COMPARATIVE STUDY BETWEEN GIRDER BRIDGE AND EXTRA-DOSED BRIDGE USING STAAD-PRO

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Abstract : A bridge is a structure built to span physical obstacles without closing the way underneath such as a body of water, valley or road for the purpose of providing passage over the obstacle. Purpose of this project is to study 'Extra-dosed Bridge' with comparison of pre-stressed girder bridge.

The extra-dosed bridge stability analysis is done by using STADD-PRO software. For The case study, Pre-stressed Girder Bridge is taken. The bridge is under constructed at Mundhwa, Pune. Result of comparison states that extra-dosed

Bridge has longer span, aesthetics, less deflection, less piers as compared to Pre-stressed girder bridge. The purpose of this project is to study extra-dosed bridge and compare the structural parameters with pre-stressed girder bridge.

Keywords: *Extra-dosed Bridge, Cable stayed, Girder Bridge, Staad-Pro*

I. INTRODUCTION

Bridge is a structure built to span physical obstacles without closing the way underneath such as a body of water, valley or road for the purpose of providing passage over the obstacle. There are many different designs that each serve a particular purpose and apply to different situations. Designs of bridges vary depending on the function of the bridge, the nature of the terrain where the bridge.

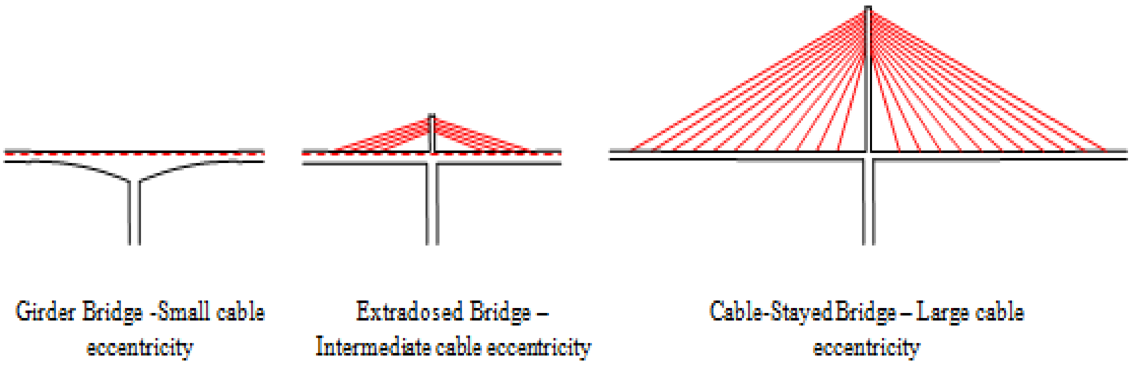

Fig no-1. Comparison of bridges.

1. Extra-dosed Bridge

The extra-dosed system is a hybrid design that is a combination of cable Stay Bridge and pre-stressed concrete girder bridge. It has been extensively used in Japan, and its use is spreading to other places.

An extra dosed pre-stressing concept, which was first proposed by installed France, is a new type of structural system in which the tendons are supports. Outside and above the main girder and deviated by short towers located at supports. Considering its definition, this type of bridge is placed between cable- bridges and ordinary girder bridges with internal or external tendons. Extra dosed PC bridges have several positive characteristics.

The major components of an extra dosed bridge are:

- Deck slab
- Stay cables
- Pylon

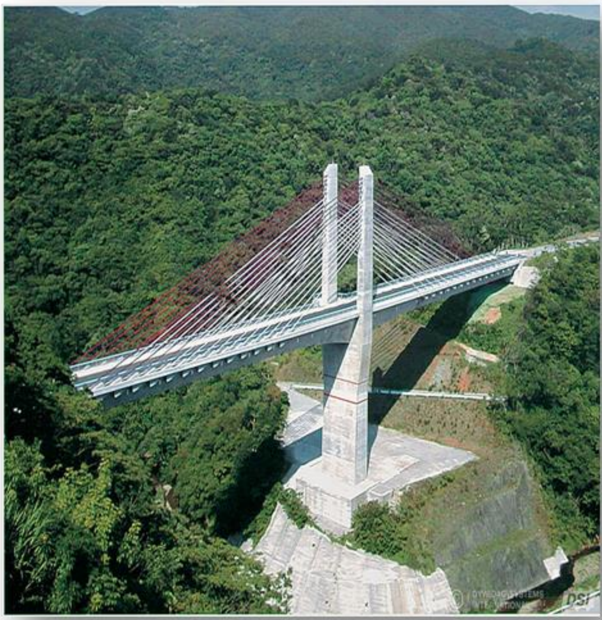

Fig no 2. Extra-dosed bridge

2. Pre-stressed Girder Bridge

Pre-tensioned concrete girders, referred to herein as PC girders. PC girders are a type of pre-stressed concrete girder that facilitates rapid construction of a bridge using girders that are fabricated off-site and then transported and erected into place at the job site. In recent years, many PC bridges have been deteriorating even before their designed service-life due to composite circumstances, alkali-silica responses, and other environmental effects.

The present study comprises of the study of Comparative study between Girder Bridge and extra dosed bridge using Staad-Pro.

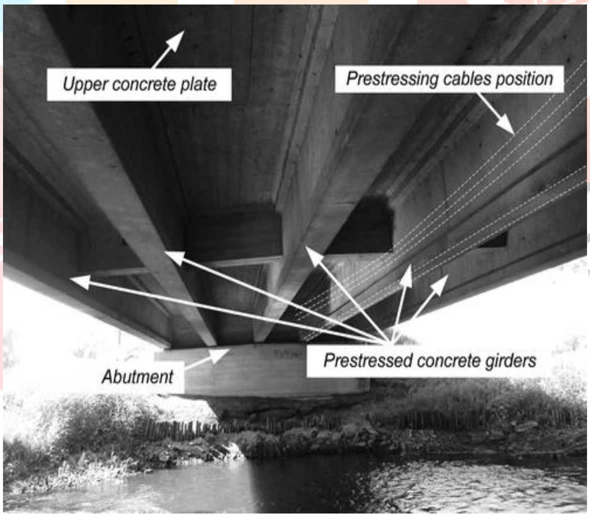

Fig no- 3 Pre-stressed Girder Bridge

II. LITERATURE REVIEW

Research papers being national and international all emphasize on the performance and Analysis of Girder Bridge and Extra-Dosed Bridge.

Literature is focused on Pre-stressed concrete bridges. Designer suggests using Girder Bridge for minor bridges and cable-stayed and extra-dosed bridge for major bridges. it is seen that the research was mainly carried out on cyclic loading with use of computer aided analysis software; Many authors experimented on cable exterior design, and came on conclusion that it's preferable to use high-strength steel cable to avoid fatigue failure of cable and to provide aerodynamic spiral, micro dent in cable outer portion or provide a grip on cable to reduce wind, rain and ice loading occurring on cable.

1. Hiroshi Mutsuyoshi & Nguyen Duc Hai Year – 2010, Recent technology of pre-stressed concrete bridges in Japan', IABSE-JSCE Joint Conference on Advances in Bridge Engineering-II. - In this paper, Pre-stressed concrete (PC) technology is being used all over the world in the construction of a wide range of bridge structures.However, many PC bridges have been deteriorating even before the end of their design service-life due to corrosion and other environmental

effects. In view of this, several innovative technologies have been developed in Japan to increase not only the structural performance of PC bridges, but also their long-term durability.

2. J.L. Liu1, H. Li and J.P. Ou , Year – 2008, Investigation of seismic performance of cable-stayed bridges with different connections - Seismic behaviours of three cable-stayed bridges with different structural systems include Rigid System (RS), Floating System (FS) and Passive Energy Dissipation System (PEDS) are studied. The result shows the displacement and force response of the main components in three cable-strayed bridges.

3. S Ikeda, Yokohama National University, Japan, Year – 2000, Japan Development of extra dosed structures in the bridge construction - Extra dosed bridges, a concept introduced by J. Mathivat in 1988, In this paper 3 bridge named as Odwara blueway bridge, the tsukuhara bridge, the kanisawa bridge are compared with their structural properties.

4. Jose Benjumea, Gustavo Chio, Esperanza Maldonado, Year-2010, Structural behaviour and design criteria of extra dosed bridges: general insight and state of the art - In this paper the historical context that describes its origin, the influence of the principal structural elements and the design criteria proposed by researchers are presented. This new typology, generally recognized as an intermediate solution between cable stayed bridges and cantilever constructed pre-stressed box girder bridges, because these take advantages of design and constructions methods of the other two typologies, has become an interesting option.

5. M V Sardesai, Dr A K Desai, Year – 2013, Investigation into Cable-Structure Interaction for Extra Dosed Bridge 'International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 3, Issue 4 - In this paper, Cable supported Bridge structures have distinctive dynamic behaviour compared to any other type of bridge, especially the dynamic behaviour. Support excitations sets structure to vibrate; cable excitations can be caused by rain, wind or vibration due to plying vehicles or due to vibration of deck. In modern cable stayed / extra dosed bridges, the stay cables are often closely spaced, with the cable lengths and tensions gradually varying from position to position. The natural frequencies of their self-vibrations are therefore likely to be rather closely placed as well. Such boundary-induced vibrations of the stay cables are likely to complicate the overall dynamic behaviour of the bridge.

III. Methodology

The methodology adopted includes collecting the data. Data collection, Site Visit, Case study, Analysis, Result, Conclusion etc. are the Parts of the methodology. Collecting Data of the girder bridge at Mundhwa.

Mundhwa Bridge in Pune is pre stressed Girder Bridge. The project was under construction since 01 Nov 2014 and was completed on 31stmarch 2017 in which five months extension was given. Analysis of Pre-stressed Girder Bridge and design of new extra-dosed bridge for the same dimensions. The inputs as per specification of material, Sizes are provided. Results are generated from analysis and compared for feasibility structure. Comparison of results generated by software.

IV. Analysis Of Bridge Using Staad-Pro

A. 1. Design of Extra-Dosed Bridge

- Specification
  - Number of Span - 3
  - Span Length – 90m, 120m, 90m.
  - Width of Bridge Deck – 18m

Structure Type	SPACE FRAME

- **Node Specification**

Table 1 : Node specification of Pre-Stressed Girder Bridge

Number of Nodes	630	**Highest Node**	630
Number of Elements	498	**Highest Beam**	983
Number of Plates	400	**Highest Plate**	947

- **Detailed Material Specification**

Table 2 : Material Specification

Property No	Name	E (KN/mm^2)	Density (kg/m^3)

1	FE500	205	7.83 E +3
2	M60	21.718	2.4 E +3
3	STEEL	205	7.83 E +3
4	CONCRETE	21.718	2.4 E +3

- **Specification of Member**

Table 3 : Member Specification

Property No	**Section**	**Area (cm2)**	**Iyy (cm4)**	**Izz (cm4)**	**J (cm4)**	**Material**
2	Rectangular 0.75x0.60m	4.5 E +3	1.35 E +6	2.11 E +6	2.77 E +6	M60
2	Rectangular 2.00x1.50m	30 E +3	56.3 E +6	100 E +6	121 E +6	M60
1	Circular 0.35m	962.113	73.7 E +3	73.7 E +3	147 E +3	FE500
4	Rectangular 1.50x3.00m	45 E +3	338 E +6	84.4 E +6	232 E +6	CONCRETE

- **Plate Thickness**

Table 3 : Plate thickness

Property no	**Node A (cm)**	**Node B (cm)**	**Node C (cm)**	**Node D (cm)**	**Material**
4	30	30	30	30	CONCRETE

- **Supports**

Table 4 : Supports

Node	**x (kN/m)**	**Y (kN/mm)**	**Z (kN/mm)**	**rX (kN-m/deg)**	**Ry (kN-m/deg)**	**rZ (kN-m/deg)**
199	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
200	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
201	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
202	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
203	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
204	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
205	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
206	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

- **Seismic Load factor**

Direction	**Factor**
X	1.5

- **Self-weight Factor**

Direction	**Factor**
Y	-1

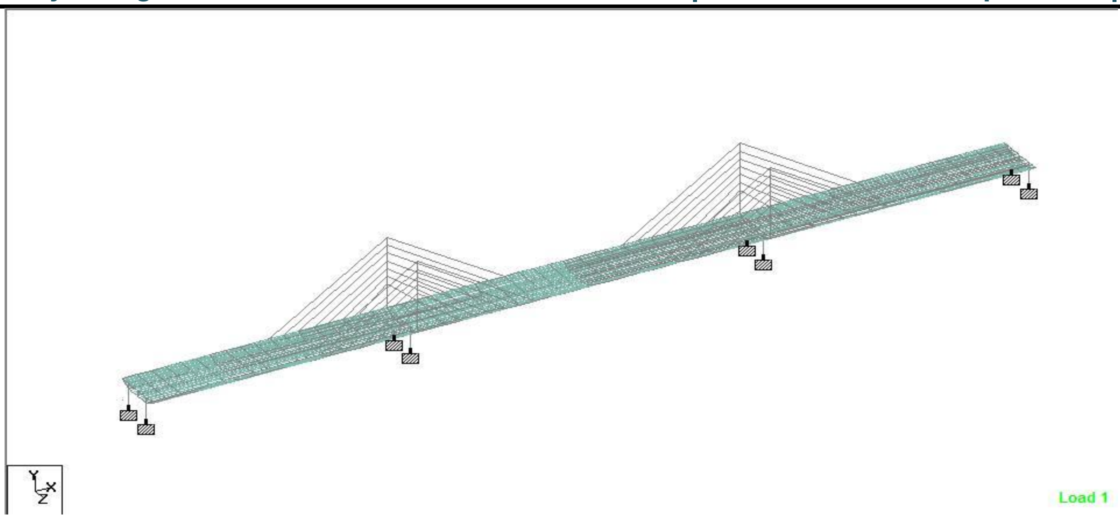

Fig no 4 - Isometric view of Model

2. Design of Pre-Stressed Girder Bridge

- Specification
  - Number of Span – 9
  - Span Length – 33m
  - Width of Bridge Deck – 18m.

Structure Type	SPACE FRAME

Node Specification

Number of Nodes	181	Highest Node	181
Number of Elements	120	Highest Beam	218
Number of Plates	100	Highest Plate	220

- **Detailed Material Specification**

Table 5 : Material Specifications

Property No	**Name**	**E (kN/mm^2)**	**Density (kg/m^3)**
1	FE500	205	7.83 E +3
2	M60	21.718	2.4 E +3
3	STEEL	205	7.83 E +3
4	CONCRETE	21.718	2.4 E +3

- **Plate Specification**

Table 6 : Plate Specification

Property no	**Node A (cm)**	**Node B (cm)**	**Node C (cm)**	**Node D (cm)**	**Material**
4	30	30	30	30	CONCRETE

- **Supports**

Table 7 : Supports

Node	**x (kN/mm)**	**Y (kN/mm)**	**Z (kN/mm)**	**r X (kN-m/deg)**	**rY (kN-m/deg)**	**R Z (kN-m/deg)**

5	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
6	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
11	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
12	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
17	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
18	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
23	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
24	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
29	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
30	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
35	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
36	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
41	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
42	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
47	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
48	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
49	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
50	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
51	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
52	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
53	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
54	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
55	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
56	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
57	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
58	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
59	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
60	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
61	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
62	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
63	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
64	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

- **Seismic Load factor**

Direction	**Factor**
X	1.5

- **Self-weight Factor**

Direction	**Factor**
Y	-1

V. RESULT

Software Results for Extra-Dosed Bridge

Table 8 : Beam Displacement Detail Summary

	Beam	L/C	D (mm)	X (mm)	Y (mm)	Z (mm)	Resultant (mm)
Max X	70	LOAD	0.000	**0.021**	-0.202	0.000	0.203
Min X	279	LOAD	0.000	**-0.052**	-0.039	0.000	0.065
Max Y	1	LOAD	0.000	0.000	**0.000**	0.000	0.000
Min Y	174	LOAD	607.474	-0.009	**-0.543**	0.000	0.543
Max Z	209	LOAD	551.584	- 0.013	-0.495	**0.001**	0.495
Min Z	157	LOAD	551.584	-0.007	-0.527	**-0.001**	0.527
Max Rst	174	LOAD	607.474	-0.009	-0.543	0.000	**0.543**

Table 9: Node Displacement Summary

Node

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)
Max X	13	1:LOAD	**207.315**	-0.829	0.570	207.317
Min X	14	1:LOAD	**-207.315**	-0.829	0.570	207.317
Max Y	18	1:LOAD	0.000	**1.854E12**	0.000	1.854E12
Min Y	17	1:LOAD	0.000	**-14.21E1**	0.000	-14.21E1
Max Z	173	1:LOAD	-29.208	-25.048	**76.810**	85.909
Min Z	174	1:LOAD	-29.309	-24.835	**-74.411**	83.743
Max rX	225	1:LOAD	1.125	-105.453	1.208	105.4666
Min rX	233	1:LOAD	1.107	-105.646	-1.169	105.477
Max rY	611	1:LOAD	12.665	-17.71	-0.867	21.94
Min rY	524	1:LOAD	12.665	-17.71	-0.867	21.94
Max rZ	17	1:LOAD	0.000	-14.211	0.000	-14.211
Min rZ	10	1:LOAD	0.000	-14.211	0.000	-14.211
Max Rst	17	1:LOAD	0.000	-14.211	0.000	**-14.21**

Displacement Summary continue...

	Node	L/C	rX (rad)	rY (rad)	rZ (rad)
Max X	13	1:LOAD	0.000	0.000	-0.156
Min X	14	1:LOAD	0.00	-0.000	0.156
Max Y	18	1:LOAD	0.000	0.000	53.567E6
Min Y	17	1:LOAD	0.000	0.000	53.567E6
Max Z	173	1:LOAD	0.003	-0.000	0.002
Min Z	174	1:LOAD	-0.003	0.000	0.002
Max rX	225	1:LOAD	**0.009**	-0.000	0.007
Min rX	233	1:LOAD	**-0.008**	-0.000	0.007
Max rY	611	1:LOAD	0.004	**0.001**	0.009
Min rY	524	1:LOAD	0.004	**-0.001**	0.009
Max rZ	17	1:LOAD	0.000	0.000	**53.567E6**
Min rZ	10	1:LOAD	0.000	0.000	**-53.567E6**
Max Rst	17	1:LOAD	0.000	0.000	53.567E6

Displacement Summary

	Beam			Horizontal	Vertical	Horizontal
		Node	L/C	FX (kN)	FY (kN)	FZ (kN)
Max FX	376	202	DL	**28127.176**	2787.686	1923.874
Min FX	350	185	DL	**-11112.153**	-110.864	0.000
Max FY	974	627	DL	1310.913	**49213.262**	-149.501
Min FY	968	621	DL	1310.913	**-49213.262**	-149.501
Max FZ	705	412	DL	-5548.757	7562.165	**2958.633**
Min FZ	811	509	DL	-5548.757	7562.165	**2958.633**
Max MX	705	412	DL	-5548.757	7562.165	2958.633
Min MX	811	509	DL	-5548.757	7562.165	2958.633
Max MY	376	202	DL	28127.176	2787.686	1923.874
Min MY	375	201	DL	28048.176	2776.686	1927.874
Max MZ	27	20	DL	-0.000	-2226.572	0.0000
Min MZ	373	191	DL	8275.846	-28238.523	984.339

Displacement Summary continue…

	Beam			Moment		
		Node	L/C	MX (kN/m)	MY (kN/m)	MZ (kN/m)
Max FX	376	202	DL	-590.980	11309.898	-8812.032
Min FX	350	185	DL	-0.000	-0.000	-0.000
Max FY	974	627	DL	-135.142	133.781	16503.841
Min FY	968	621	DL	135.142	133.781	16503.841
Max FZ	705	412	DL	868.418	-220.355	2396.873
Min FZ	811	509	DL	-868.418	220.355	2396.873
Max MX	705	412	DL	**868.418**	-220.355	2396.873
Min MX	811	509	DL	**-868.418**	220.355	2396.873
Max MY	376	202	DL	-590.980	**11309.89**	-8812.032
Min MY	375	201	DL	-591.844	**-11257.74**	-8779.295
Max MZ	27	20	DL	0.000	-0.000	**233.79E**
Min MZ	373	191	DL	-441.471	-2534.502	**-107.71E**

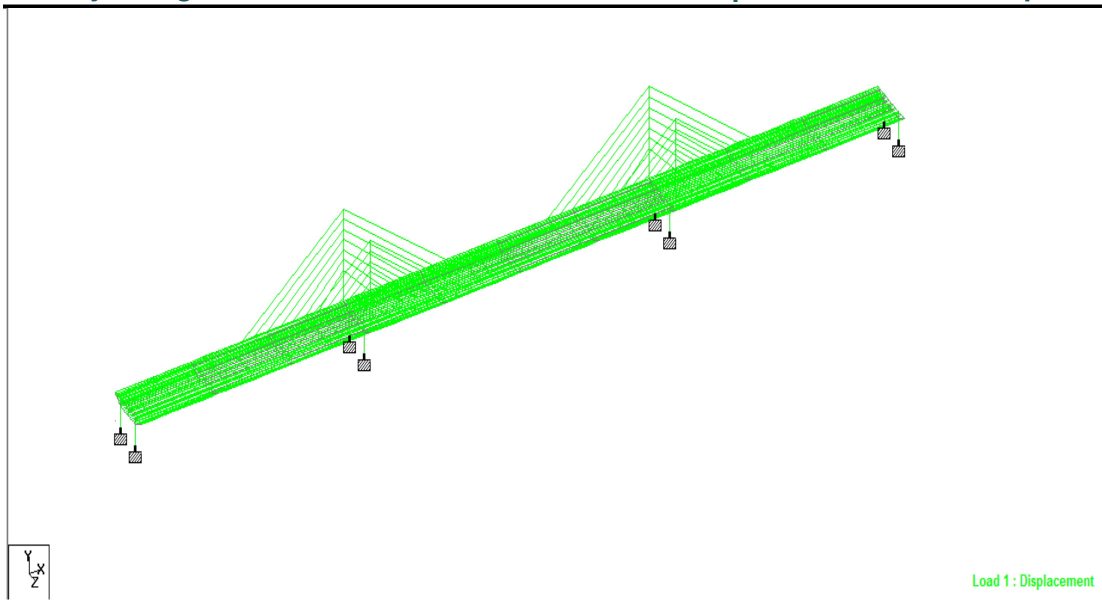

Fig no 5 - Safe Design Model Against Deflection

Table 10 : Reaction Summary

			Horizontal	**Vertical**	**Horizontal**
	Node	**L/C**	**FX (kN)**	**FY (kN)**	**FZ (kN)**
Max FX	199	DL	**28238.846**	8911.523	-984.339
Min FX	203	DL	**-28238.824**	8911.515	-984.339
Max FY	202	DL	-2787.686	**28127.176**	-1923.874
Min FY	204	DL	-28202.627	**8859.857**	980.644
Max FZ	201	DL	-2776.045	28084.057	**1957.568**
Min FZ	202	DL	-2787.686	28127.176	**-1923.874**
Max MX	201	DL	-2776.045	28084.057	1957.568
Min MX	202	DL	-2787.686	28127.176	-1923.874
Max MY	201	DL	-2776.045	28084.057	1957.568
Min MY	205	DL	2776.024	28084.049	1957.568
Max MZ	203	DL	-28238.824	8911.515	-984.339
Min MZ	199	DL	28238.84	8911.523	-984.339

Reaction Summary continue…

			Moment		
	Node	**L/C**	**MX (kN/m)**	**MY (kN/m)**	**MZ (kN/m)**
Max FX	199	DL	-3371.530	-441.471	-61721.85
Min FX	203	DL	-3371.533	441.475	-61721.83
Max FY	202	DL	-11309.89	-590.980	8812.032

Min FY	204	DL	3426.727	-473.875	61639.641
Max FZ	201	DL	11257.89	591.980	8779.032
Min FZ	202	DL	-11309.89	-590.980	8812.032
Max MX	201	DL	**11257.89**	591.980	8779.032
Min MX	202	DL	**-11309.89**	-590.980	8812.032
Max MY	201	DL	-11257.89	**591.980**	8779.032
Min MY	205	DL	-11257.89	**-591.980**	-8779.032
Max MZ	203	DL	-3371.533	441.475	**61721.83**
Min MZ	199	DL	-3371.530	-441.471	**-61721.85**

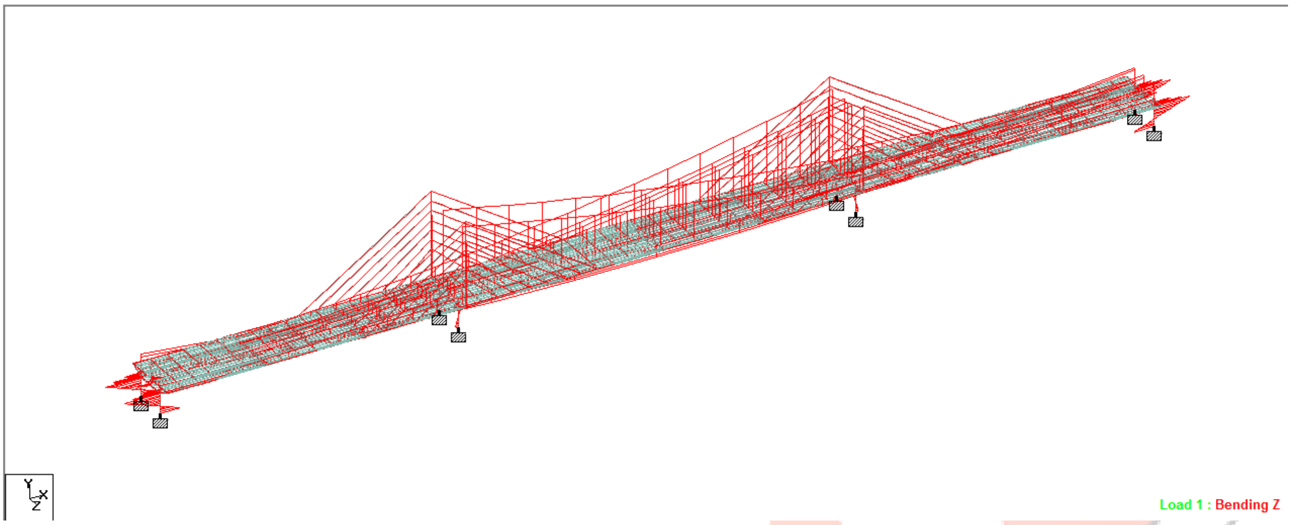

Fig no 6 - Shows Bending Moment

Software Results for Pre-stressed girder bridge

Table 11: Beam Displacement Detail Summary

	Beam	**L/C**	**D** (mm)	**X** (mm)	**Y** (mm)	**Z** (mm)	**Resultant** (mm)
Max X	28	LOAD	3.600	0.136	-0.101	0.131	0.215
Min X	23	LOAD	3.600	-0.136	-0.101	0.131	0.215
Max Y	102	LOAD	1.000	0.000	**2.341**	2.455	3.392
Min Y	2124	LOAD	2.625	0.036	**-107.21**	-2.084	107.211
Max Z	1	LOAD	6.000	-0.048	-0.097	**2.602**	2.605
Min Z	51	LOAD	6.000	-0.048	-0.097	**-2.602**	2.605
Max Rst	2126	LOAD	-0.000	-0.036	-107.21	-2.084	**107.221**

Table 12: Node Displacement Summary

	Node	**L/C**	**X** (mm)	**Y** (mm)	**Z** (mm)	**Resultant** (mm)
Max X	123	LOAD	**32.847**	-0.000	-0.000	32.847
Min X	34	LOAD	**-0.348**	-0.485	-1.780	1.788
Max Y	172	LOAD	11.85	**5.407**	3.069	13.383

Min Y	123	LOAD	-0.000	**1361.601**	-0.001	1361.601
Max Z	4	LOAD	0.079	-0.169	**3.521**	3.526
Min Z	46	LOAD	0.079	-0.169	**-3.521**	3.526
Max rX	75	LOAD	0.000	1148.464	2.566	1148.567
Min rX	167	LOAD	0.000	1148.464	-2.566	1148.567
Max rY	13	LOAD	3.577	0.005	1.903	4.034
Min rY	31	LOAD	3.577	0.005	-1.903	4.034
Max rZ	150	LOAD	0.033	-75.478	-1.327	75.490
Min rZ	141	LOAD	0.033	-75.478	-1.327	75.490
Max Rst	123	LOAD	-0.000	-1361.601	-0.000	**1361.601**

Node Displacement Summary continue…

	Node	**L/C**	**rX** (rad)	**rY** (rad)	**rZ** (rad)
Max X	123	LOAD	0.000	-0.000	-0.000
Min X	34	LOAD	-0.001	0.000	0.000
Max Y	172	LOAD	0.000	-0.001	0.001
Min Y	123	LOAD	0.000	0.000	0.000
Max Z	4	LOAD	0.003	-0.000	0.000
Min Z	46	LOAD	-0.003	-0.000	0.000
Max rX	75	LOAD	**0.072**	-0.000	0.000
Min rX	167	LOAD	**-0.072**	0.000	0.000
Max rY	13	LOAD	0.000	**0.001**	-0.001
Min rY	31	LOAD	-0.000	**-0.001**	-0.001
Max rZ	150	LOAD	0.023	-0.000	**0.046**
Min rZ	141	LOAD	0.023	-0.000	**-0.046**
Max Rst	123	LOAD	0.000	-0.000	0.000

Table 13: Beam End Displacement Summary

	Beamm	**Node**		**Horizontal**	**Vertical**	**Horizontal**
			L/C	**FX** (kN)	**FY** (kN)	**FZ** (kN)
Max FX	82	62	DL	**3226.668**	224.108	640.221
Min FX	140	117	DL	**-285.700**	0.026	-93.230
Max FY	24	13	DL	655.828	**2831.438**	-9.385
Min FY	166	31	DL	655.828	**-2831.438**	9.385
Max FZ	84	46	DL	959.3134	324.639	**1695.099**
Min FZ	77	4	DL	959.3134	324.639	**-1695.099**
Max MX	66	45	DL	97.357	521.160	-186.300
Min MX	208	175	DL	97.357	521.160	-186.300
Max MY	77	4	DL	959.3134	324.639	-1695.099

Min MY	84	46	DL	959.3134	324.639	1695.099
Max MZ	42	25	DL	845.835	2165.235	-0.792
Min MZ	42	130	DL	845.835	2165.235	-0.792

Displacement Summary continue...

	Beam	Node		Moment		
			L/C	MX (kN/m)	MY (kN/m)	MZ (kN/m)
Max FX	82	62	DL	-1.206	667.714	-316.223
Min FX	140	117	DL	1.942	357.456	-2.940
Max FY	24	13	DL	989.460	17.663	4568.559
Min FY	166	31	DL	-989.460	17.663	4568.559
Max FZ	84	46	DL	-5.288	-8045.121	1314.814
Min FZ	77	4	DL	5.288	8045.121	1314.814
Max MX	66	45	DL	**1556.849**	54.257	-18.865
Min MX	208	175	DL	**1556.849**	54.257	-18.865
Max MY	77	4	DL	5.288	**8045.121**	1314.814
Min MY	84	46	DL	-5.288	**-8045.121**	1314.814
Max MZ	42	25	DL	401.416	3.196	**7261.675**
Min MZ	42	130	DL	401.416	-2.744	**-8811.675**

Table 14: Reaction Summary

			Horizontal	Vertical	Horizontal
	Node	L/C	FX (kN)	FY (kN)	FZ (kN)
Max FX	56	LOAD	**324.639**	1208.954	-1695.099
Min FX	64	LOAD	**-324.639**	1208.954	-1695.099
Max FY	62	LOAD	-224.3229	**3229.668**	-640.221
Min FY	56	LOAD	-242.259	**-73.595**	326.474
Max FZ	57	LOAD	-324.638	1208.951	**1695.099**
Min FZ	64	LOAD	-324.638	1208.951	**-1695.099**
Max MX	57	LOAD	-324.638	1208.951	1695.099
Min MX	56	LOAD	324.638	1208.951	-1695.099
Max MY	54	LOAD	-285.713	-30.100	147.535
Min MY	51	LOAD	-285.713	-30.100	-147.535
Max MZ	54	LOAD	-285.713	-30.100	147.535
Min MZ	56	LOAD	324.639	1208.954	-1695.099

Reaction Summary continue…

			Moment		
	Node	L/C	MX	MY	MZ

			(kNm)	(kNm)	(kNm)
Max FX	56	LOAD	-2125.474	5.288	-633.022
Min FX	64	LOAD	-2125.474	-5.288	633.022
Max FY	62	LOAD	-667.714	-1.206	316.223
Min FY	56	LOAD	1544.437	389.375	1205.034
Max FZ	57	LOAD	2125.474	5.288	633.022
Min FZ	64	LOAD	-2125.474	-5.288	633.022
Max MX	57	LOAD	**2125.474**	5.288	633.022
Min MX	56	LOAD	**-2125.474**	5.288	-633.022
Max MY	54	LOAD	847.396	**807.621**	1602.668
Min MY	51	LOAD	-847.396	**-807.621**	1602.668
Max MZ	54	LOAD	847.396	807.621	**1602.668**
Min MZ	56	LOAD	-2125.474	5.288	**-633.022**

Table 15 : Comparison of Structures in different parameters.

Specification	**Pre-stressed Girder Bridge**	**Extra- Dosed Bridge**
• Number of Span	9	3
• Max. Span Length	32m	120m
• No. of piers	7	2
• Thickness of deck	1.82m	3.75m
• Tendon	Grade 7ply 12.7mm strands	Grade 7 ply 12.7mm strands
• Pylon height	-	27m
• Overall Deflection	-0.116m	-0.14m

VI . CONCLUSION

Based on the observation and results obtained from this study, the following points are concluded

The comparison show that the load carrying capacity of extra-dosed bride is more than pre-stressed girder bridge and using stay cable in bridge structure play lead role in carrying vehicle load over the bridge deck. The superiority of extra-dosed bridge is much more than traditional bridge. The height of pylon (25-30m) and span length (100-120) is efficient as compare to pre-stressed girder bridge span length (30-40m). Deflection in girder is less as compare to pre-stressed girder bridge. That's why life span is more. By using software, we conclude that the structural aspects of Extra-Dosed bridge are more effective than pre-stressed girder bridge.

VI. REFERENCES

1. A Kasuga, , (2000), 'Development of Extra Dosed Structures in The Bridge Construction S Ikeda, Yokohama National University, Japan' 25th Conference on Our World in Concrete & Structures, Singapore.
2. S Ikeda, (2000), 'Japan Development of extra dosed structures in the bridge construction' 25th conference on our world in concrete and structure.
3. Hiroshi Mutsuyoshi & Nguyen Duc Hai, (2010), 'Recent technology of pre-stressed concrete bridges in Japan', IABSE-JSCE Joint Conference on Advances in Bridge Engineering-II, , Dhaka, Bangladesh. www.iabse-bd.org
4. Konstantinos Kris Mermigas, (2008) 'Behavior and Design of Extra Dosed Bridges' Master of Applied Science Graduate Department of Civil Engineering University of Toronto.
5. J. L. Liu, H. and J.P. Ou, (2008), 'Investigation of seismic performance of cable-stayed bridges with different connections'.
6. José Benjamin, Gustavo Chi, Esperanza Maldonado, 'Structural behavior and design criteria of extra dosed bridges: General insight and state of the art'. Universidad Industrial de Santander, Bucaramanga.
7. Viktor Markel, (2010), The First Extra dosed Bridge in Slovenia, Article in Structural Engineering International .
8. Qian Li1 , Kehai Wang2 , Zhenyu Jiang3 , Discussion on Dynamic Characteristics of Extra dosed cables-stayed bridge This research was supported by China Ministry of Communications, Science Foundation for West Development Grant No. 2002-318-000-28, and by National Natural Science Foundation of China.
9. M V Sardesai, Dr. A K Desai (2013), 'Investigation into Cable-Structure Interaction for Extra Dosed Bridge 'International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 3, Issue 4.
10. Dr. K.B. Parikh , Vijay Parmar, (2015), A Review on Recent Research in Box Girder Bridge, Cable Stayed Bridge and Extra dosed Bridge , International Journal of Engineering Technology, Management and Applied Sciences.