Computer Aided Design And Analysis of Foot Over Bridge

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Abstract- *With the rapid development in urban sector in our country, construction of roadway and railways network is very fast now a day as six lining, four lining of highways and Railway Track increment. This trend is likely to continue for next ten years thus due to increased traffic and development there is great need for construction of foot over bridge to safely cross the fast moving traffic. Foot over bridges offer a wide range of opportunities for imaginative and innovative architectural design. Design should be as attractive as possible. The structure should be in harmony with surrounding environment. The proportion of different elements of the bridge should be proportionate. The external finish and painting should be such as to enhance the elegance of the bridge. A proper design of foot over bridge is very important since the clear span is 30 m & clear height above road level is 7.5m Poor design might contribute to disasters. Generally the feet over bridges are constructed with intermediate columns so that clear span is around 10-15 m. This constraint resulted a large span foot over bridge. As the span is more therefore the size of supporting members has to be very large too. At the same time, the large size of the members will contribute to heavy self-weight and hence create more moment to the support. In order to achieve equal high strength and light-weight, tubular steel members are the best alternatives. On the order hand, if the foot over bridge is supported solely by the steel beam of 30 m, heavy depth of beam have to be involved in order to get the structure to be in stability.*

I. INTRODUCTION

A. General

The pedestrian bridges are situated across roads to let pedestrians cross safely while not deceleration down the traffic. The latter may be a sort of pedestrian separation structure, samples of that area unit significantly found close to schools, colleges and busy corridors. The pedestrian bridge is taken into idea for developing the transportation, and its infrastructure to meet the needs and demand of the growing population whilst retaining its distinctive and valued market town character. This project has been proposed especially for pedestrian safety considerations, where the bridge cross over structure will serves as a best for both pedestrians and the fastest moving traffic.The structure provides a strategic and easy access to the bus terminus and in conjunction with the six lanes state highway would enable the traffic to flow at high speed so that the flow should not be disturbed in turn saving the destination, fuel and prevents hazards at a time. Durable and sustainable bridges play an important role for the socio-economic development of the nation. Owners and designers have long recognized the low initial cost, low maintenance needs and long life expectancy of RCC concrete bridges. Designs of bridgesvary depending on the function of the bridge, the nature of the terrain where the bridge is constructed and anchored, the material used to make it, and the funds available to build it.

1. Advantages

1. Provides safe and sustainable crossings and provides technical assistance to local government and communities need simple, easily applied guidelines on the selection and construction of effective water crossings.
2. Much rural travel takes place on local paths, tracks and village roads. These provide essential access to water, firewood, farm plots and the classified road network.
3. Communities and/or local government are generally responsible for this infrastructure.

2. Disadvantages

Pedestrian overpasses over highways or railroads are expensive, especially when elevators or long ramps for wheelchair users are required. Without elevators or ramps, people with mobility handicaps will not be able to use the structure. Often, people will prefer to walk across a busy road at grade rather than expend the effort to climb up the bridge and go over it.

A. Objective

1. To identify the causes why pedestrians do not use foot over bridges for crossing a road.

2. To assess the accuracy of location of bridges in terms of convenient to pedestrians.
3. To find out which sorts of passersby usually don’t use or sometimes use over bridges.
4. To identify new measures within it that may encourage pedestrians to use it.
5. To identify the government actions to ensure the best use of foot over bridges.

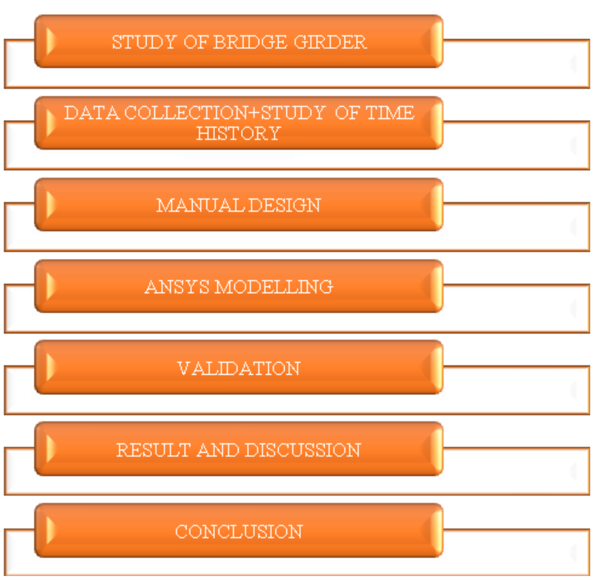
B. Problem Statement

We have considered FOB Howe Truss Bridge and have checked their response (vibration) to moving load as per IRC -2000 with FRP layers applied over the decks.

Table 1 Case Study Details

Span	35 m
Slab thickness	100 mm
I section	ISHB 350
W	67.4 Kg
Section area a	85.91 cm2
Depth of section h	350 mm
Width of flange b	250 mm
Thickness of flange tf	11.6mm
Thickness of web tw	8.3 mm
Moment of inertia Ixx	19159.7 cm4
Iyy	2451.4 cm4
Radius of gyration rxx	14.93cm
ryy	5.34cm

II. MATERIALS & METHODOLOGY



A. Material properties

The table shows the concrete and steel bar properties ,which are used for modeling of the reinforced concrete structures in ANSYS .Concrete and steel bar properties as per IS456

Table 2: Materialproperties

Sr.No.	Material	Property	Value
1	Structural steel	Yield stress f_y(MPa)	265
		Ultimate strength f_u(MPa)	410
		Young’s modulus Es(MPa)	205×10^3
		Poisson’s ratio µ	0.3
		Ultimate tensile strain et	0.25
2	Reinforcing bar	Yield stress fsy (MPa)	250
		Ultimate strength fsu (MPa)	350
		Young’s modulus Es(MPa)	200×10^3
		Poisson’s ratio µ	0.3
		Ultimate tensile strain et	0.25
3	Concrete	Compressive strength fsc(MPa)	42.5
		Tensile strength fsy (MPa)	3.553
		Young’s modulus Ec (MPa)	32920
		Poisson’s ratio µ	0.15
		Ultimate compressive strain es	0.045

III. RESULTS AND OBSERVATIONS

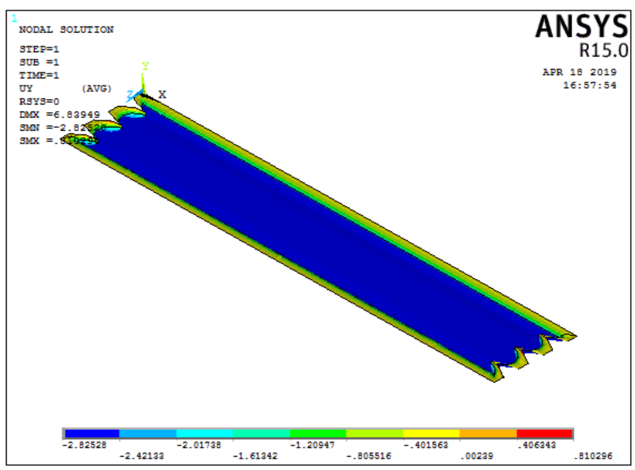


Fig 1 deflection of slab in y direction

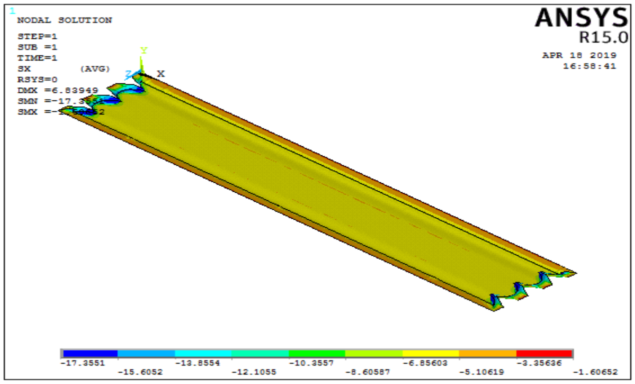
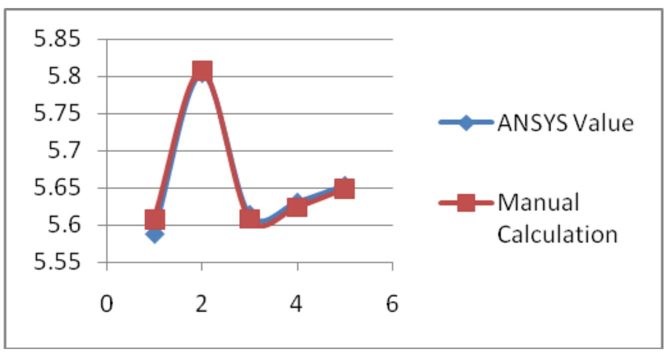


Fig 2 Stress at slab in x direction

A. Comparison of normal stress without FOB class AA at various levels with manual and ANSYS 16

Table 3 Comparison of normal stress

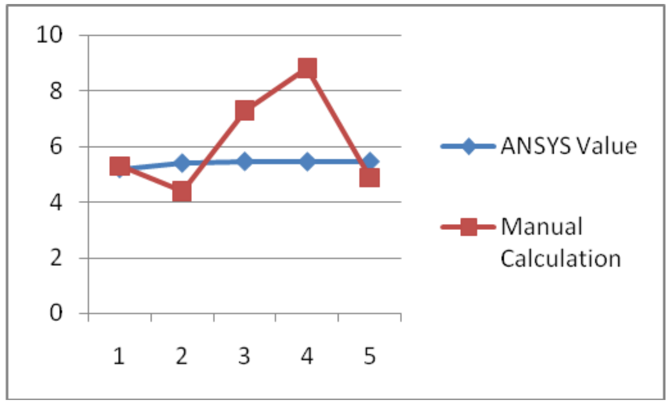
Time	ANSYS Value	Manual Calculation
0.2	5.5886	5.6071
0.4	5.8032	5.8076
0.6	5.6143	5.608
0.8	5.6306	5.6241
1	5.6531	5.6484



B. Comparison of equivalent stress without FRP class AA at various levels with manual and ANSYS

Table 4 Comparison of equivalent stress

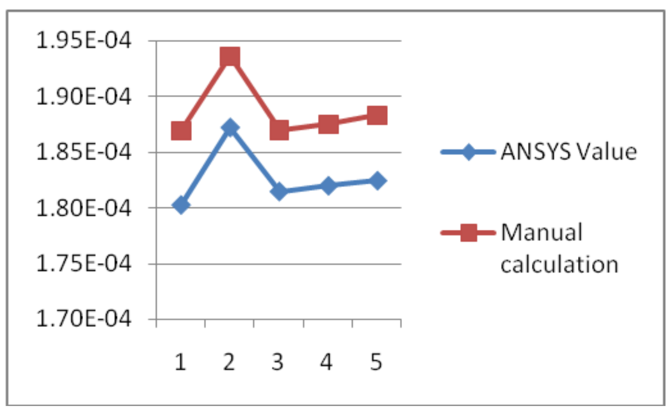
Time	ANSYS Value	Manual Calculation
0.2	5.188	5.2956
0.4	5.3896	4.3918
0.6	5.4469	7.2739
0.8	5.4406	8.8095
1	5.4438	4.8751



C. Comparison of normal elastic strain without FOB class AA at various levels with manual and ANSYS 16

Table 6.9 Comparison of normal elastic strain

Time	ANSYS Value	Manual calculation
0.2	1.80E-04	1.87E-04
0.4	1.87E-04	1.94E-04
0.6	1.81E-04	1.87E-04
0.8	1.82E-04	1.87E-04
1	1.82E-04	1.88E-04



IV. CONCLUSION

With this project we aim to contribute a working solution to the recurring problem of inconvenience and time lost for both the users. With the construction of a bridge at shelu station Pedestrian traffic will be dispersed freely and effectively resulting in reduction of congestion inside Railway Stations, better pedestrian safety, movement of pedestrians got their due right. . It will also help to reduce the number of accidents occurring at station due to trespassing. This has been a motivating factor throughout the duration of the project as different issues and learning curves have come about. After designing the bridge manually and also analysing the same in the Ansys software it is concluded that bridge can bear the load safely.

1. For moving Time FOB bridge deck gives better performance
2. Total Deformation is reduced using FOB by 25% which can affect the design approach of steel deck bridge
3. Strain energy observed more than without FOB
4. Normal stress is 20% less than without FOB
5. shear stress is observed 20% to 25%less without FOB it indicates better shear resistance against vibration induce due to moving Time
6. FOB layers can be used for rehabilitation of bridge deck
7. According to time step Timing total deformation normal stress, shear stress and strain energy are decrease continuously using FOB layer for IRC Class A
8. According to time step Timing total deformation normal stress, shear stress and strain energy are decrease continuously using FOB layer for IRC Class AA

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