Design and Analysis of Suspension Cable Bridge

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ABSTRACT - Civil engineering focuses on the construction, design and management of human and natural structures, including infrastructure such as bridges, rivers, canals, lakes and buildings. Bridging has long been one of the civil engineers' most interesting problems. For the building of the bridge products such as wood, iron, steel and concrete are used. The bulk of bridges of reinforced concrete occur in India. This work is done with the aid of STAAD pro, with standard design specifics specified in Indian Codes, to evaluate and design Cable Bridge suspension. STAAD Pro is the blueprint for the proposed suspension cable bridge. Different loads and configurations are often used in the lateral loads study. Structural design shall be undertaken with the State Limit system.

Keywords – Cable Bridge, STAAD, Civil.

I. INTRODUCTION

A suspension link is a scaffold on which the deck (the bearing segment) is hung on vertical suspenders under suspension connections. In the middle of the nineteenth century the key existing instances of this expansion worked. Easy, vertical suspension stretches in various uneven areas of the world have a long history. In addition to vertical suspension ties which convey the underlying heaviness of the deck, which cross operation, this method of grinding has links suspended between towers. The deck may be level or circular upwards to provide additional leeway for this game plan. This compose is also built without false work, as other forms of suspension connectors. At any finishing point, the suspension links must be tied down, because every heap connected with the extension of these simple links is modified to pressure. The primary ties move via columns and carry on to the backrests at the deck stage Field. The path is supported by the so-called holders by vertical suspenders or by bars. Under a few situations, the towers may sit on a barrier or a ravine edge where the path leads directly to the main trajectory, ordinarily the cloth has a scale of two liters, varying between the column match and the road that may be strengthened by the suspender ties. In the above example, the separable theory ties would be similar to no circular section.

ADVANTAGES

- Longer essential spans are workable than with every other kind of bridge.
- Less fabric can be required than different bridge types, even at spans they can obtain, leading to a reduced construction fee.
- Can be higher able to resist earthquake actions than heavier and extra inflexible bridges.

There is very high voltage on the main cables of suspension bridges. Because the system is at risk of collapse, careful precautions must be taken to stop corrosion. A very elaborate and protective procedure was designed to provide the best safety practicable for the key cables in suspended bridges. After installation, multiple coats of corrosive protective substance shall be placed across the wire. An illustration of the following various layers is:

- Polyester film coverage
- Plastic resin original coating
- A non-woven glass mat pressed layer
- A second plastic resin sheet

II. OBJECTIVES

- The bridge types: tower, suspension, truss, beam, cantilever and cable left to be defined. •
- Understand how the load on the bridge is borne by each bridge construction.
- Find out how numerous bridge styles collapse and how the bridge can be modified to improve its strength.
- Admire essential building elements, such as structural intensity and alignment. Gain an awareness of the material specifications used in the design of bridges. Link bridge templates to circumstances in real life.

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III. METHODOLOGY

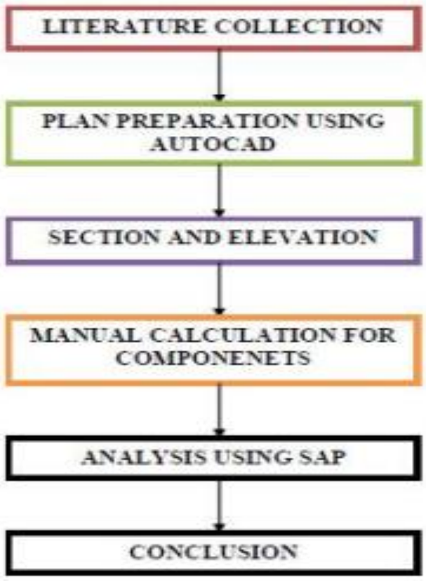

Figure 1: Methodology

IV. SOFTWARE

STAD PRO has proven to be the maximum incorporated, productive and sensible well known purpose structural program in the marketplace these days. Complicated models may be generated and meshed with effective constructed in templates. incorporated layout code capabilities can automatically generate wind, wave, bridge, and seismic hundreds with comprehensive automated metal and urban layout code assessments per US, Canadian and international layout standards.

MANUAL DESIGN:

Design of Deck Slab

Carriage way = Two lane 9 m wide

Materials = M 40 & Fe 415

Kerbs = 2 m wide

Clear span = 22 m

Width of slab = 9 m

Depth of kerb slab = 1.05 m (0.75 + 0.3)

Wearing coat = 80 mm

Width of bearing = 400 mm Loading = IRC. Class AA

DESIGN DATA:

Bearing capacity of the foundation soil = 145 kN/m³

Friction angle between footing and soil = 30 degrees

LOAD CALCULATION:

Dead Load (DL)= 49.67 KN/M

Live Load (LL) = 226 kN/m

Wind Load (W)= 3 kN/m

Wind Load on live load (WLL)= 0.5 kN/m²

Breaking force = 3 kN/m²

Shrinking and temperature force= 10% of DL

The design should conform to the specification of the bridge code IRC: 21 – 1987

Item	Unfactored (V) kN/m	Arm (m)	Moment (M_0M_0)
P-1(2*0.5*25)	25	1	25
P-2 (0.7*2.5*25)	43.75	1.15	50.31
P-3 (0.2*1*25)	5	1.4	7
P-4 (0.5*3.2*18)	28.8	1.75	50.4
DL	49.76	1.05	52.24
LL	226	1.05	237.3
V_L	4.3	1.75	7.525
V_D	2.7	1.75	4.725

V. ANALYSIS RESULT

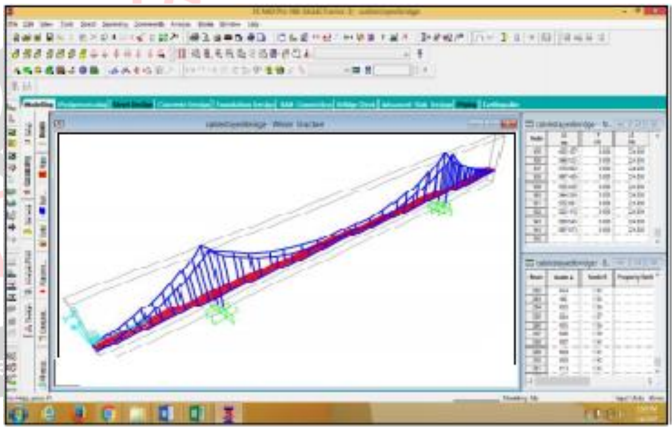

Figure 2 Finite element models

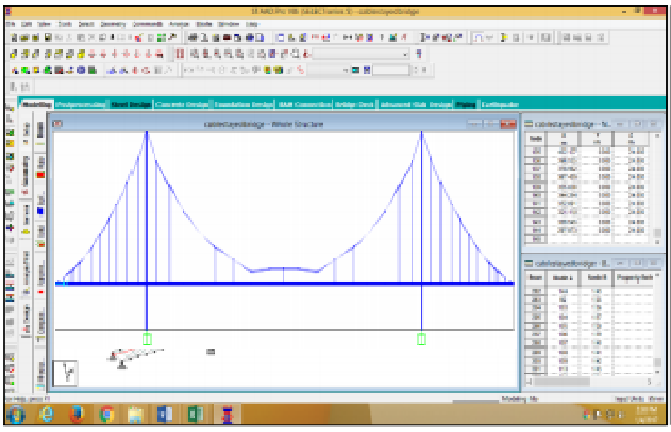

Figure 3 Suspension bridge Elevation

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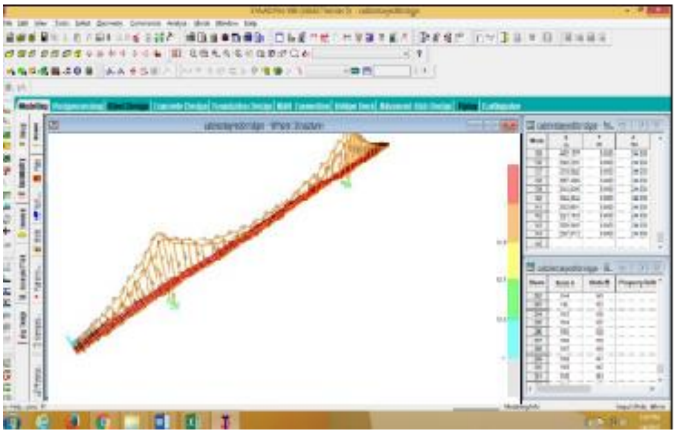

Figure 4 Design window

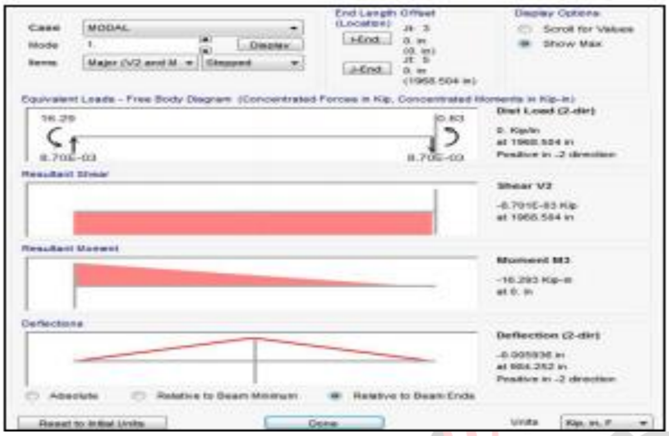

Figure 5 BM And SF Diagram window

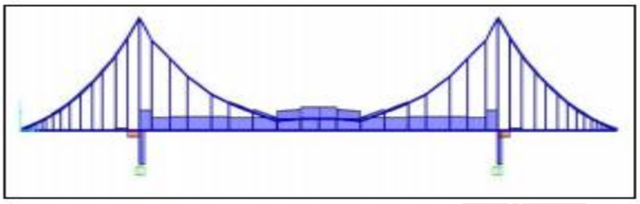

Figure 6 Axial Force diagram

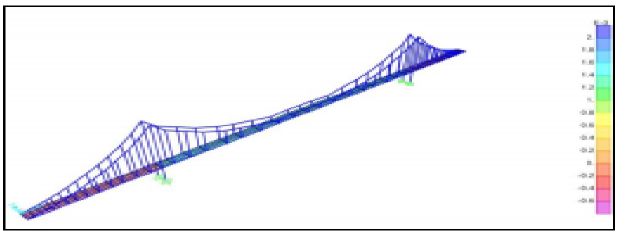

Figure 7 Stress Diagram

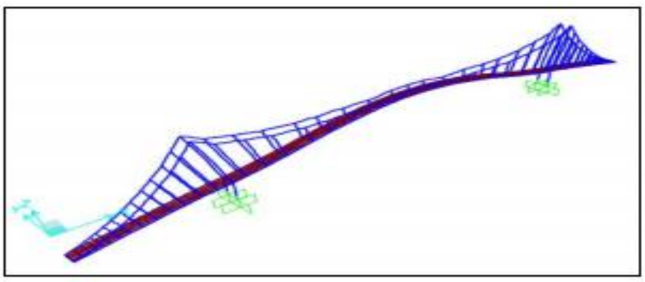

Figure 8 Deformed shape

VI. CONCLUSION

The suspension cable bridge are may furnish quarters and facilities for assemblage of human beings for social business or leisure functions and might have interaction inside the preserving portion of its premises for shops and organizations whose continuity is call for suitable to a suspension cable bridge. Particular attention should be provided during design as cables are very slim, externally influenced components. Cable vibration is a frequent cable occurrence. Damping systems are used to avoid unnecessary amplitudes of vibration from damaging the stability of the system. In this project deals with 240m span length x 7.5m carriage width suspension bridge with basic bridge components such as Deck slab, Cable design, Suspenders and Pile foundation, abutments they are designed both Manual and Analysis using STAD PRO, Results are shown in this Document.

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