing to surat central bus stand.

Foot over bridge is straight till point A to point B then it has cross shape from point B to point C then it is continue straight from point C to point D.

Height of the foot over bridge is provided about 12 m. And width of the foot over bridge is 4 m.

We provided foot over bridge with steel truss due to it is easy for installation and we kept in mind that if the surat railway station is update in future then this foot over bridge can easily removable due to the TRUSS provided.

We are designing foot over bridge for the capacity of 20000 persons/day. Normally now a day there is a capacity of 10000 persons/day but in future capacity was increased thus foot over bridge is capable for carrying load.

Stretch	Length	Width
Surat Railway Station Entry Gate To Surat Central Bus Station	171 m	20 m
Surat Railway Station Exit Gate To Surat Central Bus Station	111 m	20 m

4. DESIGN DATA

4.1: Survey

Survey are done between the road of surat railway station and surat central bus station and the data are shown in table 1 and 2.

Table 1: No. Of Vehicles Passing Between the Road

TIME	2-WHEEL	3-WHEEL	4-WHEEL
6 TO 7	350	320	272
7 TO 8	385	347	294
8 TO 9	390	366	304
9 TO 10	331	342	312
10 TO 11	380	392	344
11 TO 12	366	387	272
12 TO 1	376	290	232
1 TO 2	315	285	215
2 TO 3	306	263	229
3 TO 4	280	338	272
4 TO 5	360	272	265
5 TO 6	357	326	315
6 TO 7	372	347	327

Table 2: No. Of Passengers Passing Between the Road

TIME	MALE	FEMALE
6 TO 7	317	230
7 TO 8	315	185
8 TO 9	210	165
9 TO 10	238	155
10 TO 11	254	175
11 TO 12	276	215
12 TO 1	306	196
1 TO 2	315	292
2 TO 3	317	262
3 TO 4	630	338
4 TO 5	720	620
5 TO 6	800	680
6 TO 7	946	705

4.2: MINIMUM SPECIFICATIONS

Minimum specifications as per Indian Railways Work Manual are listed below:

Width of Gangway : 4 m

Height from the ground level : 12 m

LOADING DATA

Location : Surat railway station and surat central bus station

Total span : 171 m

Gangway width : 4 m

Height from the ground level : 12 m

Live load : 5 KN/m^2

LOADING DETAILS

The loads acting on the structure is distributed to all the structural elements. The live load and dead load acting on the main truss gets distributed from the gangway to the column. This load is then transferred in thr footing below.

4.3 MATERIAL PROPERTIES
STEEL

1) Structural steel used in this design confirms to **IS 2062** with the following properties:
   Yield stress : 250 Mpa

   Ultimate stress : 410 Mpa
2) HYSD reinforcement of grade Fe 415 confirming to IS 1786 is used throughout.

CONCRETE

All components unless specified in design : M20 grade

Characteristic compressive strength f_{ck} : 20 N/mm^2

5. RESULT

The various structural elements of the Foot Over Bridge were analyzed using STAAD. Pro for the dead load and live load. The structural steel elements were then designed for the corresponding data using IS 800:2007. The sections which are designed for use for the various structural elements are specified in the following Table 3 to Table 5.

Table 3: Sections used for main truss

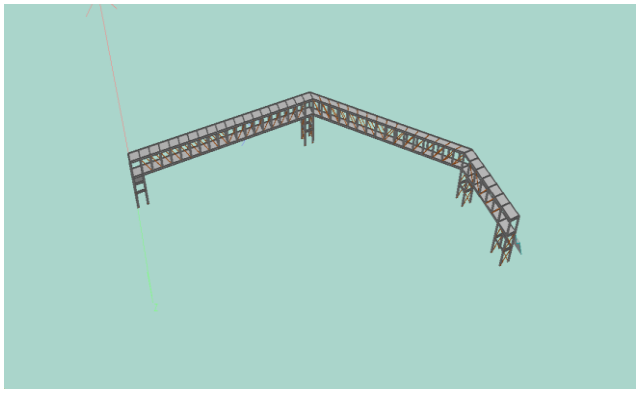
COMPONENT	MEMBER	SECTION
Top Chord	Compression	ISA 150x150x12 (double)
Bottom Chord	Tension	ISA 40x40x5 (double)
Diagonals	Compression	ISA 65x65x5 (double)
End Gonals	Tension	ISA 100x100x10 (double)
	Compression	ISA 150x150x12 (double)
Verticals	Tension	ISA 50x50x5 (single)

Table 4: Section used for gangway

COMPONENT	SECTION
Primary girder parallel to gangway	ISMB 150
Secondary girder perpendicular to gangway	ISMB 150

Table 5: Section used for Column

COMPONENT	SECTION
Main column	ISMB 500
Horizontal bracing	ISA 75x75x8 (double)
Inclined bracing	ISA 75x75x8 (double)



(Fig: Design Of Foot Over Bridge)

6. CONCLUSION

Thus the various components of the Foot Over Bridge namely Main Truss, Columns along with the Footings have been analyzed using STAAD. Pro software and the most economic and safe sections are arrived through manual design. The use of steel as the construction material has resulted in the overall economy of construction when compared to Reinforced Concrete Structure. The components are designed for the maximum safety and the adaptability of the structure to future changes has also been given due consideration.

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