Analysis And Design Of Cable Suspended Bridge Along With Identify Behaviour Of Cables During Moving Loads

[1]Patil Prashant A., [2]Prf. N. P. Phadtare

[1]P G Student, [2]P G Co-Ordinator
[1]M. Tech Structural Engineering (Civil),
[1]P. V. P. I. T. Budhgaon, Sangli, India.

Abstract : Cable-stayed bridges have emerged as the dominant structural system for long span bridge crossings during the past thirty years. That success is due to a combination of technical advancements and pleasing aesthetics attributes. The interaction of the various structural components results in an efficient structure which is continuously evolving and providing new methods to increase span lengths. The objective of this thesis is to describe in detail the basic structural behaviour of cables under moving loads cable-stayed bridges, and to present the lack of fit forces of cables during construction stage and under moving load situation

Keywords: cable-stayed bridge, truss model, incremental loading, sag effect, Ernst equivalent elasticity modulus, pylon, deck, seismic inertia loads, geometric stiffness, slackening.

I. Introduction

Cable stayed bridges are more popular because of there feasibility and aesthetic appearances at various locations and as of they are suitable for greater lengths and also they are more reliable structural system easy erection. In the preliminary design of a cable-stayed bridge, the required pretensions and sections of the cables can be pre-estimated by hand, by considering the steps of erection of the bridge, that is the suspension of successive parts of the deck from the inclined cables.

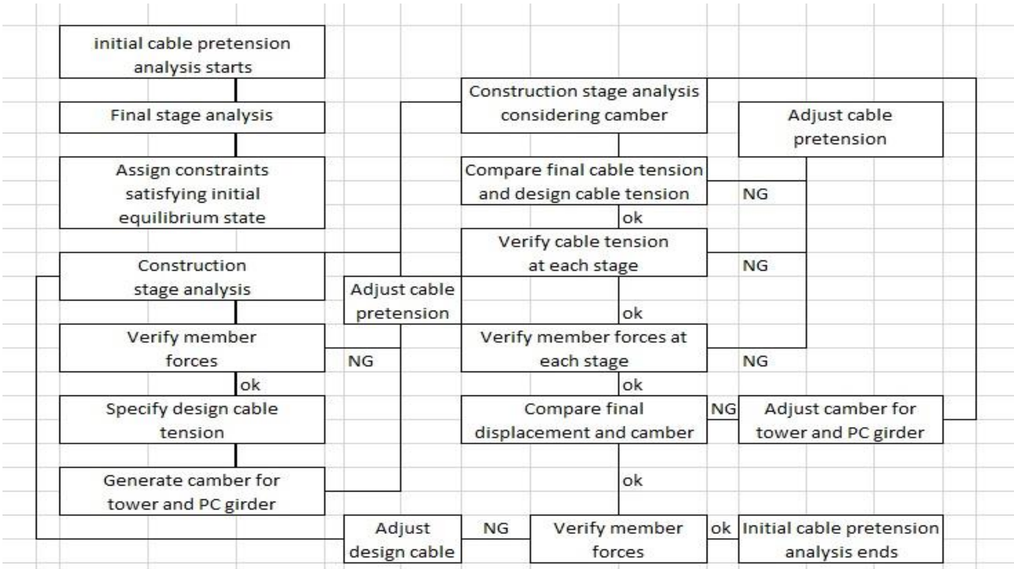
CABLES

The four types of strand configuration are

Sr. No.		Ultimate Tensile Stress (E) N/mm2	Young Modulus(σ) N/mm2
A.	Helically-wound galvanized strands.	670	165 000
B.	Parallel wire strands	1860	190 000
C.	Strands of parallel wire cables.	1600	200 000
D.	Locked coil strands.	1500	170 000

Ultimate Tensile Stress.

METHODOLOGY



Structural outline for initial pretension including construction stages

GENERAL DATA OF CABLE STAYED BRIDGE:

	END	MID	END	TOTAL
SPAN LENGTH (m)	40	125	40	205
		TOP	BOTTOM	TOTAL
TOWER HEIGHT (m)		40	20	60
ELEMENT TYPES	DECK & TOWER		BEAM ELEMENT	
	CABLE		TRUSS ELEMENT	

CABLE ARRANGEMENT: Symmetrically arranged with respect to the center of the deck portion
Boundary condition: Both End Fixed for the pylon

Unknown Load factors: from applied load check Influence Matrix
Cable Force Tuning for initial pretension in cables

On Site Construction installation stages

a) Girder Installation
b) Cable Installation with First Tensioning
c) Slab casting
d) Slab hardening and Secondtensioning

THE ANALYSIS

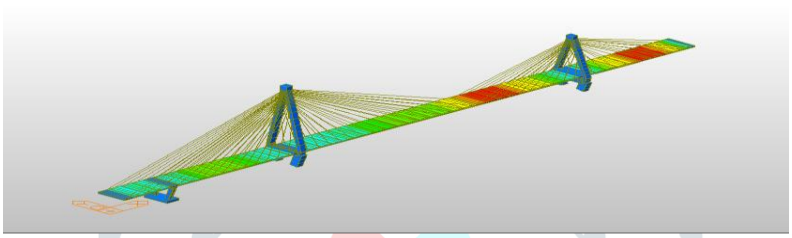


Figure DeformContMVL

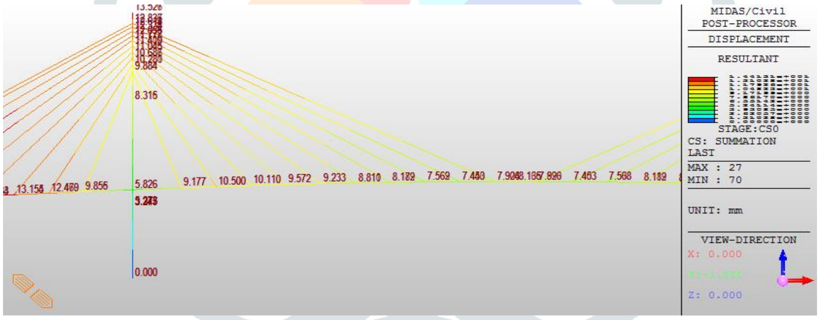


Figure : DeformCont

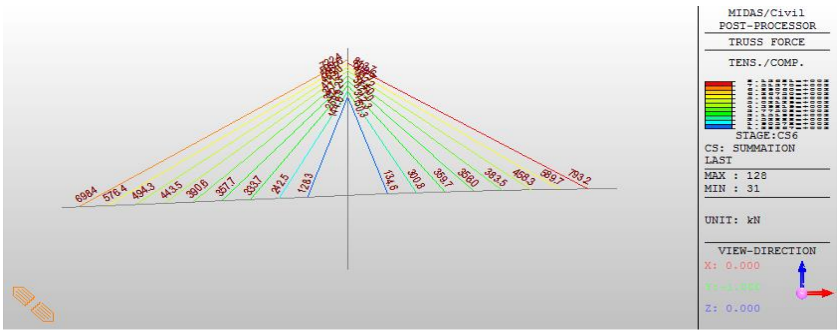
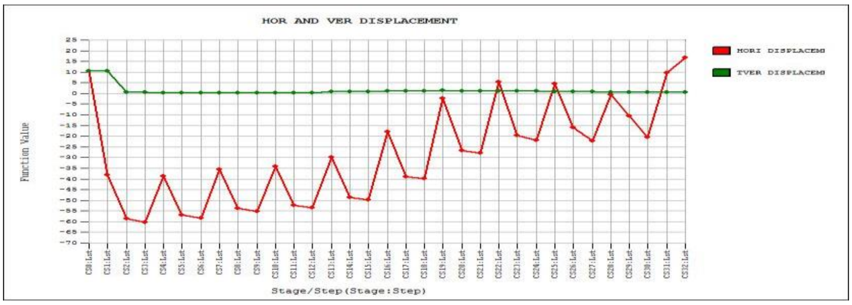
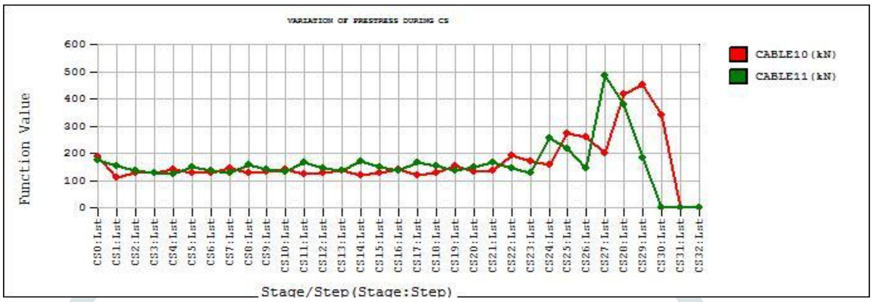


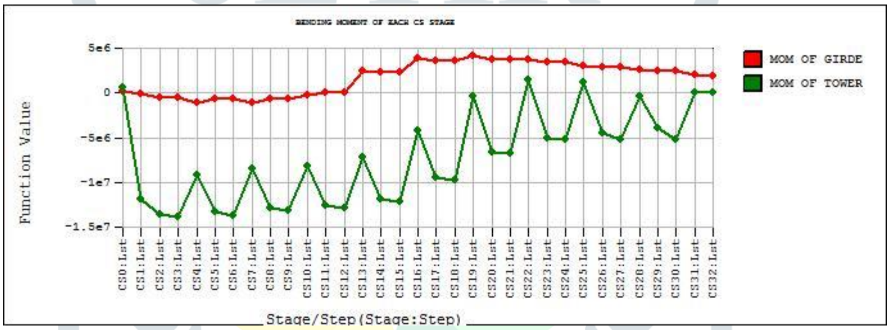
Figure Truss Force.



Horizontal and Vertical displacement



Variation Of Stress During Construction Stage



Bending Moment Tower And Girder

Cable Pressure

II. RESULTS

In cable stayed bridges as a unit pretension load applied in cables we get unknown load factors through influence matrix and then apply unknown load factors to find cable tuning forces. Also construction stage analysis as construction stage move on we consider time duration and load effects. As in construction forward and backward stage analysis cable forces are initially controlled. cable behavior are reliable and safe during moving load as we analysed previous calculations.

REFERENCES

[1] Midas Civil Guide, 2019

[2] Elizabeth Davalos (2000) "Structural Behaviour of cable-stayed bridges", Massachusetts Institute Technology.

[3] Gurajapu Naga Raju, J. Sudha Mani (2017) analysis and design of cable- stayed bridge", International Research Journal of Engineering and Technology (IRJET), Volume 5, Issue 4, December-2017.

[4] pedro delgado, aníbal costa, rui pinho , and Raimundo delgado (2004) "different strategies for seismic assessment of bridges –comparative studies" , World Conference on Earthquake Engineering 2004.

[5] J J Alvarez (2016) "Seismic Response of cable-stayed Bridge for different layout condition", World Conference on Computational Structural Mechanics 2012.

[6] Mrs. Mir Sana Fatema, Prof. A.A. Hamane (2016) "Self weight analysis of Cable stayed Bridge", International Journal of Emerging Trends in Science and Technology, 2019.

[7] h.otsuka1 and h. tanaka (2014) "a study on seismic behavior and displacement control of a continuous girder bridge with low friction sliding bearing support ", World Conference on Earthquake Engineering, March 2008.