Comparative Study of Cable Stayed Bridge with Different Material deck Girder Using Sap Software

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Abstract— In this project the comparative study of cable stayed bridge is done using SAP software and in this project we change the material of deck girder of bridges and comparison was done on the basis of shear force, bending moment, torsion, bending stress of girders with concrete and steel and prestressed girder of same span and same loading conditions and from the analysis we conclude about the most efficient girder we make on same span and loading conditions and we conclude that steel girders are more efficient than prestressed and concrete deck girders for the same span and loading conditions which we analyse through SAP software.

Keywords: Cable Stay Bridge, IRC Class AA Loading

I. INTRODUCTION

In the field of structural engineering A bridge is a structure that allows passage through an obstruction without closing any of the ways beneath for transit. The passage over which the bridge is supplied may be for a road, a railway, pedestrians, a canal, or a pipeline. The impediments to be crossed may be a river, a railway, a road, or a valley. The structural system will mostly consist of cable-supported bridges and is separated into four major components as follows: The stiffening girder or the deck of bridge girder

1) The cable system which supports the deck of girder
2) The towers or pylons which support the cable system of girder
3) The anchor blocks (or anchor piers) supporting the cable system

The composite construction, which refers to the two load-bearing structural parts that are intimately attached to one another and flex as a single unit, makes up the steel concrete composite bridge

The concrete bridge structure of the deck is attached to the steel bridge girder so that the steel and concrete work together to lessen deflections in the structure and boost its strength. Shear connectors, which are attached to the structure's steel beams and subsequently embedded in the concrete, are used to connect the two structures. The Shear connectors can be attached using a "stud welder," or they can be improved further during export preparation by mounting nuts and bolts as well as shear pressures, are compared.

II. OBJECTIVE

This project compares the designs of cable-stayed bridges made of steel, concrete, and prestressed deck girders with the same span and load. In this project, two examples are examined, one of which has a span that is supported and the other of which has a span that is not supported during construction. For a 120.0 m span of concrete, steel, and prestressed bridge girder, the maximum bending moment and stresses, as well as shear pressures, are compared.

III. METHODOLOGY

Weight of structure taken as dead load and IRC load considers as a live load. The analysis will be accomplished for Class AA IRC loading.

Description of bridge

- Left span l1=20m
- Middle span length l2= 80m
- Right span length l3= 20 m
- Deck width =3m
- Column height h1, =5m
- Top slab thickness=0.305

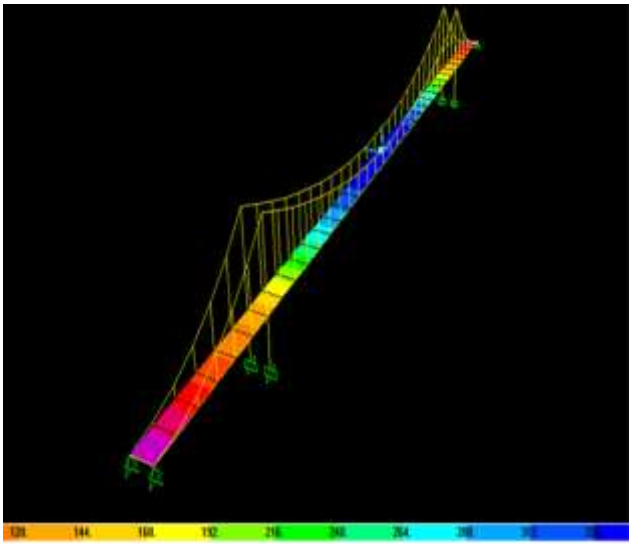
Types of spans of the bridge have been considered for design.

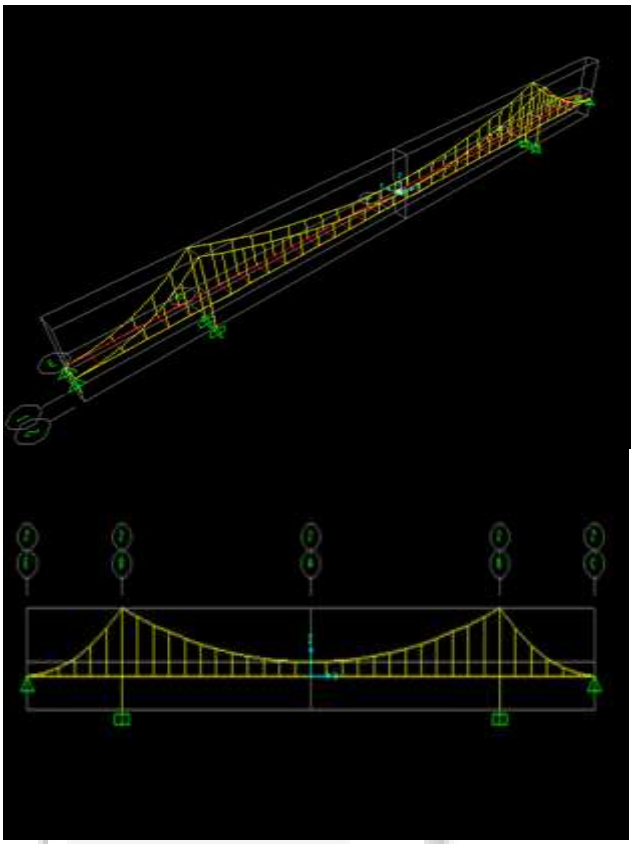
A. Un-supported span of Girder:

It has been considered that the site conditions are such that it is not possible to support the bridge during construction for the unsupported span of girder. Because of this, the steel girder will deflect when it is launched, and it will deflect much more when shuttering and concrete from the bridge deck slab are applied to it. The composite action of the steel girder and RCC deck slab will begin as the concrete on the slab begins to solidify, and the composite section will be ready to support the load. under conditions of live load.

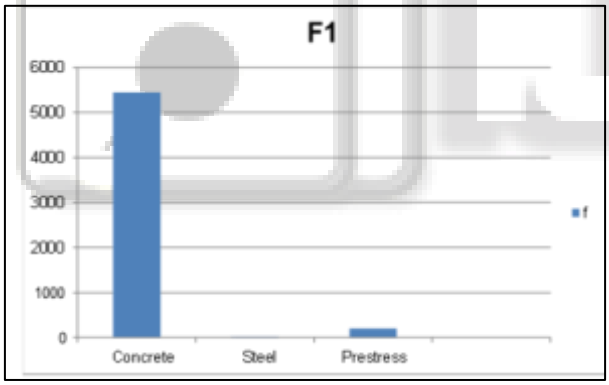
B. Supported span of Girder:

In the supported span of girder case, it is assumed that it is possible to erect the temporary support to the bridge span. There will not be any deflection of the steel girder or the deck slab as the supports are removed after hardening of the deck slab concrete. Therefore, the composite sections will resist all the loads.

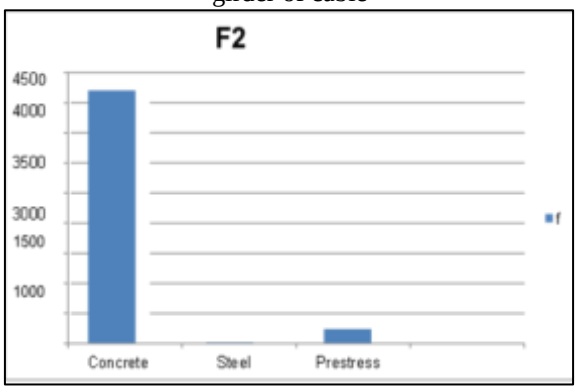




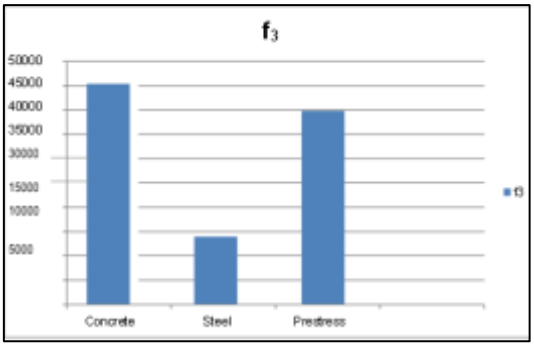
IV. RESULT



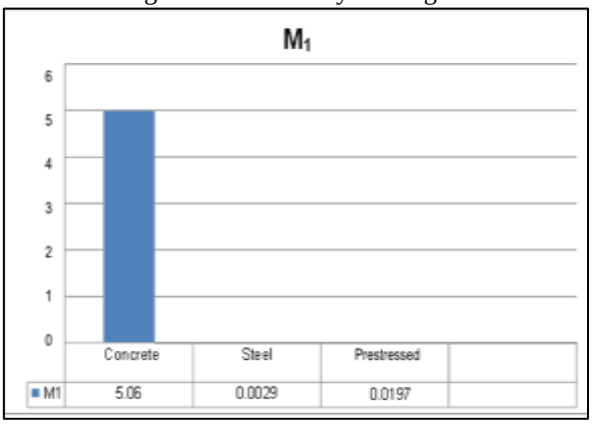
Graph 1: F1 variation of concrete, steel and prestressed deck girder of cable



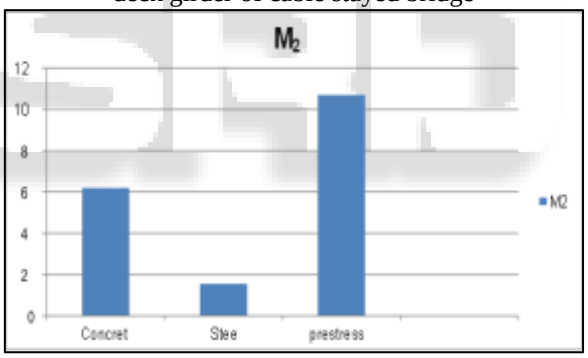
Graph 1: F2 variation of concrete, steel and prestressed deck girder of cable stayed bridge



Graph 1: F3 variation of concrete, steel and prestressed deck girder of cable stayed bridge



Graph 1: M1 variation of concrete, steel and prestressed deck girder of cable stayed bridge



Graph 1: M2 variation of concrete, steel and prestressed deck girder of cable stayed bridge

V. CONCLUSION

The models of cable stayed bridge with same span and loading conditions are analyzed using sap software and results are computed in table above and the comparative graphs are made between the structures of bridges with concrete, steel and prestressed deck girder and which girder is suitable for construction is drawn from the conclusions below:

1) The forces in steel girder are lesser than prestressed and concrete deck girder in cable stayed bridge
2) The moment and shear for concrete are more than steel and prestressed deck girder cable stayed bridge
3) Svm OF prestressed deck girder is more than steel and concrete deck girders
4) Torsion is also more in concrete deck bridges than steel and prestressed bridge.

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