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Design of Rail Over Bridge

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I. INTRODUCTION

The need of bridge is felt by people and it is communicated to Government through Public representatives or the importance of bridge is felt by Government. Due to the increased traffic demand that may be due to various reasons viz. important road, tourist place, pilgrimage centre, industries etc. Government thus decides to construct a bridge at a particular location. A structure that crosses over a body of water, traffic, or other obstruction, permitting the smooth and safe passage of vehicles. In highway transportation systems, the term "bridge" is usually reserved for structures over bodies of water. However, many other structures are generally considered highway bridges. An overhead is a structure carrying a highway over a railroad, and an underpass is a structure providing passage of a highway under a railroad. An over crossing is a structure carrying a country road or a city street over a state highway, and an under crossing is a structure providing passage of a county road or a city street under a state highway. A separation is a structure separating into two state highways. A connector ramp is a structure connecting intersecting highways and roads. An interchange is the group of ramps and structures providing connections for traffic between intersecting highways. See also: Bridge; Highway engineering Highway bridges can be made of steel, concrete, timber, stone, metal alloys, or advanced composite materials, and may have different structural systems such as girder (beam), truss, arch, cable stayed and suspension. Road project division is required to carry out survey for the bridge location and collect requisite preliminary survey data that is required for bridge planning and design. Generally 2-3 cross sections at prospective sites are taken and the bridge length is decided for the purpose of preparing stage-I estimate needed for obtaining Administrative Approval.

1. DEFINITION AND IMPORTANCE

1.1 Definition:

A bridge is a structure providing passage over an obstacle without closing the way beneath. The required passage may be for a road, a railway, pedestrians, a canal or a pipeline. The obstacle to be crossed may be a river, a road, railway or a valley.

1.2 Importance: The rail over bridge is designed to allow the road traffic to pass over the railway line.

The designing and construction of rail over bridge is on of the major structure in road ways and railways. The main purpose of construction of rail over bridge is to reduce the traveling time of road traffic and as well as trains, and increasing the speed of traffic, and avoiding the stopping of road traffic during passing of trains.

2. CLASSIFICATION AND IMPORTANT TERMS

2.1 Classification of Bridges:-

Bridges may be classified in many ways, as below

(a) According to function as aqueduct (canal over a river), viaduct (road or railway over a valley), pedestrian, highway, railway, road-cum-rail or a pipeline bridge.

(b) According to the material of construction of superstructure as timber, masonry, iron, steel, reinforced concrete, prestressed concrete, composite of aluminium bridge.

(c) According to the form or type of superstructure as slab, beam, truss, arch, cable stayed of suspension bridge.

(d) According to the inter-span relations as simple, continuous or cantilever bridge.

2.2 Some of Important terms:-

a) Bridge: Bridge is a structure having a total length of above 6 m between the inner faces of the dirt walls for carrying traffic or other moving loads over a depression or obstruction such as channel, road or railway. These bridges are classified as:

Small bridge – Overall length of the bridge between the inner faces of dirt walls is upto 30 m and where individual span is not more than 10 m.

Minor bridge – Total length upto 60 m.

Major bridge – Total length greater than 60 m.

b) Length of Bridge: The length of a bridge structure will be taken as overall length measured along the center line of the bridge between inner faces of dirt wall.

c) Safety Kerb: A roadway kerb for occasional use of pedestrian traffic.

d) Bearings: The part of the bridge structure which bears directly all the forces from the structure above and transmits the same to the supporting structure.

i) Sliding Bearings: A type of bearing where sliding movement is permitted.

ii) Rocker Bearing: No sliding movement is permitted but which allows rotational movement.

iii) Elastomeric Bearing: A bearing consisting of one or more internal layers of elastomeric boarded to internal steel laminates by the process of vulcanization. The bearing cateress for translation and / or rotation of the super structure by elastic deformation.

iv) Laminated Bearing:- A bearing composed of alternate layer of elastomeric and laminates integrally bonded during vulcanization.

v) Fixed POT Bearing:- A type of POT bearing which along with vertical load bears and transmits horizontal force in any director and allows rotation about any axis in horizontal plane without permitting any movement in horizontal plane.

e) Substructure: The bridge structure such as pier and abutment above the foundation and supporting the superstructure. It shall include returns and wing walls but exclude bearings.

2.3 FOUNDATIONS:-

Depth of foundations: The foundation shall be taken to such depth that they are safe against scour, or protected from it. Apart from this, the depth should also be sufficient from consideration of bearing capacity, settlement, stability and suitability of strata at the founding level and at sufficient depth below it.

2.4 FOUNDATION TYPES :-

Generally two types of foundations are adopted for bridge structures.

(i) Shallow foundations – Open foundations

- Raft foundations

(ii) Deep foundations – Pile foundations

- Well foundations

2.5 SUPER STRUCTURE :-

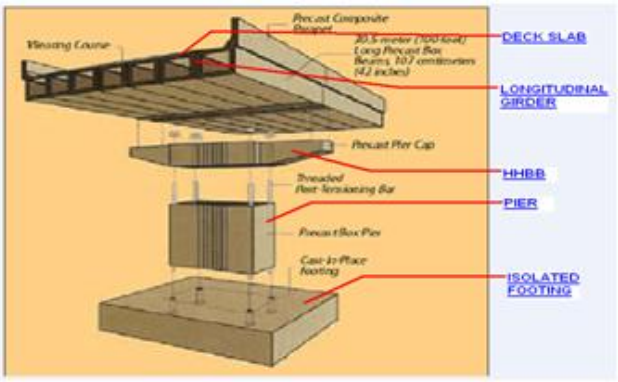
Various types of superstructure are Arches, Masonry, C.C., R.C.C. Girder and deck slab, Solid slab, R.C.C. T-Beam slab, R.C.C. Box Beam, Voided Slab, P.S.C. Two Girder, Three Girder, Multi-Girder, Box Girder, Simply supported continuous Cantilever, Balance Cantilever, Hammer Head, Bow string girder, composite construction, cable stayed, suspension.

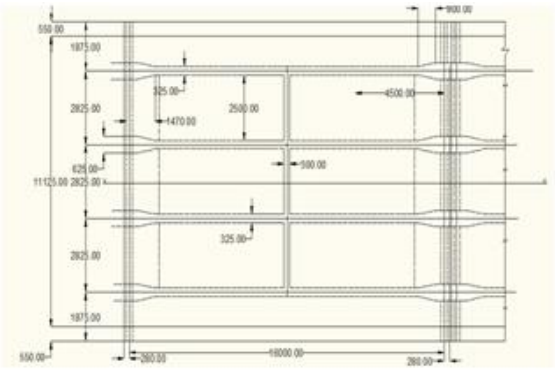
Selection of Proper superstructure: Generally the following criteria should be followed for selection of superstructure depending on span length.

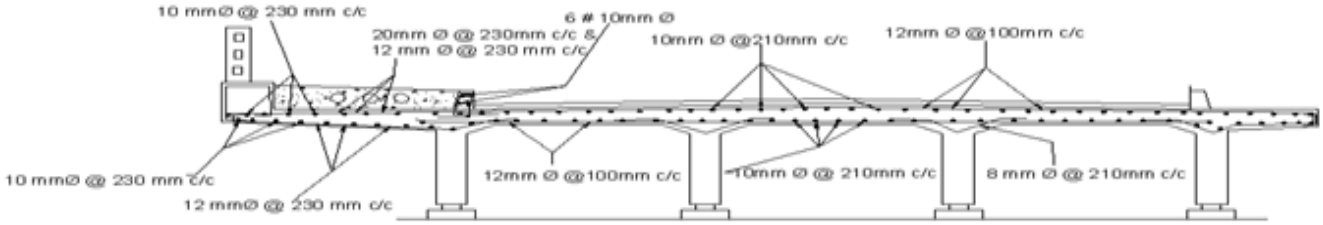
1. Spans upto 10 m R.C.C. Solid slab.
2. Spans 10 to 15 m R.C.C. slab/ Ribbed slab,
3. Spans 15 m to 20 m R.C.C. Multi-girder slab system,
4. Spans 20 m to 30 m P.S.C. Girder/ Box type superstructure.
5. Span 30 m to 60 m P.S.C. Box girder.

3.DESIGNING COMPONENTS OF RAIL OVER BRIDGE

a. DECK SLAB
b. GIRDERS
c. HAMMER HEADED BED BLOCK
d. PIER
e. FOOTING

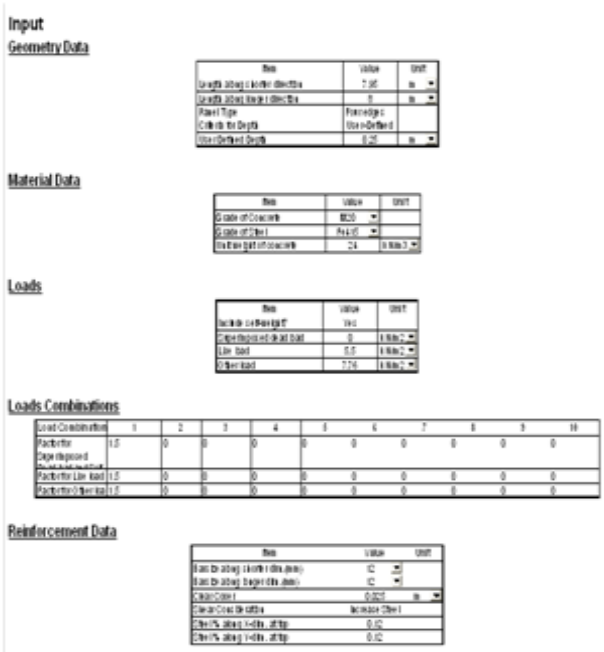






REINFORCEMENT DETAILS OF DECK SLAB

NOTE:- ALL DIMENSIONS ARE IN MM SCALE:- NOT TO SCALE



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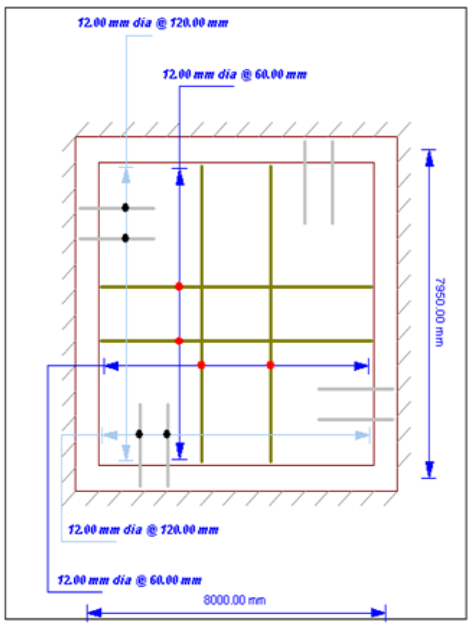
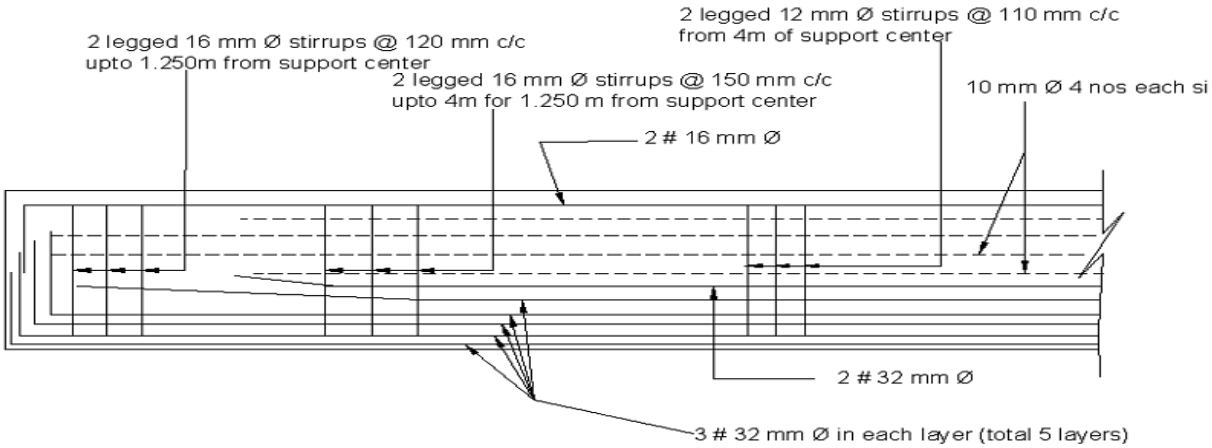
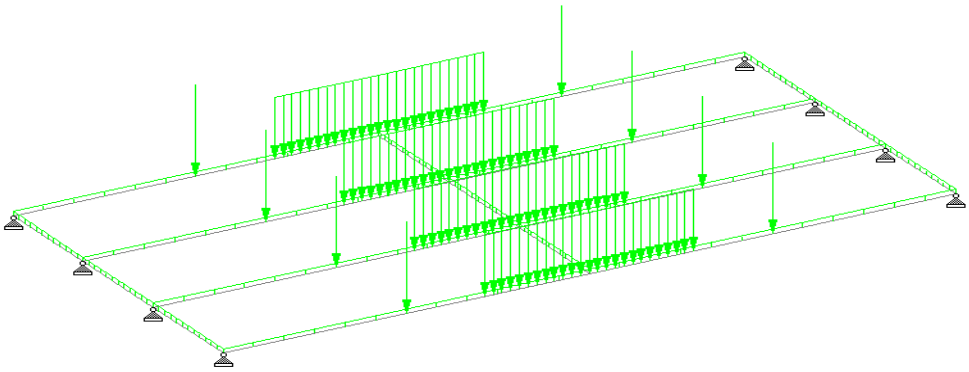


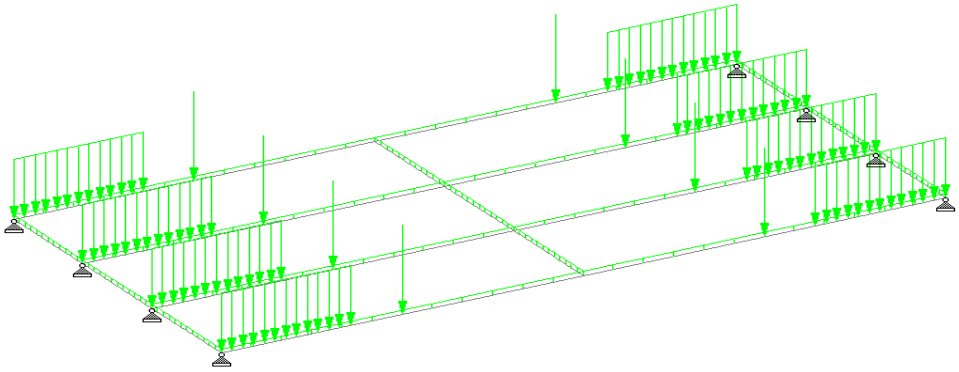
Details of Reinforcement



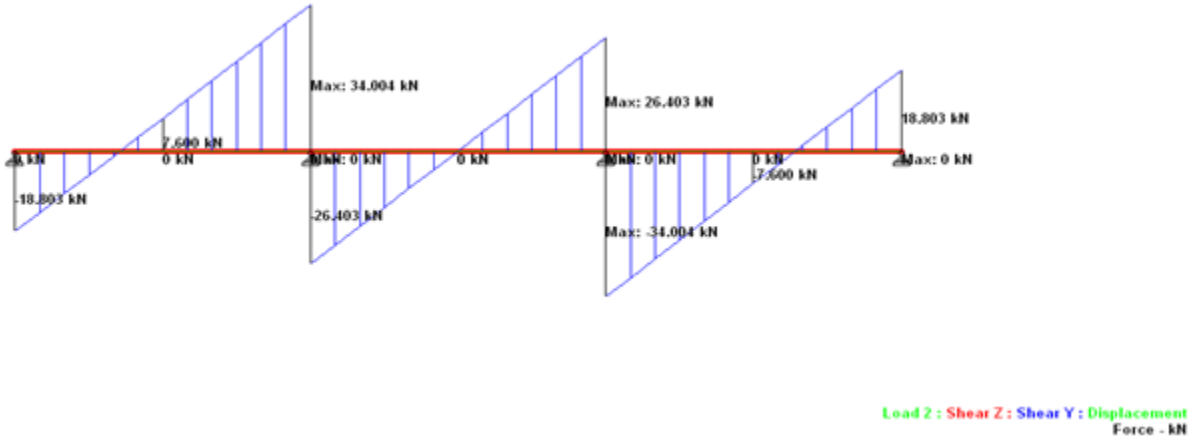
REINFORCEMENT DETAILS OF OUTER LONGITUDINAL GIRDER



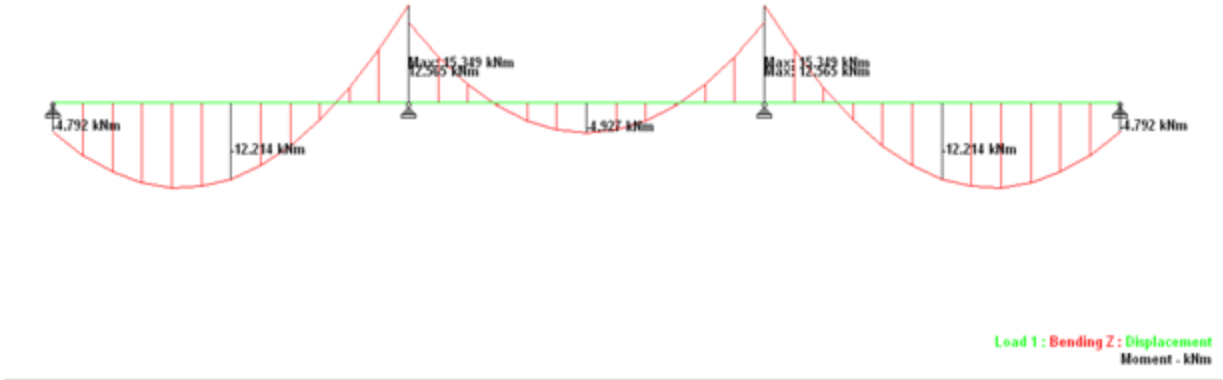
Loading maximum bending moment case-I



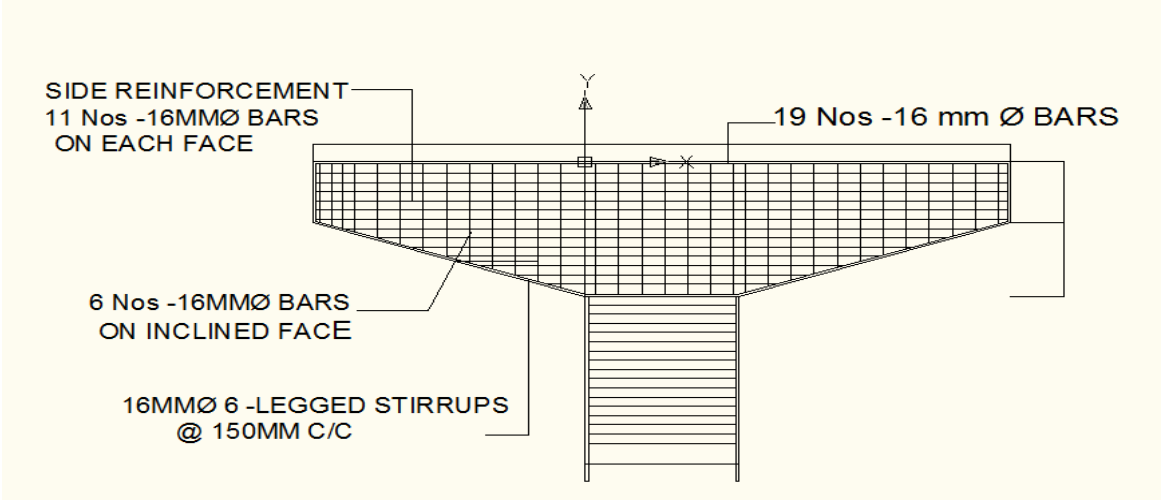
Loading on maximum shear force case-II



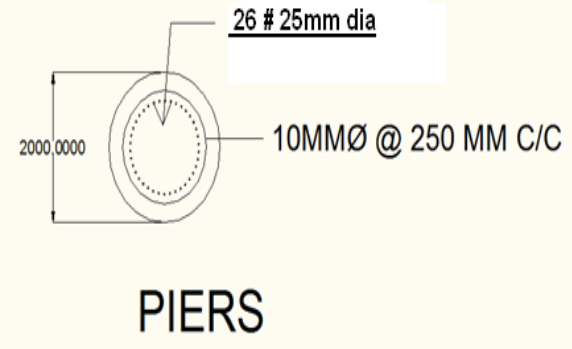
Maximum shear force for cross beam no: 1

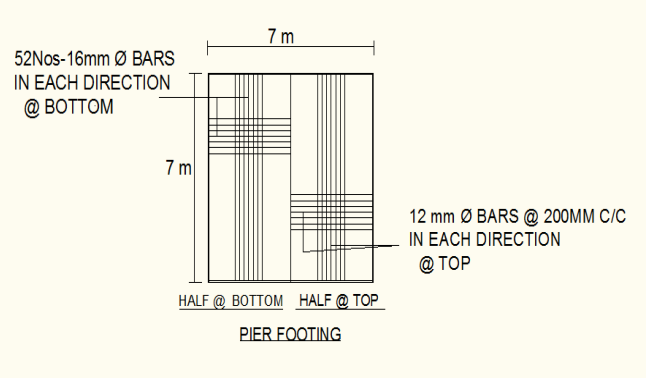


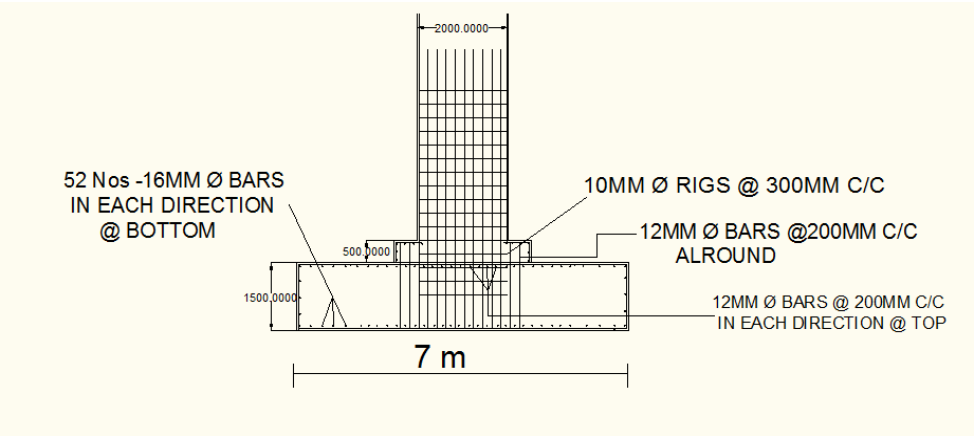
Maximum bending moment for 1st cross beam



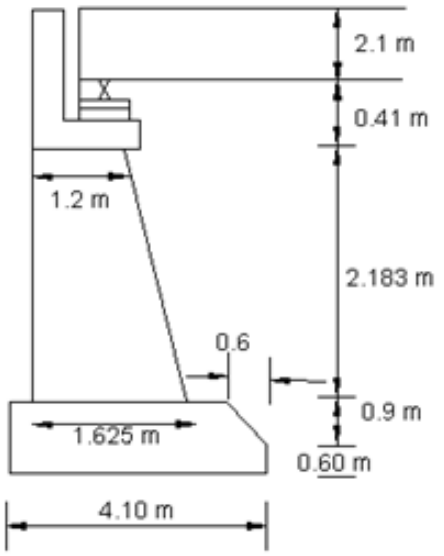
Rienforcement details of Hammer head pier cap







Reinforcement details of footing



CROSS SECTION OF ABUTMENT

4. DESIGN RESULTS

Table.1.

S. No.	DESIGN AS PER PRESENT CODE
1.	**DECK SLAB**
	Reinforcement required at bottom in short span direction is 12 mm ∅ @ 100 mm c/c
	Reinforcement required at bottom in short span direction is 10 mm ∅ @ 230 mm c/c
2.	**CANTILEVER SLAB**
	Reinforcement required at top in lateral direction is 20 mm ∅ @ 230 & 12 mm ∅ @ 230 mm c/c
3.	**LONGITUDINAL GIRDERS (OUTER)**
	Reinforcement required at bottom of girder is 17 # 32 mm ∅
4.	**HAMMER HEADED BED BLOCK**
	Reinforcement required at top (tensile zone) is 19 # 32 mm ∅
5.	**PIERS**
	Required reinforcement is 26 # 25 mm ∅ equality distributed
6.	**FOOTINGS**
	Reinforcement required is 52 # 16 mm ∅ in both direction
	Size of footing required is 7 m x 7 m

5. CONCLUSION

- The main purpose of construction of rail over bridge is to reduce the traveling time of road traffic and as well as trains, and increasing the speed of traffic, and avoiding the stopping of road traffic during passing of trains.
- By using staad.pro and manually to design and analysis of the bridge the values are nearly to same.
- The staad.pro will be used to design and analysis of bridge is more comfortable due accuracy and time consumption

7. REFERENCES

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